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Demographic Analysis

Selected Concepts, Tools, and Applications

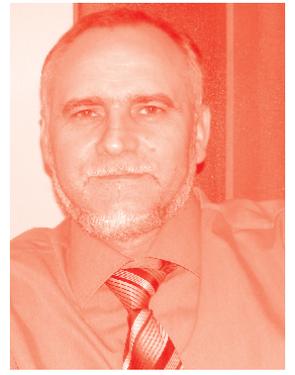
Edited by Andrzej Klimczuk



Demographic Analysis - Selected Concepts, Tools, and Applications

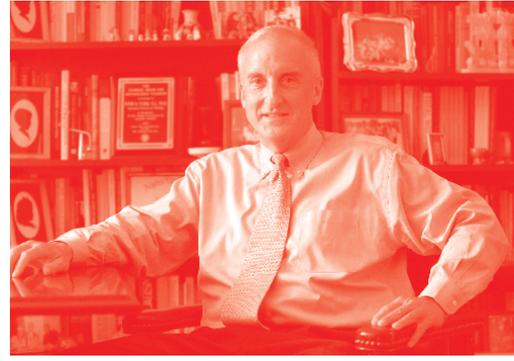
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Meet the editor



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Preface

In today's world, demographic analyses are of fundamental importance in making decisions about solving important public problems. Knowledge about the population is essential whether decisions are to be made at the local, regional, national, or international level. Moreover, recognizing demographic trends may allow public authorities to anticipate unfavorable changes and plan adequate responses. In this sense, demographic analysis always has both theoretical and practical aspects. Therefore, this volume includes chapters that contribute to the interpretation of processes and create recommendations for various public entities and policies.

Demographic Analysis - Selected Concepts, Tools, and Applications formulates an international mix of research based on various practical techniques and methods as well as examples of studies based on the usage of demographic analysis in various institutions and economic entities. The volume includes studies related to population distribution, urbanization, migration, population change and dynamics, aging, longevity, population theories, and population projections. The collection also shows relations of demographic analysis with areas such as demographic economics, political demography, population geography, epidemiology, and social gerontology.

The presented collection includes ten chapters prepared by fourteen authors from Australia, Bangladesh, Benin, Cameroon, India, Italy, Luxembourg, Poland, Tanzania, and the United States. It is a valuable resource for both academic and professional communities interested in advancing knowledge on diverse populations in various contexts such as public policies, public services, education, and labor markets. In addition, the book contains concepts and studies that may be helpful for students of demography and practitioners of various fields of social sciences, as well as those working in government, business, and nonprofit organizations.

The chapters comprising this volume are divided into three sections. The first section, "Selected Basics of Demographic Analysis," covers theoretical aspects of demographic studies and data collection. Chapter 1, "Introductory Chapter: Demographic Analysis," explains the rationale behind the book's main topic.

Chapter 2, "Demographic Analysis and the Decomposition of Social Change," focuses on converting micro-level relations into macro-level outcomes using decomposition methods. The chapter investigates three basic types of decomposition approaches (demographic, regression, and mathematical) and applies them to the example of mortality data.

Chapter 3, "Geographies of Ageing: A Visuospatial Approach to Demographic Change in Australia," shows a multi-layered approach to population aging with particular attention paid to visualization of urban and rural differences. Spatial diversity has a significant influence not only on the attitudes toward old age and older people but also on the development of health and social care systems, information exchanges, and service coordination.

The second section, “Demographic Analysis of Societies or Groups Defined by Various Criteria,” includes chapters that focus on basic features such as population size, structure, gender, age, education, religion, nationality, or ethnicity.

Chapter 4, “Demographic Transition in Sub-Saharan Africa: From Grassroots to Ivory Towers,” examines how the theory of demographic transition can be tested in the context of developing countries. The chapter critically assesses statistical principles and the philosophical basis of sub-Saharan Africa’s demographic dividends from 1960 to 2000. The study also underlines the importance of heterogeneity of population groups.

Chapter 5, “Variations in First Union Dissolution Patterns among the Lebou, Peuhl, Sereer, Toucouleur, and Wolof in Senegal,” explores differences in the union formation across diverse ethnic groups. The study is based on a biographical survey and event history analysis techniques. It highlights the complexity and the persistence of domestic and marital customs and traditions.

Chapter 6, “The Age-Sex Structure of Religion as a Determinant of the Social Inclusion of Internal Migrants in Maroua,” focuses on a study based on the usage of the exponential non-discriminative snowball sampling method. The chapter shows that diverse religious groups create various types and levels of cultural capital that influence social relationships in Cameroon.

Chapter 7, “Age at First Marriage of Women in Bangladesh: Levels, Trends and Determinants,” is based on univariate, bivariate, and multivariate techniques to analyze the data. The chapter summarizes knowledge regarding the levels, trends, and determinants of age at women’s first marriage in Bangladesh. In addition, it underlines the influence of factors such as education and wealth on demographic events.

The last section examines “Demographic Analysis in Institutions, Organizations, and Public Policy.” The selected chapters focus on issues relevant to the field such as human population planning, migration policies, health policy, climate change mitigation, and intergenerational relationships.

Chapter 8, “The City of L’Aquila after the 2009 Earthquake: Review of Connections between Depopulation, Identity and Continuity,” discusses a complex Italian case study in which an extreme natural event influenced demographic events and processes. The devastating earthquake led to a progressive demographic depopulation and discourse about the future of the city and its inhabitants.

Chapter 9, “Health Seeking Behaviors among Displaced Populations/Refugees,” examines issues related to acculturation and integration of migrants in the United States. The study underlines culture-dependent healthcare utilization patterns and is based on a mixed study. Also, it shows recommendations for health policy concerning the culturally diverse population.

Chapter 10, “Researching into Commitments for Sustainable Development Goals and Healthy Aging,” summarizes debates around the public actions related to population aging. The study primarily focuses on the United Nations’ strategic documents and policy ideas that are promoted mainly among stakeholders from public, private, and non-governmental entities all around the world.

I would personally like to thank each and every author for their contributions to this book. Together, we make a small step to advance the field of demographic studies. I would also like to thank Jasna Bozic and Sandra Maljavac of IntechOpen, who, through excellent organizational skills, helped with the editorial and publication process.

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Section 1

Selected Basics of Demographic Analysis

Introductory Chapter: Demographic Analysis

Andrzej Klimczuk

1. Understanding demographic analysis

Demography is typically defined as the study of human populations and the changes in their quantity associated with migration, fertility, and mortality. The term demography comes from Greek word and means “describing people.” Thus, this discipline deals with the characteristics of the population, taking into account features such as, sex ratio, age structure, composition, spatial distribution, and population density. In addition, sometimes a distinction is made between “formal demography” or “demographic analysis,” which includes the statistical analysis of population parameters and their dynamics, and “population studies,” that is, the analysis of the causes and effects of changes in the structure of the population in a broader context and in connection with other phenomena and processes [1, 2].

Demography uses databases of public statistics, including national administrative data on births, deaths, registered marriages, divorces, diseases, employment, as well as data from censuses. An example could be the “Demographic Yearbook System” [3] of the United Nations Statistics Division that has been developed since 1948. In addition, the demography attempts to develop predictions of the future population size (e.g., “World Population Prospects” [4]), which can then be applied by various public policy areas, including, for example, social policy, health policy, labor market policy, pension policy, and tax policy [5, 6]. Censuses organized by governmental centers (e.g., the United States Census Bureau [7] or the national statistical offices) became the first type of social survey conducted regularly due to the diversity of uses of the collected demographic data. It should be remembered that the statistics of the natural movement of the population usually need to be supplemented with knowledge coming from sociology, economics, and political science concerning, among other things, motivations, value systems, goals, and preferences of various groups of the population [8]. For example, without linking demographic and non-demographic variables, it may be challenging to understand fertility and migration behavior. Non-demographic variables concern, for example, the level of education, family structure, languages used at home, ethnic group, place of birth, stages of life, sources of household income, professional status, and position in the labor market.

2. Basic variables and research techniques

The term “demographic analysis” is usually related to forms of statistical analysis that are primarily based on mathematical and statistical techniques used on data from population censuses as well as population change surveys and systems [9, 10]. Demographic analysis is aimed at finding out the course of individual demographic phenomena in a given territory and in a specific period of time. For example,

group analyses are possible in which the behavior of a given group is tracked over a period of time. Such a cross-sectional analysis involves the study of many cohorts at a specific point in time or over a period of time; most often, it is a year. Periodic analyses of events typical for a given time period are also possible. Longitudinal (cohort) analysis concerns events that occurred in one generation throughout the life of that generation. It may be retrospective, that is, after the end of the cohort or prospective, if it concerns forecasting the phenomenon in the future. In the case of both types of analyses, the key feature is age, which differentiates population movement. Hence, descriptions of demographic processes based on age patterns, such as life tables, life expectancy, fertility rate, or net reproduction rate, are considered fundamental.

In addition, the variables used in the demographic analysis are as follows: cross-sectional, when data are collected at a fixed point in time from selected units; time series, when data are collected from one unit at a time; resources, such as population, the number of women, newlyweds, or households; and streams, such as events taking place in these communities, such as births and deaths [11]. The demographic analysis also takes into account absolute values, such as the number of deaths and the number of births, as well as relative values, that is, measures of intensity called ratios, such as the death rate and the fertility rate. The coefficients are the relations: the resource to resources, such as the share of the urban population in the total population; stream to stream, such as a number of births versus deaths; and stream to resource, such as divorce rate and migration rate. Summing up, demographic analysis usually includes the determination of the purpose and scope of the research, the selection of measures of the phenomenon under study, the observation and measurement of this phenomenon, as well as the identification of its structural features. For this purpose, the researched variables are categorized, appropriate measurement scales are created, and often the numerical value of the measure is decomposed and standardized. Depending on the aim of the study, quantitative relationships between the variables are also established, and comparisons between different populations are made, or time series are created [12, 13].

An important issue is the interpretation of the results of the demographic analysis. Economic effects and historical effects should be taken into account [11]. It is possible that the intensity of a given phenomenon in a given unit of time reflects common behavior in a given population that occurred under the influence of circumstances such as wars, economic crises, or ethnic conflicts. On the other hand, it is possible to strongly differentiate life experiences resulting from belonging to a specific age group and specific stages of the individual life course in different conditions. For example, the current generation of youth may have a better socio-economic position than the generation of its predecessors of the same age.

Moreover, there is a need to interpret demographic phenomena and theoretical scales are created, for example, the scale of the advancement of the aging process or the scale of urbanization [13]. There are also constructed balances of population phenomena used to estimate the level of selected population phenomena, for example, population size between censuses. In addition to censuses, techniques for collecting demographic data are used, such as regional, national, and international surveys based on random samples using standardized direct, telephone, or mail interviews with randomly selected respondents (e.g., “Generations and Gender Survey” [14]). Panel surveys are also carried out, during which questions are returned to the same respondents in successive “waves,” carried out every few years (e.g., “Survey of Health, Ageing and Retirement in Europe” [15]). This type of research allows capturing the stability or dynamics of changes in behavior and attitudes, for example, regarding the functioning of households, the history of procreation, and intergenerational relations in families.

3. Key uses of demographic analysis

Demography is often viewed as applied science. The collected and processed data on the population are widely used both among public entities (e.g., national, regional, and local administration) and private actors (e.g., commercial companies as well as non-profit and non-governmental organizations). It is difficult to imagine modern management of, for example, health care, education, and transport without knowledge of the population structure or making investment decisions without knowing the specifics of the local labor market. Demographers not only analyze trends but also often create recommendations regarding, among other things, family policy and migration policy [1, 5, 6]. In addition, from a business perspective, demographic data have a fundamental application in marketing as well as managing the production and sale of new products and services.

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Demographic Analysis and the Decomposition of Social Change

Parfait Eloundou-Enyegue, Sarah Giroux and Michel Tenikue

Abstract

Social science has made great strides over the last half-century, with some of the most significant gains made in micro-level studies. However, analysts interested in broad societal change will not be satisfied with this micro-level detail alone. They will find the detail useful, but they still need to convert the micro-level relations into macro-level outcomes. Decomposition methods rooted in demography can help in those situations. This chapter discusses how these decomposition methods can build on other methods traditionally used in the social sciences. It specifies the kind of problems that are well suited for decomposition analysis, and it briefly reviews three basic types of decomposition approaches (demographic, regression, and mathematical). We illustrate, using mortality data as an example, and conclude with some suggestions for how this method might more broadly advance macrosocial research.

Keywords: decomposition, demographic methods, social change, secondary data, sustainable development

1. Introduction

Social science has made great strides over the last half-century, with some of the most significant gains made in micro-level studies. With advances in computing and communication technology, researchers can now collect, share, and process statistical data on millions of households and individuals. The combination of increased computing power and the expanded availability, size, and complexity of social science datasets has resulted in a “data gold rush,” with the gold digging powerfully aided by remarkable advances in novel statistical methods [1]. With these methods, researchers can now explore in great detail the mix of factors shaping individual behaviors.

These methods can offer powerful insights into individual behavior. Yet, scientists and planners are primarily interested in societal rather than individual outcomes. For example, rather than how individual characteristics –such as education level– shape an individual’s likelihood of smoking, we might also want to see the big picture: how would an educational expansion at the national level shape changes in smoking rates? While the former, microlevel question can be robustly addressed with existing micro-regressions, the latter cannot. This is unfortunate when the interest is in national-level outcomes.

Answering such societal questions is tricky on two fronts. First, as Robinson [2] argued 70 years ago, is the risk of ecological fallacy when one draws macro-level conclusions from micro-level analyses, or vice-versa. Thus, a researcher may find

highly educated individuals to be less likely to smoke, but it does not follow that highly educated *countries* will necessarily have lower smoking rates. Second, the same regression methods cannot robustly apply to countries as units of analysis. Even if we had adequate data for every country in the world (an optimistic scenario), we would still have a relatively small sample of about 200 cases. Such a small sample cannot support robust statistical analyses, especially if one begins to consider many covariates [3, 4]. Despite being widely used in development economics in the 1990s, cross-country regressions have fallen out of favor. Yet, the broad questions about societal transformations remain.

Researchers thus need alternative approaches to link micro-data and macro-issues, building on the detail and robustness of microlevel statistics as they aggregate them to inform macro-level questions. Decomposition methods, a broad set of tools that emerged from the field of demography, present a useful set of options [5–11]. Researchers interested in studying social transformations (spontaneous or induced changes in the structure or performance of a large community or state) can leverage various decomposition approaches to examine issues where the unit of analysis is not the individual but the community.

These methods can be used when the study outcome meets three critical criteria; namely, it is 1) quantifiable, 2) aggregate, and 3) the result of a gradual change. A *quantifiable* outcome is one that can be captured as an absolute number, a percentage, a ratio, or an average. This is the case for outcomes such as rates of smoking or marriage, or average incomes. Second, the phenomenon studied must reflect an *aggregation of individual behaviors*, rather than being an intrinsic/indivisible feature of an entire society. Thus, an outcome such as a country's migration laws (an intrinsic feature with no micro-level correlate) would be excluded. However, one could very well study migration rates among different groups since this is an aggregated measure of individual behaviors. Last, the outcome must be a phenomenon that *changes gradually over time*- such as changes in the ratio of male to female wages. These methods are not suited to sudden changes or rare events (i.e., deaths from Hurricane Katrina) but rather to processes that unfold gradually.

1.1 Limitations and advantages of decomposition methods

Decomposition methods are accounting tools. Thus, while excellent at describing the processes, sectors, or groups driving change, they say little about causation. Thus, in examining changes in smoking rates, decomposition methods could reveal the extent to which different education groups (i.e., no schooling, primary, secondary, higher) contributed to declines in smoking rates. Still, they cannot say *why* education caused smoking rates to change. This is a sizable shortcoming, as causal understanding remains the holy grail for scholars and policymakers seeking to develop better-informed theory and policy. However, understanding the proximate drivers of change is still a useful guide in policy development.

Additionally, decomposition methods have four key advantages over other forms of data analysis: they are 1) easy to interpret; 2) transparent; 3) compatible with other research methods, and 4) efficient. The findings from decomposition methods are easily applied and interpreted because they use basic analyses that do not rely on complex statistics or software. For instance, one standard output from decomposition is to show the percentage of social change accounted for by a given process or group. Such an output (a percentage) is easily digestible compared to outputs from regression analyses such as beta coefficients or odds ratios. The method is transparent because the results of a decomposition analysis are easy to replicate, and the accuracy of the results is easy to check: the sum of all groups' contributions is 100%. The efficiency of decomposition methods reflects its

flexibility and the tradeoff between data requirement, analytical technicity, and the type of findings. Its basic forms can be modified and support more complex combinations to suit the researcher's individual needs. Also, decomposition methods are not very data intensive. In the field of global development, for instance, one can conduct insightful decomposition analyses by relying on tabulations and data sources that are widely available online.

As the examples in this contribution will show, the method and results are quite transparent. First, the input data and sources can be easily checked online by other scholars. Second, unlike multivariate statistics, where results can vary heavily depending on the model specification and individual coding details, decomposition results do not depend on the vagaries of individual modeling choices. Finally, the output from complex regression analysis often seems to be spewed from an impenetrable black box, and it must be taken at face value, with the reader often unable to detect an odd result from, say, a programming mistake. Such is not the case with decomposition: the decomposition findings are presented in a way that allows the reader to immediately assess the internal coherence, credibility, and accuracy of the results.

A third strength is that the decomposition approach can be leveraged and combined with other methods of analysis. In our previous work, we combined a micro-level regression examining the associations between the number of siblings a child has and their educational outcomes, with a decomposition analysis [12]. By combining these two approaches, one can aggregate the robust micro-level findings and answer the macro-level question of how fertility transitions (a country level phenomenon) impact educational attainment at the national level. This integration of methods bypassed the standard limitations of cross-country regression, while also drawing upon the robust micro-level regression findings. The decomposition method is also compatible with many other methods, including qualitative analysis. By quantifying the key behavioral and compositional changes and stratifying across groups and processes, decomposition methods can serve to direct the qualitative research. Essentially, this series of methods does not replace or compete with other methods but, rather, it complements them and expands our toolkit in innovative ways.

Last but not least, decomposition methods efficiently leverage existing information. While some parts of the world are indeed experiencing a “data gold rush,” researchers and policymakers in many parts of the global South often operate with a paucity of data [1, 13]. Despite recommendations by the International Monetary Fund's (IMF) General Data Dissemination System (GDDS) that countries conduct censuses every ten years, 66 countries currently fail to meet the standard [14]. Many researchers in these settings turn to publicly available nationally representative living standards (e.g., the Living Standards Measurement Surveys) or health surveys (e.g., the Demographic Health Surveys or Multiple Indicator Cluster Surveys). These sources can generate robust micro-level data, but they do not occur at regular intervals and are spotty or unavailable for numerous countries. For instance, from 2002 to 2011, 57 countries had either zero or a single poverty estimate [15]. Thus, decomposition methods are an ideal tool that allows scholars to leverage limited data in creative ways.

2. Decomposition basic types

Decomposition is not a single method but a set of related methods. It is used across different fields, but its variants are insufficiently integrated. Most researchers know only the variants that directly apply to their issues of interest, such as life expectancy [8, 16], job discrimination [6, 17], and poverty or inequality

[18, 19]. Yet all these variants can fit into the general taxonomy presented here. Their commonality is in using accounting-based approaches to describe patterns of change. However, they vary in the functional relationship between independent and dependent variables, as shown in **Table 1**.

For each of these relationships, decomposition analysis allows us to examine how a change in the dependent variable is driven by changes in each independent variable (reflecting a group or a process).

2.1 Demographic decomposition

In a demographic decomposition, the main accounting question is about the contribution of ‘composition’ or group-specific size versus ‘group-specific behavior.’ Thus, a researcher might be interested in documenting how much the change in the national rate of smoking between 2000 and 2020 was driven by changes in the distribution of the national population across different education levels

Relationship between X & Y	Example	Nature of the dependent variable	Description	Formula
Demographic	The total smoking rate in a country (Y) is a function of the educational composition of the population (w_j) and the average smoking behavior within each education group (y_j).	Nominal or ordinal (e.g., country, region, age group, ethnicity, marital status, educational levels).	The macro-level outcome (Y) is a weighted (by demographic weight, w_j) average of prevailing values in the various subpopulations of the country (y_j)	$Y = \sum(y_j, w_j)$
Statistical	An individual's expected earnings (Y) as a function of the model intercept (α), the “payoff of each additional year of education (β_t) and the average level of schooling (X_t).	Quantitative (e.g., a person's years of education, the number of siblings, or income in dollars).	A linear regression relationship between the dependent and independent variables (Y and X, respectively)	$Y_t = \alpha_t + \beta_t X_t$
Mathematical	GDP per capita (Y), which is a function of a country's GDP (G) and its total population (P).	A quantitative variable (i.e dollars spent per pupil)	The dependent and independent variables are linked by a simple mathematical relationship, which typically involves a quotient, sum, product, or log.	$Y = G/P$

¹Notations used in this table and text are as follows:
X indicates the independent variable.
Y indicates dependent variable for the entire country.
w refers to the demographic weight of an individual subgroup.
y_j = value of the dependent variable for group *j*,
x_j = value of the independent variable for group *j*.
t = time;
 Δ = indicates the historical change.
 α = intercept or baseline value.
 β = the marginal change in *Y* associated with a one-unit change in *X*.
e = error term.

Table 1.
 Three basic types of relationships in Decomposition¹.

(compositional effect) versus changes in the smoking rates of each education group (behavioral effect).

Formally, the national rate of smoking rate (Y) is expressed as a weighted average (by w_j) of smoking rates in subpopulations groups defined by educational categories (y_j).

$$Y_t = \sum w_{jt} * y_{jt} \quad (1)$$

In this formula, a national change in the smoking rate can be broken down into two components:

$$\Delta Y = \sum \bar{y}_j * \Delta w_j + \sum \bar{w}_j * \Delta y_j \quad (2)$$

Formula (2) thus allows the analyst to apportion change into two conceptually compelling components- the compositional ($\sum \bar{y}_j * \Delta w_j$) and behavioral ($\sum \bar{w}_j * \Delta y_j$) effect. The compositional effect is change that is driven by changes in the relative size of each subgroup. The compositional changes are relatively mechanical, as they simply reflect a change in how much each subpopulation is weighted when calculating the national average. The second component of change reflects changes in the behaviors of each subgroup. While the decomposition does not highlight the reasons for change, it does allow the researcher to understand how much of a total change is driven by a meaningful shift in group-specific behavior.

2.2 Regression decomposition

Simple regression analysis tends to model an outcome (Y) as a function of a baseline outcome or intercept (α), a regression coefficient (β), and the value of a predictor variable (X). For instance, one may predict the performance of a well-trained athlete (Y) by knowing the basic performance of a ‘couch-potato’ who has never set foot in a gym (α) and the payoff from each hour of being at the gym (β) multiplied by the number of hours one spends at the gym (X). In that case, if you randomly picked two people in the world, say one from Senegal and the other from Turkey, the difference in their athletic performance (ΔY) can entirely be explained by three factors including:

- the difference in the basic performance of a Senegalese couch-potato vs. a Turkish couch-potato ($\Delta\alpha$)
- the difference in the payoff of gym work in Senegal vs. Turkey ($\Delta\beta$)
- the difference in the number of gym hours for our Senegalese vs. Turkish person (ΔX)

Similarly, a researcher might use a regression decomposition to document how much of the variation in men and women earnings was driven either by the differences in education levels or by the differences in returns to education, suggesting that the gap is driven by discrimination processes. In other words, the researcher would like to know the contribution of (1) the male-female difference in the average level of education, (2) the male-female difference in return to education to

male–female wage differences, and (3) the differences in baseline wages between men and women. These three possibilities are explored below. The formal analysis consists of writing the earning equations for males (m) and females (f) and then taking the difference between these two equations.

$$Y_m = \alpha_m + \beta_m X_m \quad (3)$$

$$Y_f = \alpha_f + \beta_f X_f \quad (4)$$

The decomposition seeks to explain the difference in wages based on the change in the various parameters of the regression equation. This change is expressed as follows

$$\Delta Y = \Delta\alpha + \bar{\beta}\Delta X + \bar{X}\Delta\beta \quad (5)$$

In Eq. (5), the term with upper bar represents the average $\bar{x} = \frac{x_m + x_f}{2}$

Eq. (5) expresses how much of the pay gap is driven by differences in base salaries ($\Delta\alpha$) versus differences in the levels of schooling (ΔX) and differences in return to education ($\Delta\beta$).

Note that the same procedure can apply to both cross-sectional analysis (the difference between two groups in a given year) and longitudinal analysis (the change experienced by one group between years). The approach is the same; only the interpretations differ.

2.3 Mathematical decomposition

In some cases, an outcome of interest is a function of a set of other variables. For instance, a country’s GDP per capita (Y) is measured as the size of the economy divided by the total population. Thus, change in GDP (ΔY) between two time periods can be decomposed into two pieces—the amount of change driven by the growth or contraction in the economy (ΔG) and the change in the total population size (ΔP) or precisely change in the inverse of the population ($\Delta(1/P)$).

$Y = G/P$ is differentiated as

$$\Delta Y = (\bar{G} * \Delta(1/P)) + \left(\left(\frac{1}{\bar{P}} \right) * \Delta G \right) \quad (6)$$

This first decomposition is not very informative. However, one can transform the initial equation into a formula that is slightly longer but conceptually richer:

$$Y = \frac{G}{P} = \frac{G}{A} * \frac{A}{P} \text{ where } A \text{ is the working-age population.}$$

With this transformation, G/A represents the economic productivity of the adult population (or π). This is a conceptually important factor in theories of economic growth. The same is true for the new term A/P (or α), which reflects the ratio of the working-age population to the total population, a core variable in the analysis of demographic dividends. Thus, we now have two theoretically interesting variables (π and α) and can decompose national income in terms of these two variables.

$$\Delta Y = (\bar{\pi} * \Delta\alpha) + (\bar{\alpha} * \Delta\pi) \quad (7)$$

Now, any historical change in GDP (ΔY) can be decomposed into the change in productivity (π) versus the change in the share of the working population (α).

3. Demographic decomposition: a deeper dive

While offering readers a review of different decomposition approaches, we wanted to focus in some detail on demographic decomposition. As noted above, demographic decomposition applies to national outcomes (Y) that are an aggregated result of the outcomes of several subpopulations (y_j), each weighted by its relative size (w_j). Formally:

$$Y_t = \sum w_{jt} * y_{jt} \quad (8)$$

For example, the mortality rate of a country (Y_t) is the weighted average of rates (w_{jt}) in different regions or socioeconomic groups. In this formulation, Y , the dependent variable, is quantifiable and the independent variable X is measured nominally and captured by a set of categories (j). For the demographic decomposition to work, the independent variable must meet four critical criteria: *exhaustiveness*, *distribution*, *variability*, and *relevance*.

Exhaustiveness simply means that each member of the population belongs to one, and only one, of the categories within the independent variable. The set of categories must cover the entire population, and the categories have to be mutually exclusive. Distribution refers to the concept that the number of categories cannot be too few (>2) nor too many. If there are too few categories, as in a variable like a dichotomy, the analysis will not be detailed enough to be informative. Yet, with too many categories (i.e., age in single years), the data will end up spread too thinly.

It is also crucial that the independent variable change over time, i.e., the size of the individual categories comprising the independent variable (the w_j) must fluctuate over time. Without such variation, the compositional effect in the decomposition analysis will always remain zero. Because of this, an independent variable like gender is often not ideal, as sex-ratios in a national population rarely change dramatically over time. Similarly, annual income with set threshold cut-offs (i.e., less than \$20,000; \$20,000–\$40,000; \$40,000– \$60,000; more than \$60,000) could be appropriate, but income quartiles would not, since, by definition, there is no change in the size of each quartile over time.

Lastly, a good independent classification variable should be conceptually relevant to the outcome of interest. Thus, for many phenomena, a strong classification variable might be “region of country” if there has been 1) changes in the size of the population within each region and 2) variation in the Y variable by region. This would be especially appropriate if the variation in Y reflects a scenario where programs and policies are designed at the regional level.

3.1 Two patterns of change: a visual representation

Demographic decomposition allows the analyst to document how much of a particular change is driven by 1) changes in the behavior of different social groups vs. 2) changes in the demographic size of these social groups.

Both compositional and behavioral factors can drive a range of important changes in national social, economic, and health outcomes. **Figure 1** below

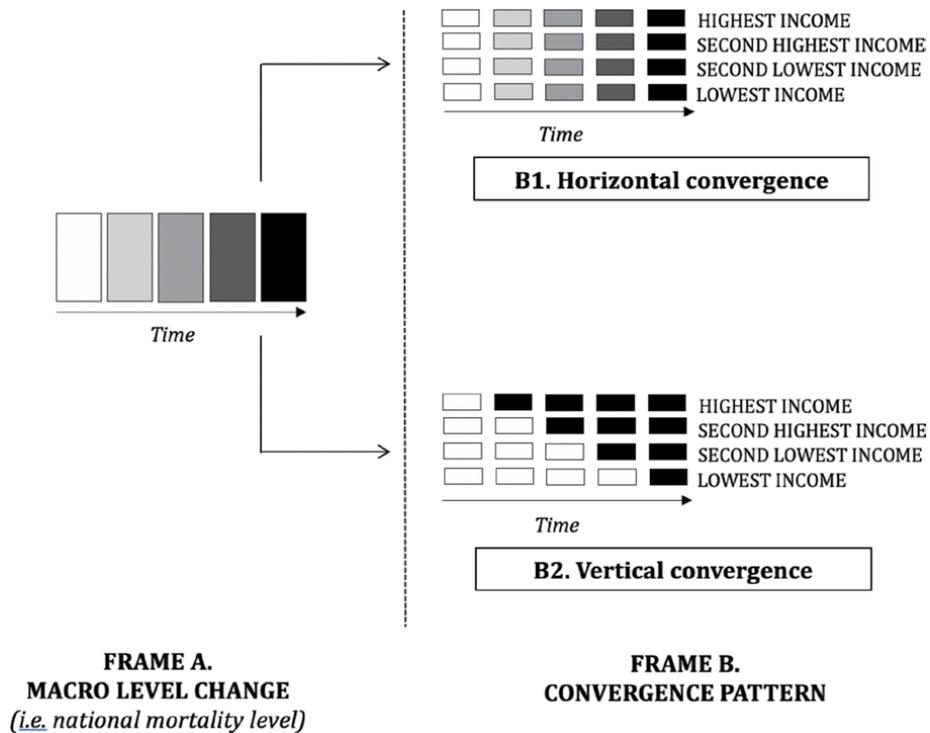


Figure 1.
Patterns of change: Vertical versus horizontal convergence in infant mortality.

illustrates a basic decomposition using the example of infant mortality. This topic is especially relevant for sub-Saharan African policymakers working to achieve Target 3.2 of the Sustainable Development Goals (SDGs), aiming to reduce the levels of child mortality to no more than 25 deaths per 1,000 live births by 2030 [20]. In 2019, Sub-Saharan Africa had the highest neonatal mortality rate at 27 deaths per 1,000 live births [21]. In their first month of life, a child born in sub-Saharan Africa is ten times more likely to die than a child born in a high-income country [21]. However, this fact masks considerable variation within African countries, including severe differences by parental wealth and maternal education [22]. Having a better understanding of the internal variation in these trends can be critical for developing effective policies.

Figure 1 provides a visual description of how the same national-level change can stem from very different subnational patterns. On the left-hand side of **Figure 1** (Frame A: Macro-Level Change) are five squares that represent the trend in child mortality for the country as a whole, with darker colors indicating lower levels of mortality. The chart shows a steady regression at the national level from lower levels of child mortality (the white square on the far left) to higher mortality levels (the black square on the far right). Given these trends, one crucial question is how this evolution occurred, specifically, how various socioeconomic classes contributed to it.

On the right side of the diagram (Frame B) are two possible, and fundamentally opposite, scenarios of how this change can unfold. The first, (B1), highlight a case of horizontal change, where the child mortality rates decline at the same rate for all income groups. Conversely, in Frame B2, we see a vertical change, with the mortality declines beginning with the country’s highest income group before gradually spreading to the rest. In year 2, it was only the highest SES group that was

experiencing any decline in child mortality—the other income groups remained unchanged. If we were to ask about the groups that drive the change, we would get different answers from the two scenarios: in the first case, all groups evolved simultaneously, while in the second case, the change occurred first in the higher SES groups. Understanding how this national trend unfolds has key implications for resource allocation and policy targeting.

3.2 Compositional vs. behavioral change

The example above shows how the same national-level change in mortality can emerge from a single group (i.e., entirely driven by mortality declines among the highest SES group) or be something that occurs as the result of a widespread change throughout the population (i.e., all groups experience a decline, but the declines are quantitatively smaller for each group). However, a full decomposition allows the analyst to identify the groups driving the change (referred to here as the compositional effect) and *also* consider how changes in the behavior of each group mattered (referred to here as the behavioral effect).

Figure 2 presents a hypothetical case where a researcher is trying to understand changes in average monthly income. The figure’s left portion shows Time 1, where the average monthly income for all individuals is \$142.50. The classification variable is economic class, ranging from richest to poorest¹, and income is the weighted average of incomes across all of the economic classes making up the national population. On the right-hand side of the figure are two different scenarios, with the average monthly income rising to \$159.20 in both cases. Yet while the two scenarios reflect an identical aggregate change, they are qualitatively quite different.

In scenario 1, the average income of each economic group remains exactly the same between time 1 and time 2. The only factor that changes is the percentage of the population in each economic class. The percentage of the population in the second-highest economic group rose from 15% to 20%, while the poor’s share of the population declined. Thus, the change in scenario one is entirely *compositional*. No individual group became richer, but more individuals moved to higher economic classes. Conversely, in scenario 2, we see the same aggregate gains but no

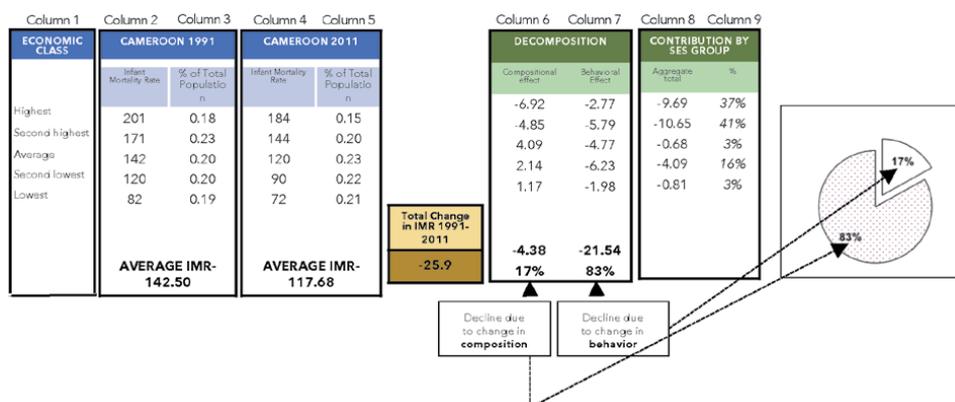


Figure 2. Decomposing change in child mortality, Cameroon 1991–2011.

¹ For this example, these are not quintiles but based on dollar cutoff values that remain the same between time one and time two.

compositional change. Instead, all of the gains are driven by an increase in the average income among some groups. The wealthiest group became even richer, jumping from \$350 in year 1 to \$400 in year 2.

This example presents an extreme contract, where social change entirely (100%) stems from a change in either composition (Scenario 1) or behavior (Scenario 2). While useful for pedagogical purposes, it's perhaps unsurprising that reality is usually less extreme. In most cases, change is driven by some combination of the two effects. For example, compositional change might explain 30% of the change, while behavior accounts for the rest. Demographic decomposition allows the analyst to piece apart these different drivers of change (Figure 3).

3.3 Demographic decomposition: the mathematical formulation

In this first case, we focus on a national average; Y will be expressed as a weighted average (by w_j) of the values of individual subpopulations (y_j).

$$Y_t = \sum w_{jt} * y_{jt} \tag{9}$$

In this formula, a national change can be broken down into two components:

$$\Delta Y = \sum \bar{y}_j * \Delta w_j + \sum \bar{w}_j * \Delta y_j \tag{10}$$

As noted above, decomposition methods apportion change into two key components. The compositional effect captures the amount of change driven by changes in each population subgroup's relative size. As seen in the last example, national income may go up simply because the number of individuals in the highest economic class increases, thus increasing the group's demographic weight. Conversely, the behavioral effect captures change that was driven by an actual change in the group's behavior. In our last example, this was reflected by actual gains in income among the lowest economic groups.

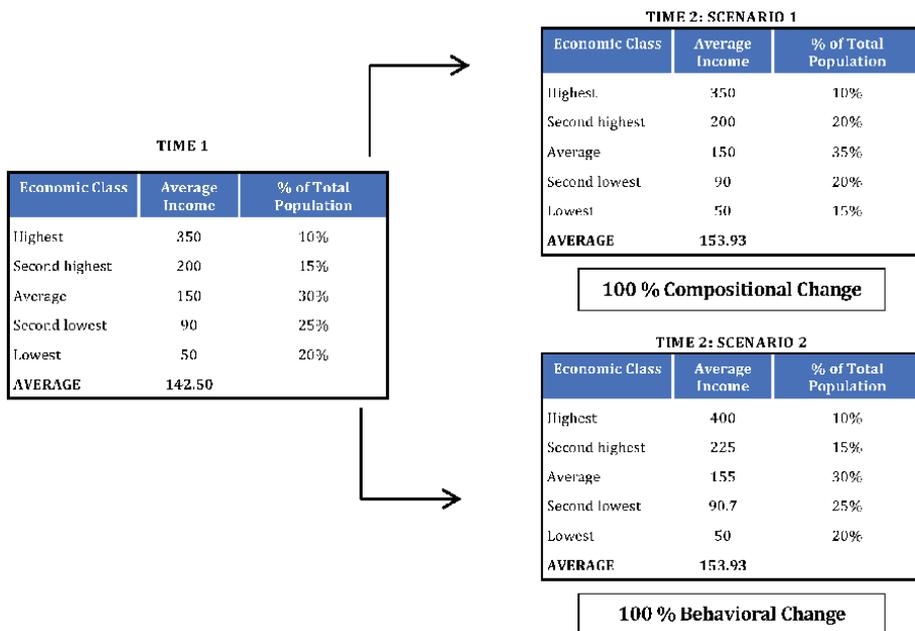


Figure 3. Compositional vs. behavioral change: An extreme case.

In the case of child mortality, declines can similarly be driven by compositional and behavioral effects. Mortality declines could result from an economic contraction whereby the relative size of the lower economic groups, already characterized by higher mortality levels, expands (i.e., their population weight, w , increases). This would reflect a compositionally driven change. Conversely, change can also be driven by changes in the behavior of groups. If one subgroup's mortality levels increase, all else equal, the national mortality will increase. Thus, mortality reversals can also be driven by behavioral change. The researcher's task is to identify how much of the change is driven by each component.

3.4 Key steps

Regardless of the topic, a researcher using demographic decomposition needs to attend to four key tasks, as follows:

1. *Problem definition.* First, the analyst must identify the dependent and independent variables, ensuring that the issues of exhaustiveness, distribution, variability, and relevance (as described above) are suitably addressed. The researcher must then identify the time period they are going to examine. This choice may be constrained by data limitations (i.e., ensuring that the measures are standard across Time 1 and Time 2) but should ideally reflect a conceptually relevant time period. In the example below, we investigate child mortality (dependent variable), with socioeconomic status as the independent (classification) variable. We compare outcomes between 1991 and 2001, as this was a time of severe economic contraction.
2. *National averages:* To conduct the decomposition, we first need to calculate the national averages for the first and last year. We apply formula #9, wherein the national average (Y_t) is a function of the weight of each subgroup at time t (w_{jt}) and the group-specific mean for the dependent variable at time t (y_{jt}). For our example, the group size (w_{jt}) is calculated from a basic frequency analysis for the socioeconomic status variable. The group-specific mortality rates (y_{jt}) are derived from a means comparison, where mortality rates are the dependent variable, and economic class is the independent variable. This information can be calculated from micro data sets using a standard statistical package, but can also come from aggregated reports and studies or online data tools (i.e., the Demographic Health Survey Statcompiler; World Bank Development Indicators; Afrobarometer Online Analysis Tool), making the analysis even more straightforward.
3. *Decomposing the Change.* Once the national averages are calculated for Time 1 and Time 2, the analyst can then use Formula 10 to decompose the change. As the calculations are simply repeated for each group, the researcher can either use Excel software or create a mini-program in a statistical software package to generate the full output. **Figure 2**, below, summarizes the basic data for the calculations.

For our example, the analyst is trying to understand the extent to which changes in the composition of the population (here, changes in the relative size of each economic class) versus behavioral changes of economic groups (here, changes in the mean mortality rate of each economic group) drove the declining rates of infant mortality in Cameroon.

Column 1 highlights the social class categories used (Highest, Second Highest, Average, Second Lowest, Lowest). Columns 2–5 are where the analyst must insert their data (gathered elsewhere) on group size (w_{jt}) and behavior (y_{jt}). The spreadsheet is built to then calculate the national average for each year, here 143.6 in 1991 to 117.7 in 2011. The resulting difference reflects a decline in infant mortality of 25.9.

The last step is then to explain this 25.9 unit decline, using formula 10. As reflected in Column 6, the researcher can see that 17% of the decline was driven by compositional change. This is unsurprising, as the class composition of the population changed slightly during this period. The proportion of children living in low-income families declined (from 18% to 15%) while there was a slight rise in the proportion of children living in rich families (19 to 21%). As poorer families exhibit higher infant mortality rates, mortality rates will mechanically go down if their representation in the population shrinks. Column 7 displays the amount of change due to behavioral changes, which was the larger contributor to change, at 83%. A glance at Columns 2 and 5 (showing mortality rates by economic class in 1991 and 2011) confirms that mortality rates did indeed decline across all social classes during this period, including the poorest.

4. *Presentation of findings.* **Figure 2** is easily presentable to most scientific audiences, requiring little explanation. Moreover, the researcher can not only highlight the leading processes- i.e., how much of the change was driven by compositional (Column 6) vs. behavioral (Column 7) forces- but can also explore leading groups. The percentages in column 9 are simply the result of adding the behavioral and compositional contributions of each socioeconomic class and dividing by the total change. The second-lowest economic group's contribution was the largest, with the total change equal to the sum of its composition effects (-4.85) and behavior (-5.79) for a total of -10.65, or 41% of the total change. The lowest economic group made the next largest contribution to the mortality decline (37%), followed by the second highest (16%), average (3%), and highest (3%) groups.

As is evident from **Figure 2**, the sum of all contributions in a decomposition reflects the total change- thus, the values in columns 6 and 7 sum to -25.9, the total decline in mortality. As a percentage, the sum of all contributions must equal 100%. One important note is that some contributions can be negative (less than 0%) or greater than 100%. Conceptually, a negative value reflects a contribution that worked in the opposite direction of the observed change. In our case, a negative percentage would reflect a change in either the composition or behavior of a group that worked to increase mortality. Percentages larger than 100% signal that the overall change would have been even greater, if it was not hampered by the effects of opposite influences from other groups.

While relatively easy to digest, decomposition findings are easy to present to non-technical audiences as a graph rather than a table. Pie charts, such as the one on the left side of **Figure 2**, can cleanly show how much of the total change was driven by compositional vs. behavioral factors. Similarly, stacked histograms can efficiently summarize the results and identify the dominant social groups driving change.

4. Policy implications

Even if decomposition is not a causal method, it can guide policy. For instance, if a planner observes that much of recent national change is derived from

compositional changes, then s/he gains insights into future changes. In a country where education levels are rising, having a positive compositional effect (having more educated people leads to progress), then one can anticipate further gains if national levels of education continue to grow. Likewise, if child mortality is declining mostly via a compositional effect (fewer high-parity births), then one expects child mortality to continue to decline if fertility does. In some cases, the planner may have reason to expect the composition changes to continue largely on their own, as is the case of mortality, educational, fertility transitions. In some instances, s/he must proactively induce compositional change through policy.

If mortality is driven by a behavioral effect, the appropriate response is to target either the leading group or the lagging group. One would target the leading groups if one is not worried about inequalities and one does not expect further growth in this top group to be curtailed by a ceiling effect. One has further justification for investing in this leading group if one expects the example set by this vanguard group to trickle down and promote change among the following groups. Some development theorists might argue that in the early stages of development, it can make sense to build up some pioneers who would set the pace and pull the rest of the population [23]. On the other hand, one may favor the lagging group if one assumes that leading already has a momentum on their own and will continue to progress even if unaided. One may further favor the lagging groups out of concern for inequality.

This application of decomposition to policy requires a nuanced theoretical understanding of processes of change and the diffusion of innovations in the general population. In diffusion theory, change may accelerate among the lagging groups after reaching a critical mass in preceding groups [24, 25]. In other ways, change proceeds in a domino pattern and, to the extent that decomposition analysis helps identify the next group in that domino line, it can speed the process.

5. Conclusion

Students of social change need robust methods to inform policy reliably. With the significant advances in data and computing technology achieved over the last forty years, they are in a better position to study micro-level processes, including the causes of individual behavior. However, this microlevel expertise is not sufficient to account for social change, where the focus is on aggregate (not individual) outcomes. Applying the existing micro-methods methods to understand aggregate social problems amounts to “barking up the wrong tree” or—to stay with this canine metaphor- “letting the methodological tail wag the dog.” Decomposition methods can help address this micro–macro conundrum by making it possible to aggregate evidence from smaller units to understand the big picture.

Given that the big picture, rather than individual-level detail, is the focus of most socioeconomic planning, decomposition methods are quite relevant to policy. The methods are ideal for studying many of the social transformations underway across the globe. In particular, they can inform the study of critical components in the United Nations’ Sustainable Development Goals (SDG), including poverty, health, inequality, and schooling. Many countries are working hard to achieve these goals face with severely limited data and resources. A fuller understanding of the drivers of socioeconomic change and the unevenness of change in these rapidly changing and diverse societies can allow policymakers to target policies more effectively. To this end, decomposition methods can help.

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Geographies of Ageing: A Visuospatial Approach to Demographic Change in Australia

Hamish Robertson and Nick Nicholas

Abstract

The global phenomenon of population ageing is both complex and multi-layered. We know at a global level that different countries are progressing towards becoming aged societies at different rates. We know that within national borders some regions, mainly rural, are affected by ageing more than others. We also know the health and social care systems struggle to respond effectively to ageing because it is complex and, often, runs counter to the structural design of healthcare systems with their emphasis on clinical and organ-specific problems. Ageing challenges these conventional approaches and is compounded by the prevalence of wide-spread ageism at the societal and systemic levels. Therefore, if we are to adapt to population ageing and care for older people effectively, we need to better understand them and their situational contexts. This includes where they live and how their social, biological and clinical trajectories are progressing. Synthesising this kind of multi-layered information also presents challenges because many health and social care systems operate in silos, with limited information exchanges and limited service coordination. One strategy is the concept of a visuospatial data-informed approach. Here we present a conceptual basis for this approach drawn from our work in the Australian health and ageing contexts.

Keywords: data visualisation, spatial, ageing, dementia, complexity

1. Introduction

The global phenomenon of population ageing is both complex and multi-layered. We know at a global level that different countries are progressing towards becoming aged societies at different rates [1]. We know that within national borders some regions, mainly rural, are affected by ageing more than others, especially as younger people leave for urban opportunities in education and employment [2]. We also know the health and social care systems struggle to respond effectively to ageing because it is complex, sometimes messy and, often, it runs counter to the structural design of healthcare systems with their emphasis on specific clinical and organ-specific problems (e.g. heart, lung, kidney, brain etc.). In this context, it is or certainly should be seen as a driver for systemic change.

Ageing challenges these conventional approaches and is compounded by the prevalence of wide-spread ageism at the societal and systemic levels [3]. Therefore, if we are to adapt to population ageing and care for older people effectively, we need to better understand them and their situational contexts. This includes where they live and how their social, biological and clinical trajectories are progressing. Synthesising this kind

of multi-layered information also presents challenges because many health and social care systems operate in silos, with limited information exchanges and equally limited service coordination. One approach, explored here, is the concept of a visuospatial data-informed approach. In this paper we present a conceptual basis for this and outline a data visualisation project the authors have developed to address some of these complexities. The data and analysis presented are specific to the Australian context, but we anticipate the applications could be readily modified for other countries.

2. Trends in population ageing

It has become something of a truism to note that populations are ageing globally, which does not diminish the scale of this phenomenon. It is also the case that even within countries, population ageing tends to be unevenly patterned. In many countries, rural populations are ageing faster than urban areas due to out-migration as well as economic factors, climate change, service availability and so on [4]. In the Australian context, this issue can be seen in the way population ageing is moving differentially across states and territories. Major urban areas such as Melbourne, Sydney and Brisbane are less prone to overall ageing because they are major immigration intake centres but even then, specific areas may age faster than others [5]. In other words, the general trend of population ageing can vary by speed and location. This makes it a complicated phenomenon to respond to in health and social care environments because planning and response mechanisms are often slow, while infrastructure funding and construction cycles can run to decades.

3. Demography and destiny

The distribution and composition of the Australian population is highly variable. Across the country, local and state/territory populations are ageing at different rates and on different spatial and temporal trajectories. Current conditions indicate that some major urban areas will have increasing numbers of older people, but the proportions will be lower than many regional and rural areas where outmigration is already a problem. Such conditions may be exacerbated by other factors such as climate change [6]. In addition, Australia already has a pattern of migration away from major urban centres by ‘younger’ retirees, as people seek lifestyle changes and/or lower cost of living situations [7]. These sea-changers can have their own impact on smaller coastal settlements for example, as they buy property, invest and consume goods and services. Such patterns are likely to change as these people age in situ and later the local need for home support services, general medical and specialist medical care [8]. Thus, the epidemiological patterns associated with ageing bring their own challenges to these sea change locations.

4. Epidemiological considerations

While demography is a major driver of epidemiology in general, it is also a powerful influence on factors such as shifting patterns of chronic disease and late-life acute care demands [9]. These can range from the complexities associated with co-morbidities through to the relatively predictable consequences of fall-related injuries in community-dwelling older people [10]. Some of these epidemiological phenomena are distinctly age-related (e.g. macular degeneration) and others can be seen as a consequence of current systemic and clinical arrangements.

As we have noted elsewhere [11], population ageing is characterised by rising *multimorbidity* at a global level. This is a major consideration for analysing the intersectional nature of co-morbidities often experienced by older people that can include the complexities associated with physical ill-health and associated sensory and cognitive impairments. In addition, the side-effects of treatment options for one condition may have implications for co-morbidities including polypharmacy [12]. As well as this, we already know that polypharmacy is highly correlated with negative outcomes in older people, especially when irregularly reviewed and/or poorly managed. Our position here is that the complexities associated with progressive population-level ageing and the treatment patterns associated with these conditions require increasingly sophisticated data modelling and analysis if population-level health management is to be improved. The scale of this concern is already significant, but it can only become more important as population ageing progresses at the global, national and sub-national levels [13].

Our knowledge of the complex interactions between, for example, a dementia diagnosis and a mix of sensory and physical impairments is well-developed but continues to grow in scope [14]. Conventional models, often based on younger age cohorts, of living with a particular condition are inadequate for managing the twin concerns of population ageing and rising chronic disease, a pattern no longer restricted to the more affluent economies [15]. Data from projects such as the Global Burden of Disease Study (GBD) illustrate the consequences of these convergent circumstances in increasing detail [16]. In addition, the development of a variety of international ageing studies and, more specifically, centenarian research projects, have illustrated just how variable these patterns can be, not only between countries but within them as well. Our position here is that our knowledge about age and ageing is still highly developmental and, consequently, improving our capacity to model and respond to particular conditions can only grow in importance (**Figures 1 and 2**).

The two figures above show the fast-growing urban area of greater Melbourne is likely to experience a decrease in the proportion of people with a dementia between 2020 and 2032, even as the numbers of older people continue to grow. This

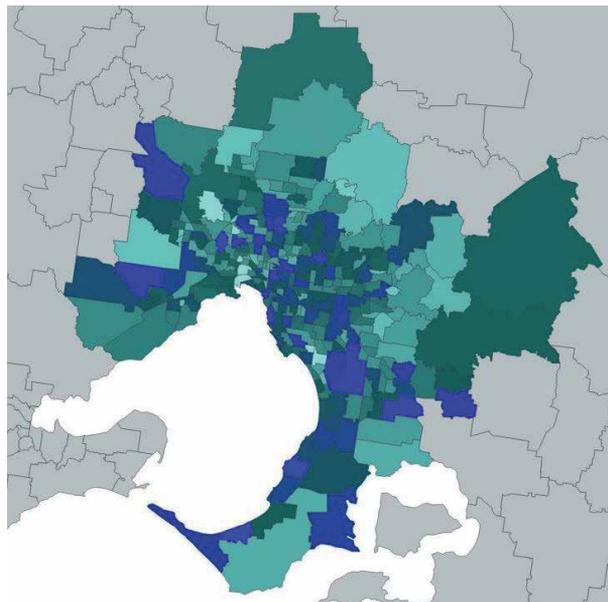


Figure 1.
Map of dementia projections for Melbourne in 2020.

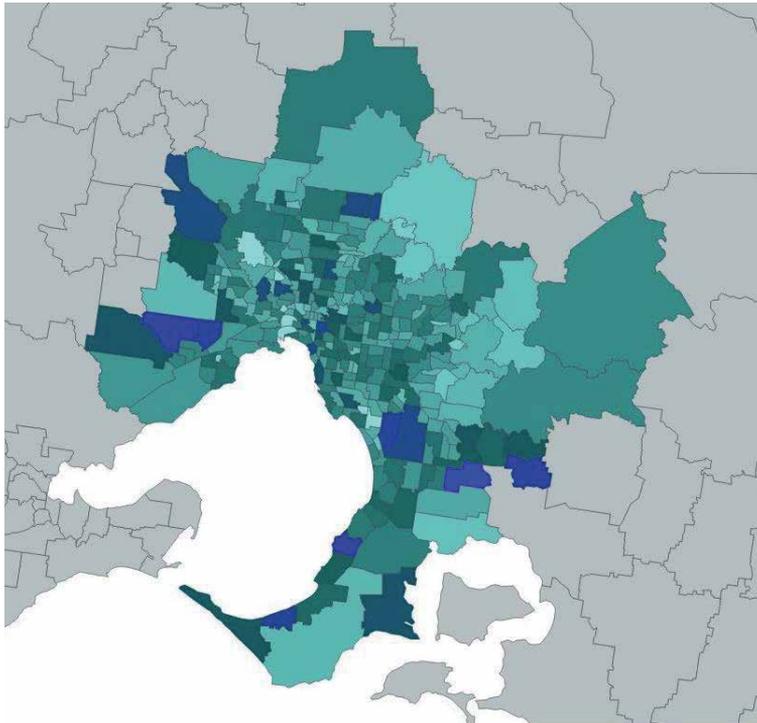


Figure 2.
Map of dementia projections for Melbourne in 2032.

visual environment, backed by quantitative data, tables and associated analytical tools, provides the service planner with a clearer understanding of where and how resources might be better allocated between 2020 and 2032. And of course, if a new Census improves and alters our understanding of population dynamics, that data can be added to the Power BI environment and alterations made accordingly. This approach has the power to greatly improve planning for both shorter and longer-term resources, from workforce needs such as specialist dementia care nursing staff through to where new aged care facilities would be best located sustainably.

5. Service provision and service providers

There are two general considerations in relation to service providers identified here. The first is the issue of *where* service providers are located, especially relative to population-level need (and estimates of such needs). The second is the issue of future *gaps* in service provision and population ageing and its associated complexities progress. In other words, where are we at now and how is this scenario likely to change at some future point or points? While these problems are not unique to Australia, here we focus on the Australian situation as emblematic of how difficult these issues can be when dealing with a large and unevenly populated geography. We also propose that this is yet another reason for more and better modelling of these variables because the issue of scale can be more efficiently addressed within a data modelling environment that acknowledges the importance of location from the outset.

An additional consideration is the skills of the available workforce and how evenly or unevenly skilled workers are distributed relative to current and emerging need. Currently, the demand for clinical and personal care staff is growing at pace in health,

aged and disability services [17]. However, getting workers to take employment across areas of geographic need is another matter entirely. In Australia, this issue is especially problematic and remains unresolved. How then do we incorporate many, or all, of these factors in a single data environment? How do we ‘capture’ the complexities associated with these varied interactions and their dynamic nature? Even if we can achieve this sophistication in our modelling, it is no guarantee that policies and funding will necessarily flow in the right direction – but without it, there is a finite evidence base for prioritisation, planning and the evaluation of funded service provision.

6. Modelled data elements

While the data elements included in this model are limited, this is not to say that the model or the modelling process is necessarily as finite as presented. By this we mean that additional variables or measures can be added as can new data sets or related inputs, such as service providers by type and classification. The point here is that in order to address the issues identified above, we have undertaken a selection process with a view to establishing a base model of the geography of population ageing in Australia and its key correlates.

These data elements identified include:

- population estimates and projections by age and sex for the period 2017–2032, based on official data releases from the Australian Institute of Health and Welfare (AIHW, 2019);
- estimated prevalence rates for three dementia sub-type categories – Alzheimer’s disease (AD), vascular dementia (VaD) and the mixed dementias (a category being reassessed at regular intervals as our research and data-informed knowledge grows);
- sub-type severity estimates including mild, moderate and severe with a view to identifying the type and level of resource needed to support such individuals in the community;
- key health service providers such as acute care hospitals and residential aged care facilities.

These data were connected using the Microsoft Power BI data visualisation software package (<https://powerbi.microsoft.com/en-us>). All data sets were either geocoded on access or integrated into a spatial frame of references so that the data visualisation capabilities of Power BI permitted the user to see all data elements in a spatial or map-like context. This essentially means that the user can explore, using the zoom function, the whole country on down to a particular state or territory and then to even smaller areas such as a city or local suburb. At every point, because of this geographically enabled data architecture, the data viewed is consistent with the scale at which the user views it.

7. Data visualisation

We make a distinction here between spatial analysis, of the kind conducted using geographic information systems software, and spatial data visualisation. The first relates to specialist software environments that provide a variety of spatial

analysis tools and produce explicitly spatial data analyses. In this instance, we focus instead on the latter concept of spatial data visualisation of the kind available within current data visualisation software environments including, for example, Tableau and Microsoft Power BI. While the capabilities of these two software types may appear similar, their actual applications tend to differ at the present time. There is the perhaps obvious likelihood that these environments may become increasingly similar over time as, in particular, data visualisation software providers add a growing range of spatial analysis capabilities to their packages. In addition, many GIS providers are shifting to dashboard and dashboard-like capabilities as well (e.g. ESRI's ArcGIS).

8. Results

These results are developmental and intended to illustrate both the importance and viability of managing the concerns discussed above in an accessible visual data environment. One of the considerations we had in approaching this effort was to develop resources that could support researchers and service providers from different backgrounds. Thus, a key principle of the data visualisation is to provide a mutually intelligible information environment that can be used and enhanced to meet the needs of groups whose interests may all be focused on aged care but who come from different backgrounds (e.g. planners versus clinicians) and who may have different priorities. For practical purposes, we have used the Microsoft Power BI data visualisation software in this discussion. A key result here is all data included are accessible within the one 'frame' of inquiry but also, each data element can be reviewed separately. This provides a flexible basis of data inquiry and analysis for different types of user and their associated purposes (Figure 3).

The dashboard below illustrates how geographic location, year (past, current and projected), dementia estimates and likely severity (mild, moderate and severe) can all be modelled within the same visual environment. The severity measure gives a sense of the relationship between prevalence and likely clinical and support service need as the dementias tend to be progressive in nature. The

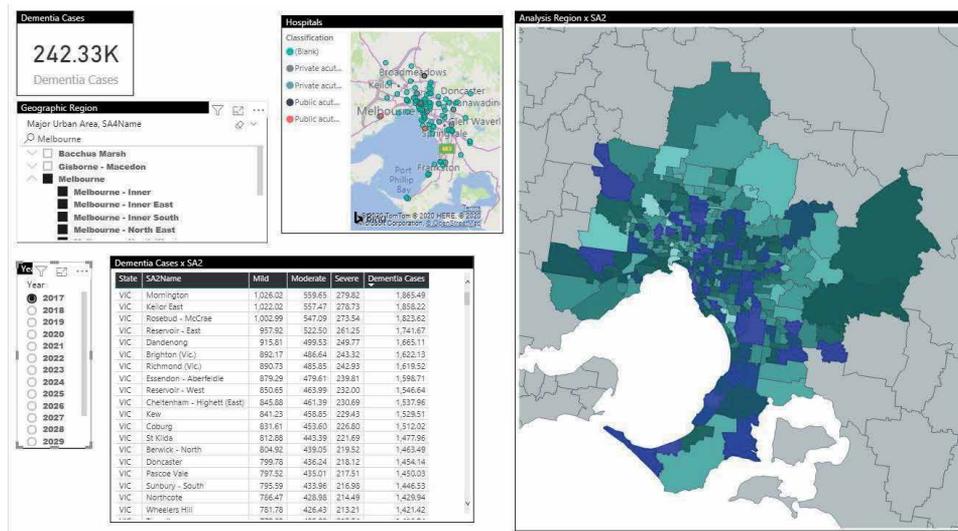


Figure 3. Dementia data dashboard.

estimate of *total* cases is shown in the top-left of the dashboard and this figure adjusts for each year of estimates and projected population data. This is underpinned by the use of official age and sex population projections in the model. All of these data are provided at the SA2 level of the official Australian geography developed by the Australian Bureau of Statistics (see below) but, in doing this, larger geographic areas can be compiled or visualised to meet the needs of specific user groups e.g. local government, state government and so on. With the data all modelled to a base geography that can scale hierarchically, this extends the utility of this visual modelling from a relatively local small area level right through to the national picture (**Figure 4**).

Each data element can be examined more closely by separating it out from the dashboard for inspection. Thus, the map above shows the location of healthcare facilities within the same area currently visualised. This is also scalable so different users in the greater Melbourne area can inquire on their own particular area of interest or zoom out to explore the spatial relations between their local picture and a larger geographic catchment.

8.1 Small area visualisation

In this data visualisation model, the smallest official geography for which we had data available was the Statistical Area 2 (SA2) level of the official Australian Standard Geographical Classification (ASGC) ([https://www.abs.gov.au/websitedbs/D3310114.nsf/home/Australian+Standard+Geographical+Classification+\(ASGC\)](https://www.abs.gov.au/websitedbs/D3310114.nsf/home/Australian+Standard+Geographical+Classification+(ASGC))). The Australian Bureau of Statistics (ABS) does provide some data at smaller areas but only under more confidential data access conditions. Also, all of the data sources utilised here were available at the SA2 level, so they were fully compatible at that geographic level. This simplifies the data structuring and integration processes as well as providing a quick and consistent data analysis and visualisation environment. The issue of speed means that new data at the same geographic level can easily be integrated to update and improve modelling capabilities.

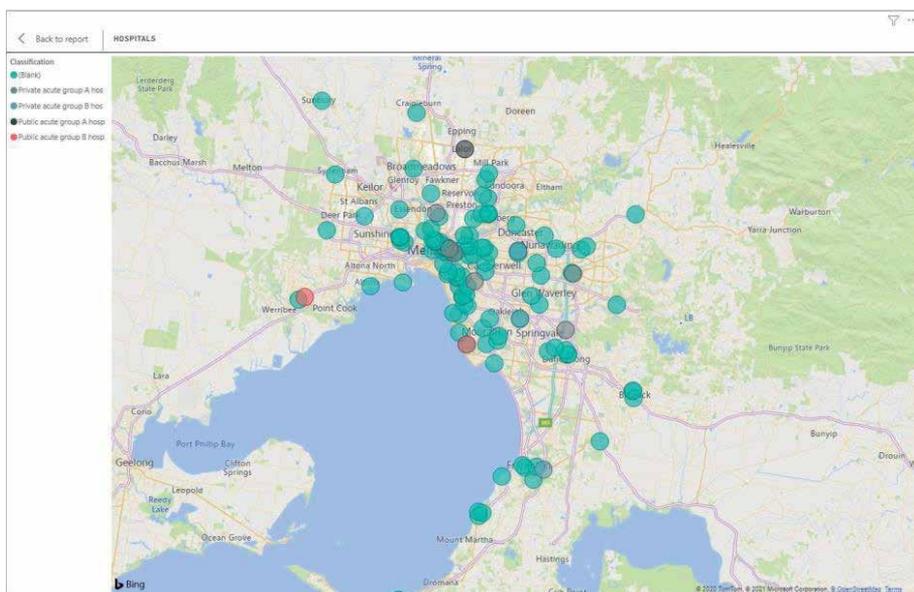


Figure 4.
Health services in Greater Metropolitan Melbourne.

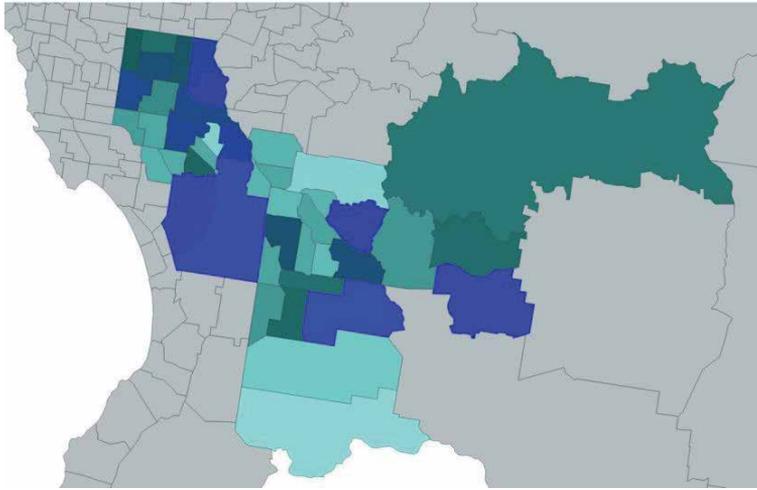


Figure 5.
South East metropolitan Melbourne SA2 dementia estimates 2020.

What this means is that small areas can be selected and examined in closer detail to explore particular epidemiological and/or service provider issues or concerns. This is useful for, say, a hospital service planner, a residential aged care service developer, or a provider of in-home support services. They can all examine the same consistent visual data environment at the same or different geographic levels, as required, to anticipate and plan for both population-level needs and business potential. Potentially, small area modelling below the SA2 level could be developed but we have not attempted that here at this time, as a key requirement for such work would be to examine a specific problem or concern of service planners, for example. Nonetheless, several individual SA2s can be selected, highlighted and examined to explore their similarities and differences. This means that smaller ‘catchment’ areas can be produced by individual users.

Figure 5, above, provides a brief illustration of this segmentation approach that permits the user to explore a specific catchment area in more detail. An additional benefit is that by selecting this region in the dashboard, the relevant data for that catchment is explicitly shown only for the relevant SA2s in that catchment. If this was not adequate for a particular purpose, such as plotting a series of patient home visits, the same data can readily be exported to a geographic information systems (GIS) software environment to permit route planning, for example. Thus, both scalability and interoperability are facilitated by the core data visualisation strategy.

9. Implications and limitations

It is necessary to emphasise here that this modelling approach is incomplete, as is any model of a complex existing environment in which the full scope of relevant causal and influencing factors may be unknown. This can be seen as a sub-set of the ongoing *incompleteness* debate in the philosophy of science (e.g. Gödel, Popper etc.) [18]. Many other data sets, and improving/improved data quality, could increase the utility, accuracy and actionability of this modelling approach. A key consideration is that such visual modelling environments cannot necessarily improve their validity simply by adding *more* data but rely on analytical processes to refine how particular age-related problems are framed, explored and appropriate responses developed. While population ageing and associated factors are sometimes framed

as a ‘wicked problem’ [19], the proposal here is that such complexities can be better managed through visuospatial strategies and tools such as these.

In this example, the visualisation is not a fixed or static attempt to describe a known complex situation, in this case dementia prevalence and its impacts, but for the visualisation *process* to be developed over time as an explanatory tool with ‘what-if’ capabilities. This makes it a deliberately adaptive modelling environment, one which can be updated as new or improved data sets become available. In this sense, if concepts and methods used are adapted to better address such scenarios, then the perceived intransigent complexity of ‘wicked’ problems may become more amenable to evidence informed understanding and analysis. Certainly, the idea that differential patterns of ageing can be analysed using visuospatial approaches is already well-established [20].

For example, the currently available Australian Census data was collected in 2016 and is now quite dated (hence the use of more recent official projections data in this chapter). Assuming a high-quality Census is carried out in 2021, the resulting data will likely require modifications to this current visual environment. This is not the problem it might first appear, since a foundational concept in this modelling strategy is that of an ongoing and progressive updating and refinement process. The use of software such as Microsoft Power BI also means that this type of updating and adjustment can be quick and effective – taking far less time than traditional approaches. An implication of this is that users of the model can adapt their strategies, planning, programs and funding models accordingly. In this sense, the dynamism of the real world, which exists outside the computer-generated model, is more easily and quickly accommodated. This has obvious benefits for both service providers and their older clients since systemic adjustments and changes can be accelerated.

10. Conclusions

In this chapter we have discussed and illustrated some of the key concerns we see associated with progressive population-level ageing at the sub-national level in the Australian context and the value of a visuospatial data strategy in addressing these concerns. The differential geographic nature of population ageing across Australia means that age-related problems, such as the dementias and associated clinical and social support needs, have a level of complexity not currently manageable, in our view, by other, especially aspatial, means [21]. The capacity illustrated here to connect spatial information to demography, epidemiology and service infrastructure (and allied information from service providers, such as pharmaceutical usage or financial performance), makes this complexity much more manageable in the current moment and into the foreseeable future. The kind of visual data environment illustrated here provides one approach but far from the only one. Many jurisdictions are already utilising visualisation techniques to make both data and its analysis more readily accessible to their audiences (e.g. <https://www.census.gov/topics/population/older-aging/library/visualizations.html>).

Key factors here include the scalable nature of the information visualisations shown – that is, the user can look at the national, state and even local area all within the same information framework and toggle between these ‘views’ to inform discussions, analysis, policy development and even service provision. Different service providers can be highlighted, or minimised, to explore different questions, and local data can be added to improve small area knowledge and understanding such as frailty [22]. While much, if not most, of this current data is quantitative in nature, this does not preclude the inclusion of qualitative data or findings from qualitative

analyses. In other words, this pilot model is potentially extensible in scale, temporality, and data types. Microsoft Power BI already has a text analytics capability (not explored by the researchers at this time) that could connect such analysis to the data architecture developed for this modelling exercise. That is, qualitative client or provider data could be connected directly to geography.

As well as being useful for the Australian situation, the concept is replicable elsewhere. In the context of global population ageing and the variable health and social care systems available to older people [23], this concept could be extended to inform these jurisdictions about how to more effectively manage age-related complexities. And while this might suit, for example, national government organisations in the first instance, the same capacity is potentially available to sub-national jurisdictions, municipal governments, direct care providers and not-for-profits or advocacy organisations. While we acknowledge that data visualisation is only as good as the data sources it relies on, the potential of these types of tools to improve the accessibility and efficiency of age-related care is considerable. As population ageing progresses, the position of this chapter is that such tools will become increasingly useful and relevant to ensure that the health and wellbeing of ageing populations is supported, and that established systems of care can be both sustainable and adaptive to shifting conditions.

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Section 2

Demographic Analysis of
Societies or Groups Defined
by Various Criteria

Demographic Transition in Sub-Saharan Africa: From Grassroots to Ivory Towers

Kelvin Melkizedeck Leshabari

Abstract

The concept of *demographic transition* has been evident to European, North American and Japanese population since the early 1960's. It loosely followed natural patterns that were postulated as far back as 1795. However, scientists and policy makers, still erroneously consider *demographic transition* to be absent in sub-Saharan Africa. The aim of this chapter is to uncover the hidden truth behind population censa in sub-Sahara African countries using Statistical tools. The chapter analyses philosophical basis of sub-Saharan Africa demographic dividends from 1960 to 2000. It then cautiously highlights how *demographic transition* is emerging in sub-Saharan Africa. Specifically, it endeavours to highlight how different African countries are in different stages of demographic transition. The chapter also contrasts some of the prevalent misconceptions about Africans, especially the *delusional* idea of Africans as a *homogenous* population group on genetic basis. Lastly, it offers solution, to the current demographic chaos, and their relationship to future matured *demographic transition* in sub-Saharan Africa.

Keywords: Aging, Africa, Morbidity, Mortality, Demographic transition

1. Introduction

The sub-Saharan Africa is a vast land full of mystery. There is compelling indication, that the origin of man goes back to sub Saharan Africa (the Eastern part), [1–3] and the modern means of exchange in trade using money (in form of *coins*) also reported in the East African island of Kilwa [4]. There are several mysteries, that go unnoticed, whenever the topic of Africa is brought into the discussion tables. For instance, for quite sometimes, there appears to be no full attention paid *in pedagogic sense*, for population growth dynamics in the region. It is not entirely clear on factors for population growth dynamics in much of sub-Saharan Africa. Moreover, available population data have questionable reliability as it will be evident in later sections. Likewise, there is palpable evidence of *demographic transition*, in most of sub-Saharan Africa. Conversely, it is hypothesized that, the popular view on sub-Saharan Africa demographic data inter alia, reflects Western ideas, in terms of views and extrapolations.

The concept of *demographic transition* in sub-Saharan Africa seems to be a farfetched idea. At present, I consider important to be clear about what is meant by *demographic transition*, in order to avoid confusion to readers. Put simply, *demographic transition*, refers to that phenomenon, where by human population shifts its

pattern, from the high frequencies of fertility and deaths, to the one characterized by low fertility and deaths. The effects are to be observed at a group (e.g. society) level. It should not be interpreted at individual level. The rewarding effect of demographic transition being increased longevity at the level of the society. *Demographic transition* as it is known to date has its rich history.

As far back as 1930, there was already evidence in literature for the concept of *demographic transition*. Warren Thompson introduced the concept when he categorized the nations of the world to a three tier demographic patterns [5]. Little was known by the time of Thompson, that what he hypothesized, was in Actual sense, a *demographic transition* in its basic form. After the publication of Thompson back in 1929, various other scholars formulated the concept, in its elaborate features, as we know it today. It may be of benefit to highlight, some of the earlier works, that gave rise to this concept, as means to acknowledge earlier scientific work, as well as provision of the groundwork for deviation, when one wants to analyze, the concept of *demographic transition* in sub Saharan Africa.

Warren Thompson publication in the *American Journal of Sociology*, makes an exemplary published evidence on *demographic transition* in English literature [5]. According to Thompson, three types of countries exist [5]. The first (group A) was composed of nations characterized by a rapid drop in population growth [5]. These countries have a steep fall in birth rates (a marker of declining fertility), accompanied by relatively declining death rates [5]. This pattern initially masked the depopulation feature. In the long run, they were faced by net population drop. Thompson referred to these countries as mostly found in the Western & Northern Europe; like England, France, Germany, The Netherlands & Sweden; as well as parts of the present day United States, and Australia. The second set of countries (group B) were characterized by rapid decline, in both birth and death rates, but with earlier and more steep slopes in death rates reduction, relatively to the slopes of birth rates [5]. Thompson's estimations were such that, countries making the second set were likely to report rapid population growth, until a certain point, when birth rates would stagnate before actual depopulation occurs [5]. In this set, he referred to most Eastern & Southern Europe; like Poland, Bulgaria, Greece and Spain. On the other hand, the rest of the world; including Asia, Africa & Middle East; were to form group C [5]. Contained countries with characteristic high fertility and premature mortality at young age [5]. It is interesting to point out that, Thompson referred to group C countries as following *Malthusian* rule, [5] probably on an account that, neither birth nor death rates were under control in these countries. However, he did not have data to substantiate most of the demographic patterns in Africa, and other members of group C, so he decided to use the sparse data, available from Japan and Russia, to account for them.

Audrey Landry was perhaps the most important scientist in bio-demography during the 20th Century. His views have largely been adopted by demographers and bio-gerontologists alike, when describing *demographic transition*. Landry, who was a French demographer, managed to explain better, about the drivers of *demographic transition*, post-industrial revolution [6]. According to Landry, the entire world would ultimately follows the demographic pattern characteristic of contemporary society [6]. He viewed the human society to follow three distinct patterns, determined purely by the factor of time. According to Landry, the primitive society is composed of rather high levels of both fertility and early mortality; ultimately characterized by a society full of children and young adults [6]. From this stage, the society is said to undergo a "demographic revolution", characterized by delayed mortality but with relatively high fertility rates [6]. Lastly, the society becomes modernized, with characteristic features, of both delayed and falling fertility, as well as reduced mortality rates at the level of the society [6]. What Landry initially

termed as “demographic revolution”, is what is referred to as *demographic transition* in present times. It is still ill-understood, whether Landry’s hypothesis, on what we currently term as *demographic transition*, is original or a transformation of the earlier work by Thompson. However, in an optimistic view, this chapter will explain the differences in ideologies between the two scientists; that perhaps motivated the author, to consider their ideas to be distinct and original to each, in the next section.

2. Demographic trend in sub-Saharan Africa

2.1 Sub Saharan Africa: the basics

On a strict geographical context, sub-Saharan Africa is that region in Africa south of the Saharan desert [7, 8]. However, it is important to caution the reader, about the confusion associated with the term, found in published literature. For instance, while in actual sense (on the basis of geographical boundaries), all African countries, that are fully or partially located south of the Sahara desert, are referred to as sub-Saharan Africa, there exists a number of *currently acceptable definitions*, for sub-Sahara African countries. According to the so called “League of Arab States”, countries like Mauritania, Somalia (and the current divided states of Somaliland & Puntland), Djibouti and Sudan; all of which located either in part of, or south of the Sahara desert, are sometimes included among the “North Africa & Middle East region”; together with Egypt, Libya, Morocco & Algeria; and therefore are considered to be out of sub-Saharan Africa. This is especially in matters involving politics of Islam and Islamic welfares. On a geographical sense per se, these states are part and parcel of sub-Saharan Africa. Not only are they geographically part of sub-Saharan Africa but also they share a number of cultural, socio and historical ties with the rest of sub-Sahara African states. This confusion renders the task of establishing the demographic trends and dynamics of sub Saharan Africa especially difficult, since facts & figures can change dependent on the source, even when no real differences exist. As of July 2017, the UN lists 46 countries out of the current 54 African independent states as belonging to the region identified as sub Saharan Africa [7].

The confusion highlighted in defining sub-Saharan Africa does not end with politics of the Arab world. It is rather comic, when one realizes that for some yet unknown reasons, the Republic of South Africa, and the islets of Mauritius and Reunion; are also generally left out, when discussing sub-Saharan Africa. To the best of the author’s understanding, this rather *comic view* has a probable basis from the colonial past, as South Africa was considered a ‘*whites only*’ territory until 1994. The effects of such ‘post-truth politics’, on the coverage of sub-Saharan Africa, have a direct impact on demographic estimates of the region. The same fact can be substantiated on statistical ground by reviewing the demographic share (5.6%) of population size of the Republic of South Africa to that of sub-Saharan Africa in 2018 [9].

Moreover, the story of the islands of Mauritius and Reunion is even more fascinating. Some of its neighbours (e.g. Malagasy & Seychelles), are annexes of the main continent. They are counted as part of sub-Saharan Africa. However, the two beautiful set of islets are left out independently. It is my opinion that, what so ever goes on with the exclusion of the Republic of South Africa, as well as Mauritius and Reunion, from the geographical regions of sub-Saharan Africa, to be a function of colonial history and attitudes, rather than real justifiable demographic phenomena. This is because there are more similarities, both in cultural traditions,

values and even history, say between the Zulu found in South Africa and The Shona of Zimbabwe. Likewise, there are perfect resemblances between the Zulu of South African Republic and the Ngoni of present day Tanzania than are between the Zulu and the South African whites. Besides, there are a number of cultural and social connections between residents of Madagascar and their companions in Mauritius – and even between inhabitants of Mauritius with those in Reunion, than between Reunion residents and French. Thus, to remove the ambiguities, it is important to stick to geographical markers, when describing the region referred to as sub Saharan Africa.

2.2 Sub Saharan Africa: demographic trend from 1960 to 2000

2.2.1 The philosophical basis of sub Saharan Africa demographic dividends from 1960 to 2000

The demographic trend of sub Saharan Africa for the period encompassing 1960–2000 reflects socio-political picture of the region. On demographic grounds, the year 1960 to Africa is as important to demographers as it is to historians. The year 1960 marked the political independence of at least seventeen (17) African states from colonial rule. This same year, also saw the re-incarnation of some of the new countries. For instance, Somalia republic was born, on 1st of July 1960, after the so called *British Somaliland*, that was granted her independence on 25 June 1960 by the United Kingdom, united with *Italian trust territory of Somalia*. Thus, for the same reasons, all efforts have been made to measure population dynamics from that time on wards. Besides, it is important to caution the reader at this stage, that even though the region is composed of population with virtually the same skin color, Africans in sub Saharan Africa, tend to differ in a number of distinct ways, as explained later in this chapter.

The demographic divide in sub Saharan Africa reflects the anthropological variation, that has been evident in literature for a long time now [10–14]. Moreover, the genetic variation in modern day African population is causally related to demographic history [12]. Changes in short- and long-range migration patterns, as well as changes in population size and social interactions, across different parts of sub Saharan Africa, have shaped its demographic and even genetic history, into its current unique profile. The islands of Unguja and Pemba (famously referred to as Zanzibar), that are part of the present day Tanzania may offer the best vivid example. Immediately following the Zanzibar revolution of 1964, there are reports that the act was accompanied by mass upheaval, [15] that resulted to social unrest- where by women of Arab, Indian and Persian origins; reported to have been sexually assaulted, and a significant majority raped [15, 16]. Much to the same reported atrocity, others were forced into marriages, with the local African population or neighbors of different cultural base [15–17]. The results of the reported *social turmoil*, are to a large extent visible today, where by a growing select of the population of Zanzibar's with Indo-Persian, Afro-Arabic, Afro-Persian as well as Indo-African demographic identities are prevalent throughout the isles [15]. However, it is the ultimate belief of the author, that the factual information provided here, will be used for widening the scope of the demographic picture among sub-Sahara Africans, rather than a source of racial segregation-or *emotionally determined finger pointing*, as it has been the case, whenever the same concept is discussed. This is because, to a large extent, the facts above reflect human egoistic tendencies, just like the actions of Spaniards to the locals in parts of today's Latin America, during the medieval period. The same human egoistic tendencies can be reflected to previous actions by the Vikings, on Anglo-Saxon region of the past. Thus, it is important for the reader of sub Saharan Africa demography, to be knowledgeable in history, as well as

socio-political contexts of different times, in different sides of the continent; least of that he/she may be a potential victim of cognitive biases.

2.2.2 Trends of 65+ years population in different sub-Sahara African countries

Analysis of demographic transition in sub-Saharan Africa, needs constant attention and appraisal, for a variety of reasons. First, there exists a lot of confusion in merging data for demographic analyses across different sub-Sahara African states. This also goes hand in hand with data augmentation processes. The cause behind this being unpredictable and rapid population migration; from one state to another, for a multitude of reasons over time. The aftermaths of which, being failure to appreciate the population growth trends, as per standard principles of demographic analyses. This applies whether one studies *cohort* or *period* population data. For instance, when one wants to analyze the population growth trend of Tanzania for a period 1960–2000, s/he must take into consideration, not only what went on in Tanzania during the reported time, but also what went on in Rwanda & Burundi – especially in the early-to-mid 1990's; the socio-political avenue behind citizenship in Tanzania during the same time period; as well as the effects of HIV/AIDS; that was reported in Tanzania, for the first time back in 1983.

Besides, there appears to be a lot of what may safer be termed as *doctoring*; that includes both *data dredging* efforts, as well as *overt politicking*, in the national population census statistics in much of sub-Saharan Africa. Factors influencing these rather statistical manipulations, are inter alia, diverse- and beyond the objectives of this chapter. However, in order to enlighten the reader, I considered it important to uncover, some of the vivid examples, behind these allegations, that are available in published literature.

Nigeria, a country located in the mid-Western region of Africa, is currently the most populated of all in Africa. It is a federation comprising of 36 different states, with Lagos counted as the largest city; not only in Africa but in the entire continent [18]. In the past, and until very recently, Cairo (An Egyptian capital) was the most populated city in Africa. From a demographic stand point, Lagos may be termed as a *prototype*, of modern African metropolitan area, on both socio-political as well as demographic base. What fascinated me, to study the demographic pattern of Lagos, to say Cairo or Cape-Town; is the richness in *demographic puzzle*, that Lagos offers, compared to others in Africa. For instance, even though Lagos had estimates of population census, first reported by an American sailor, way back to 1789, [19] the real *head counts* in Lagos has never been known even to the closest ten percent to date [20–23].

It is especially interesting, for the reader to notice that, factors responsible for *data snooping*, in the population census of Lagos, have also changed over time. For instance, the attitude of household heads was the prime culprit in the past [19]. Accordingly, household heads in Nigeria previously perceived, that 'counting in-house children brings *bad luck* to the family' [19]. The current reported chaos of the questionable reliability, in the actual population size in Lagos, has something to do with politicians, who tend to benefit in *the Nigerian house of representatives*, based on population base of their sphere of influence [20]. Thus, in the past, Lagos used to have a population census figure, that grossly under-estimated the true value, while at present, the concept is that of over-counting, for revenue gains among politicians! Therefore, whenever one endeavours to compile statistics of population census in parts of Africa, there is a dire need to consider confusion matrix tables, least of that, it is highly unlikely to obtain any reasonably reliable estimates on statistical grounds.

From the above description, I considered it crucial to analyze individual national population growth trend over time. The motive behind this undertaking, using the best available/retrievable data, is to appreciate the coherent structural changes, in defined and politically bound, population trend over time.

2.2.2.1 Population growth trend over time for ≥ 65 years old in Tanzania

Tanzania is a country situated on the East African coast. It is an amalgamation of two (2) different independent former nation states of *Tanganyika* and *Zanzibar* (*Unguja and Pemba*) islands. Tanganyika, the largest inland structure, also commonly referred to as *Tanzania mainland*, is a former German colony that went under British protectorate, by the directives of the then League of Nations back in 1920. It gained her official political independence from the United Kingdom back in 1961. The Zanzibar archipelago – formerly part and parcel of the Sultanate of Oman, was a *de facto* British zone until her formal political independence in 1964. The overall population growth trend for the ≥ 65 years in Tanzania was mainly greater in Zanzibar than Tanzania mainland (former Tanganyika) up to 1988. From that point onwards, there was a switch in the pattern, as Tanzania mainland population growth surpassed that of Tanzania-Zanzibar. Moreover, one should be able to appreciate the drop in both mortality and fertility rates over time. **Figure 1** below highlights the population growth trend for ≥ 65 years in Tanzania over time.

It is important to realize that population growth trend for any demographic segment in Tanzania is likely to have a mixture distribution. There are key attributes, for this rather statistical picture, namely *the population structural differences, union segments* as well as *social & historical hallmarks*. Whereas Zanzibar, the demographic picture is likely to reflect the *islandic culture* (demographic mixture of culture and values) – just like today’s Great Britain and/or Japan, the situation in Tanganyika reflects a subtle homogenous picture, characteristic of a typical continental nation. Besides, whereas in both cases, there are mixed population, as evidenced by the Swahili culture in Zanzibar, as well as the peasants-pastoralists in the mainland, one needs to appreciate that there are different ethnic groups in Tanzania; than say ethnic groups in her former colonial masters- namely Germany and Great Britain respectively. Thus, readers are reminded here, to exercise a great deal of caution, when analyzing the historical script that dictates the current population growth in today’s Tanzania.

Moreover, and maybe of practical importance to any demographer and aging researcher, are the historical events that culminate important hallmarks for the elderly population growth changes in Tanzania. Tanzania, from its point of formation in 1964 (official union time) to early 1980’s, exercised a uniform increase in population growth to all demographic segments over time. However, and this

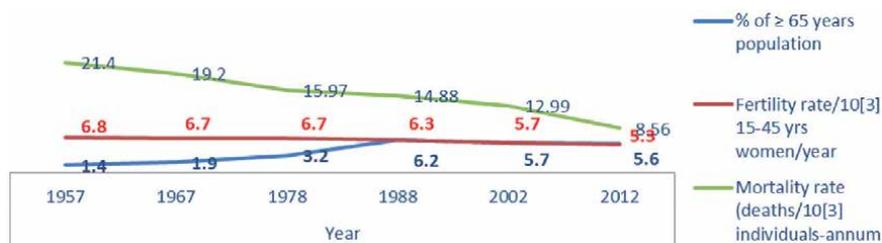


Figure 1. Demographic trend in Tanzania (1960–2000). Source: Adapted from National Bureau of Statistics (NBS) and Office of the Chief Government Statistician (OCGS) Zanzibar, 2013 [24]. The trend above reflects a steady relative % increase over time out of a base total population that also grew positively over time.

comes as an important demographic hallmark, HIV/AIDS was first reported in Tanzania sometimes in 1983. It is highly likely, that immediate impact of HIV/AIDS, to be responsible for the *relative* sharp increase in the '≥ 65 years' cohort growth in Tanzania, for the period that includes 1978 up to and including 2012.

There are countless vivid evidence, that shows effects of HIV/AIDS, in the trend statistics of '≥ 65 years' population cohort in Tanzania [25–29]. Of paramount importance to bio-demographers and bio-gerontologists in the field, is perhaps trend statistics over time associated with demographic sect of '≥ 65 years' in Tanzania. It is important for one to recall that, HIV/AIDS in Tanzania, initially contributed to significant increase in mortality among youth and young adults. Thus, the relative increment in population of '≥ 65 years' in Tanzania, observed between 1978 to 1988, has been accounted before, to be likely a relative phenomenon, secondary to massive deaths in younger generations in the population pyramid, almost exclusively due to HIV/AIDS in the same period [25].

HIV/AIDS epidemic in Tanzania went on without any significant clinical course during 1980's to mid-1990's. HIV/AIDS victims died, simply by following the natural history of the infection. Ante-Retroviral Therapies (ART) against HIV in Tanzania started in mid-1990's [25]. These drugs do not cure HIV-infection. Rather, they slow down the progress, with newer varieties significantly preventing viral replications in human cells and tissues. The immediate impact at individual level being, regressing in the speed, to which HIV infection would otherwise cause death without intervention over time. That translates to, HIV-infected individuals living almost normal life, resembling those without HIV infection. However, their impact on mortality was not reflected in demographic data until around mid-2000's [25]. Thus, even though there are clues of a probable *demographic transition* in Tanzania, readers should not forget that all these global strategies on HIV/AIDS and Ante-Retroviral Therapies, at best postponed all morbid and mortal effects of HIV/AIDS to later ages!

At present, it is important to realize that, there are projections suggesting average life expectancy at birth for both Tanzania and *Tanzania mainland* to increase from 62 years in 2013 to 74 years in 2035 for both sexes [30]. Of course, just like in other areas, the projections confer a slight female advantage to the effects. Specifically, males will experience an average increase of about a decade (from 60 years in 2013 to 71 in 2035) while females will increase on an average of 13 years (from 64 years in 2013 to 77 years in 2035) [30]. Moreover, Total Fertility Rate (TFR) will experience a significant drop (from 5.3 to 4.1) between reported period of 2013 and 2035 respectively [30]. Whereas the author believes factors responsible for increased longevity in Tanzania over the reported time period to be multifactorial, it is no doubt, that overall, these statistics display a clear picture of a *demographic transition*.

2.2.2.2 Population growth trend over time for ≥65 years old in the Republic of South Africa

The Republic of South Africa (RSA) is a relatively new nation state under post-colonial African perspective. It was officially made a republic, under majority rule, independent nation in 1994. However, much as the goal of this chapter, is to inflict knowledge to readers, it is important to underscore, the fact that, no other country in Africa, is as a subject to *confusion* as the Republic of South Africa. Dependent on how you view it, the Republic of South Africa may be considered a higher income country, and hence far apart, other sub-Sahara African countries. Moreover, if one is interested in demography and sociology, the Republic of South Africa offers her own fair share of *confusion* as well, due to mixed racial & ethnic varieties. If one decides to enter RSA via the city of Durban, the country is more or less like Indian subcontinent.

Should one set foot in RSA via one part of Johannesburg or Cape Town; RSA is more or less like a European destination. Much of the other parts of RSA still reflect a typical African semi-rural structure. Much still, one needs to be cautious when reviewing the population base in RSA. Republic of South Africa has a rich mix of Indians, Africans and Caucasians living in the same geographical borders! The author almost always gets confused himself, whenever he visits the Republic of South Africa, since his first trip to a medical congress in Durban. More to the confusion, RSA is also home to a significant number of *illegal immigrants*! Thus, the author wishes to extend his sincere vote of caution, to any sensible reader, when analyzing the population dynamics, in the Republic of South Africa.

On a strict demographic sense, the Republic of South Africa is at the midst of a *demographic transition*. The *median age* of the general population has risen from 18 years to 25 years, in just about past three decades [31]. With the continuing aging of the population, this statistic is expected to rise, even further to about 31 years, in less than three decades time [31]. Besides, the sheer size of ‘*senior citizens*’ as a distinct group, in the population pyramid, of the Republic of South Africa, has also increased tremendously. For instance, Statistics South Africa, an official central government statistical body, reported an increase of people ≥ 60 years in South Africa from 2.8 million to 4.1 million between 1996 to 2011 [32]. The proportional increase in the population pyramid was from 7.1% to 8.0% between 1996 to 2011 [32]. During the same reporting period, total fertility rate dropped from 3.5 to 2.57 [33]. It is worth noting however, that these reported statistics are averages, compiled out of an approximate mixture distribution. Thus, whereas there is a marginal increase in average life expectancy at birth, among the demographic sect identified as “*South African whites*”, the magnitude is somehow different, and significantly lower, among those identified as “*Black African*”. The bottomline argument – *confusion!*

Over time, Republic of South Africa has reported a relatively steady growth in her cohort of ‘*senior citizens*’. **Figure 2** below highlights the ≥ 65 years growth trend over time among South Africans. It is worth noting that, these grouped statistics reflect a probable increase in longevity, among resident South Africans. When these statistics are taken into consideration, together with those of fertility rate over time, they signify a typical *demographic transition* in that society.

There are a number of possible postulates readers are advised to consider, when analyzing the observed demographic trend in Republic of South Africa over time. First and perhaps the most important, is the fact that there are sharp differences in reported data between what happened in RSA prior to 1990 versus what ensued thereafter. The exact cause of this observation is not clear even to the author of this chapter. However, there are a number of speculations worth appraisal on forensic

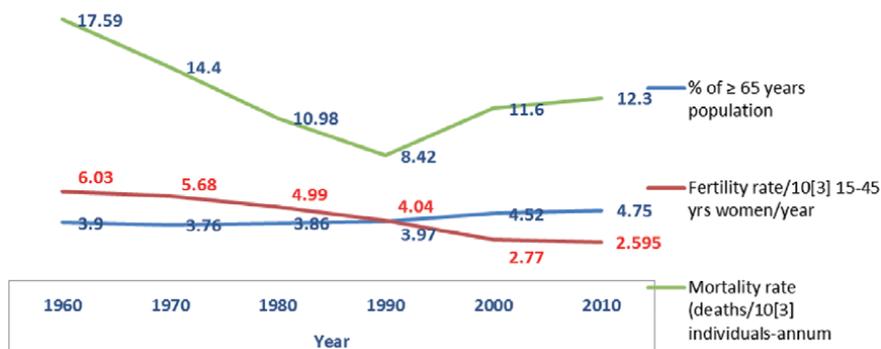


Figure 2. Demographic trend in Republic of South Africa (1960–2010). Source: The World Bank [34].

grounds. For instance, it is highly likely, that reported data prior to 1990's, reflected a segment of South African population only. This is because, what is currently referred to as Republic of South Africa, was essentially under 'South African whites' rule prior to 1994. Should this hypothesis be authentic, then caution needs to be exercised when one interprets the pattern of *demographic transition* vivid on reported South African data over time.

Otherwise, RSA is among countries worst affected by HIV/AIDS. Much as it is a multi-racial country on demographic sense however, "Black South Africans" are the majority. The same cluster has the highest all-time prevalence of HIV in RSA to date. Unlike other sub-Sahara African countries, RSA has the highest population inequality in their health system. "Black South Africans" are the largest population group without health insurance and/or reliable social security. By far, they are also the main segment of South African population with highest all-cause mortality rates of all. The fact that the largest mortality effects due to HIV/AIDS became vivid in RSA statistics around 1990's is also worth recognition. It is highly likely therefore, that the attenuated effects of mortality trend statistics from **Figure 2**, to reflect "Black South Africans" health inequalities, as a *latent variable*. Thus, RSA demographic trend over time is likely to be a reflection of societal inequities in a number of other social parameters, apart from health and/or HIV/AIDS alone.

Besides, readers should avoid the temptation to believe improved longevity (>65 years population growth) to be equivalent to improved health among South African population. It is currently common knowledge that South Africa is among countries with the highest per-capita consumption of ARTs for HIV in the world. Thus, just like Tanzania, a significant proportion of South Africans lives with HIV, and are likely to enter old age with the HIV-infection. The same 'cohort' is likely to suffer from significant morbid conditions, either associated with HIV itself or long term consumption of ARTs against HIV, some with known tolerable side effects, and therefore adding up in multi-morbidity statistics and reduced Quality of Life (QoL) in later life.

2.2.2.3 Population growth trend over time for ≥ 65 years old in Nigeria

Nigeria is a federal republic situated on the West side of Africa, North of the Gulf of Guinea. It is a multiethnic state, with more than two hundred ethnic groups. The main demographic clusters are dominated by Igbo (East), Yoruba (West) and Hausa-Fulani (North) [35]. Nigeria is the largest country by population size in the continent of Africa. About 3% of its current population is considered ≥ 65 years of age [36]. The 'gray cohort' is projected to increase, to an all-time highest figure of 10% by 2050 [36]. To appreciate the impact of these figures, in less than 25 years, Nigeria's 'gray cohort' is projected to be double the current population of Senegal [36]. The trend is worrisome, considering that little if any, has been planned ahead, To cater for this population growth changes in Nigeria.

The ≥ 65 population trend in Nigeria for the period encompassing 1960 to 2000 is as shown in **Figure 3** below. It is worth noting that the total population size of Nigeria has been continuously increasing over time, ever since it got her independence from Britain back in 1960.

From the **Figure 3** below, there are several research line of thinking to social researchers, demographers, policy makers and planners as well as to clinicians and clinician-scientists at work. First, it is still ill-understood how does the rapid aging population in Nigeria influences public health, social and economic milieu of Nigerian society at present and in the future? Moreover, given the over-burdening in the unprepared Nigerian economy, how to safely ensure resource allocation and utilization without causing ever-lasting damages in the Nigerian economy? Lastly, how does Nigerian public health system prepared to tackle the emergent epidemics

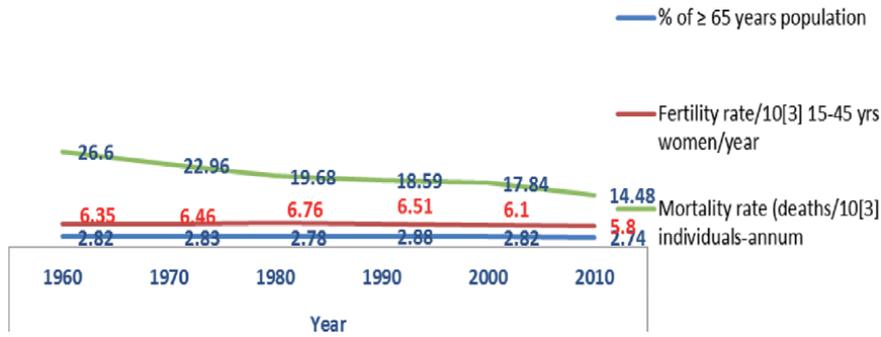


Figure 3. Demographic trend in Nigeria for the period 1960–2000. Source: World Bank [36].

(all chronic diseases!) associated with conditions that occur almost exclusive in later ages? All these challenges are likely to become *insurmountable* (i.e. a conundrum) should their position be left to be appreciated at the time when little can be done.

2.2.2.4 Population growth trend over time for ≥ 65 years old in Egypt

Egypt, officially Arab Republic of Egypt, is colloquially referred to as *the grandmother of Africa*, just as Denmark is to Europe. It is a trans-continental country, spanning from the North-Eastern corner of African continent to the South-Western parts of Asia. Egypt is so ancient to Africa and perhaps among the most ancient countries on earth. It is so rich in its history, spanning from mathematics and geometry to navigation and governance. The famous *Bibliotheca Alexandrina* (i.e. The Great Library of Alexandria) remains as one of the most notable features of pedagogic virtue from Ancient Egypt. It forms an important attraction site whenever the author visits the Egyptian coastal city. To the most part of Egypt, her rich historical background forms basis of its complex demographic pattern.

Egypt is the third-most populated country in Africa, after Nigeria and Ethiopia, with over 100 million inhabitants. It is among countries that are considered Afro-Arabic, as dependent on how you analyze Egypt, it may be part of Africa or Arab world. The decision to include Egypt as part of this analysis was not an easy task. For real, on geo-political sphere – Egypt is not part of sub-Saharan Africa. However, on a strict historical note, and perhaps considering Egyptian’s ethnic groups, some have typical ‘*Nilotic*’ features, prominent mostly to other sub-Sahara African states. In short, Egypt is to *river Nile* as Israel is to Jerusalem. It was on the basis of this “*Politics of river Nile*”, Egypt has been included in this demographic analysis. **Figure 4** below highlights the ≥65 population growth trend over time in Egypt.



Figure 4. Demographic trend in Egypt (1960–2010). Source: World data atlas [37].

3. Hallmarks in the pattern of *demographic transition* in sub-Saharan Africa

One silly mistake that scholars and researchers make about Africa; is the assumption that Africans are a homogenous cluster of human beings. Perhaps, there are probably few (if any) other overt gross mistakes on earth today than this! To put matters into perspectives, no other human race is as *genetically diverse* and with *less Linkage Disequilibrium (LD) among loci* as the African race [38–42]. It must be noted that, the observation of genetic variations in modern Africans, to be a function of history on a strict pedagogic sense. Of interest to demographers and aging researchers, being short and long migration events of the past; changes in population sizes as well as admixture [12]. Thus, the author considered it a selling point, to highlight this important fact that almost always goes unnoticed, prior to any subsequent African demographic trend analysis.

At present, there appears to be a disconnect, to appreciate that most of the political borders, that define African countries, are essentially a historical accident, with almost completely no role in identification of any distinct African ethnic group. Africa is at present identified solely based on what happened in the city of Berlin, Germany between November 1884 and early February 1885. To this end, while it is logical to assume distinct ethnicities across different geographical areas, say between Italians North of the city of Rome, from those in the South, it is a matter of total *confusion*, and in actual fact purely *illusionary*, to separate a Somali found in Somalia from another one in Puntland. In the same token, it must be considered completely futile to differentiate a maasai man in Tanzania from another one in Kenya on the basis of geographical location alone. Thus, the current analysis in the trend of >65 years population growth will dwell into viable known biological, clinical, historical or social constructs (e.g. tribes) than mere geographical markers.

It is worth noting that the pattern of *demographic transition* seems to occur at different pace among African nations. It is clear from the prototype nations, in this chapter, that Tanzania is perhaps at the beginning of demographic transition. In Tanzania, the proportion of >65 years cohort are yet to surpass fertility rate, there are clear markers, for mortality rate to drop over time. There are a number of other factors (e.g. HIV/AIDS), that are likely to stop the current pace, in accelerated >65 years population growth, in the near future. However, on a serious note, Tanzania seems to accelerate faster in *demographic transition* than the rest of studied African nations. It is quite vivid from the demographic estimates, that Tanzania had its >65 years cohort, almost doubling in quantity, in the last two decades of the 20th Century. During the same time, there was also a relative slowing down of crude-mortality rates, a clear pattern to justify a probable *demographic transition*. The accelerated pattern in the 'gray cohort' population in Tanzania in the 1990's has an elaborate explanation published in literature before, [25] and explained in the previous section in this chapter. Specifically, the author believe that, the effect of >65 years proportional growth to be relative, in that the 'observed' >65 years population growth between 1970's to early 2000's, was probably a result of increased mortality, secondary to HIV/AIDS among youth and middle aged groups. HIV/AIDS was first reported in Tanzania in 1983, and the disease was left to spread unabated, under just natural history of the infection, up until mid-1990's, when ante-retroviral therapies against HIV first became available in Tanzania [25]. Thus, according to this postulate, first published by the author back in 2017, [25] it is highly likely, that the 'middle-aged' cohort back in 1980's, who was probably to enter 'gray cohort' in 1990's, and reflected in the reported statistics, died before ante-retroviral drugs became available in Tanzania [25]. The drop was considered a relative picture secondary to high mortality rates associated with HIV/AIDS in Tanzania during the

mid-1980 to mid-1990's. However, HIV/AIDS alone cannot be a substantial reason to doubt the >65 years population growth, and therefore *demographic transition* pattern in Tanzania. Other parameters associated with *demographic transition*, like a significant drop in all-cause mortality as well as reduced fertility rates were also prominent during the same reporting period. Health system resilience in Tanzania may also a potential marker influencing vitality in middle aged and therefore ensuring longevity in later life. However, there are little studies to link the two variables at present. We have just started a research group, that aims among other things, in establishing the link between reproductive endocrinology and ageing process [43, 44].

From a bio-demographic point of view, HIV/AIDS pandemic picture that was introduced in this chapter is not unique to Tanzania. In fact, it is highly likely, that a similar situation, to be applicable to Republic of South Africa as well as Nigeria. However, additional information needs to be retrieved to prove this agenda; an activity that was considered beyond the objective of this chapter. However, as a matter of intellectual maturity, the author wishes to suggest that, HIV/AIDS effect on the demographic trends, is highly likely to create a more complex picture, in sub-Saharan Africa over time. For instance, whereas the earlier era, the picture adapted in this chapter was contributed by HIV-infection spread under natural history; present day and future patterns are likely to be significantly influenced by chronic and debilitating conditions, associated with ante-retroviral agents against HIV. Thus, whereas in the past, HIV contribution on demography was mainly on mortality statistics, future trend is highly likely to be dominated by prevalent chronic conditions, and therefore shifting the picture, from mortality to morbidity statistics. The author believes that, societal consequences of HIV/AIDS pandemic, to contribute significantly on demography of diseases and deaths, at later ages in future Africa.

If one considers later life success (i.e. *successful aging*) to have its basis from early life experiences, there is a desperate need for African governments to invest in primary and preventive healthcare for all. This can be effectively done using universal health care. At present, there is *palpable evidence* to warrant future disaster in Africa. This is because there are still a lot of illnesses affecting under-fives throughout Africa [45–48]. Most of these illnesses, have long term repercussions, to be evident even at old age [47, 48]. It is therefore a matter of intellectual maturity; for scholars, researchers, policy makers and decision makers in general, to consider effective primary and preventive healthcare strategies. Short of that, Africa is likely to have an uncertain future, full of *frail* people in later life, out of disease states that can be prevented, using relatively cost-effective and proven interventions. The cornerstone of all these efforts being *successful aging* process starts from earlier life primary care prevention.

Moreover, by analyzing the current trend in *demographic transition* among selected African countries, policy makers and decision makers alike, should consider effective ways to mitigate effective established and proven intervention strategies. This will accommodate the ever increasing '*gray cohort*'. Short of that, African nation states should prepare for a disaster; that is likely to become unmanageable, given the weak African economic base, and poor health and social security systems. Part of the interventions, by African governments and local institutions, could be resource allocation and utilization, in the direction of old age sociology. They may include items like enhanced social security measures (e.g. pension system), universal health coverage (to serve as a pool of funding for old age cohort in future) as well as capacity building in old age arts and sciences.

On clinical grounds, and this serves as an important alert notifications, to healthcare decision makers and healthcare workers, *demographic transition* is prevalent in Africa. Whereas it is about to start in Nigeria, it is on its infancy stage

in Tanzania, and already matured in Egypt as well as Republic of South Africa. There is a need for substantial investments in geriatric care, as well as all branches of bio-and social-gerontology. The idea that, *senior citizens* can be effectively managed by internists from general internal medicine is likely to prove disastrous over time. Quite often, even in Europe and the USA to date, *senior citizens* are prone to be victims of poly-pharmacy, adverse drugs effects as well as a number of other iatrogenic effects- almost always fatal [49–54]. There are barely significant clinical research findings on geriatrics from Africa. This is a rather disappointing finding. Orthodoxy medical practice has entered the era of precision medicine that entails treatment of patients from as far down as their genetic composition. Capacity building and effective legislations (e.g. enforcing a sizable % of GDP on Research & Development) are part of the short term solution to an otherwise long term foreseeable conundrum.

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Variations in First Union Dissolution Patterns among the Lebou, Peuhl, Sereer, Toucouleur, and Wolof in Senegal

Justin Dansou

Abstract

Major changes have been observed in recent decades both in the mode of union formation and in the stability of conjugal unions in Sub-Saharan Africa. Although these changes are known to vary in intensity across countries, variations across ethnic groups within countries are still not well studied. The present study investigates ethnic variations in the dissolution of first union in Senegal, focusing on five ethnic groups: Lebou, Peuhl, Sereer, Toucouleur and Wolof. It attempts to examine the specific effect of ethnicity and to identify underlying mechanisms of action of ethnic variations in union dissolution among men and women. The study uses data from a biographical survey on “vulnerabilities and chronic poverty” in Senegal (2008-2009) and event history analysis techniques. Kaplan-Meier survivor functions were used to explore bivariate relationships and Cox semi-parametric hazard model for multivariate analysis. Results showed that ethnic differences in the hazard of union dissolution become apparent only after controlling for the effects of cumulated fertility, education and birth cohort highlighting the persistence of cultural differences between ethnic groups that cannot be explained by only standard sociological and demographic variables. Ethnicity practices continue to shape marital outcomes in Senegal, especially after controlling for other covariates. This study suggests the need for large-scale and more detailed data covering all Senegalese ethnic groups for a better understanding of the complexity and the persistence of domestic and matrimonial customs and traditions in matrimonial relationships.

Keywords: marriage, divorce, union dissolution, ethnic group, Senegal, biography

1. Introduction

In sub-Saharan Africa (SSA), union dissolution has become one of the main drivers of family instability in most countries [1], with a declining proportion of women in marital unions [2]. In this region, under the influence of acculturation factors and socioeconomic modernism, major changes have been observed in recent decades in various areas including both mode of union formalization and their subsequent stability [3]. The investigation of the evolution of family patterns has begun to draw the attention in this part of the world not only of researchers but also of policymakers. However, due limited data a little is known about union

dissolution in SSA [1]. The changes in family transformations are observed in the mode of constitution of the unions, and in their dynamics: rise of the age at first union, simplification of union formation rules and the extent of celibacy [3]. Based on systematic estimates of union dissolution in 33 SSA countries including Senegal, Clark and Brauner-Otto [1] found that beyond substantial geographic variation, union dissolution is common in most countries investigated and far exceeds the risk of widowhood as a cause of union instability. Progress in education especially for girls was revealed to be among the leading causes of those changes [3, 4]. The great diversity in social, economic and cultural practices, including marital ones, across the subcontinent likely yields subnational variation in prevalence of union dissolution [5].

In general, functional families love, rear and protect children and buffer them from negative effects [6]. As a result, union instability could moderate its consequences for children [5]. While extensive evidence pays attention on worse outcomes [7, 8], other focuses on positive outcomes [9] of parents' separation on children outcomes. But, the majority of evidences come from studies in European and American families [9–14]. However, studies from low and middle income countries including African countries, have linked parents' separation to worse outcomes on children [5, 15–17]. Sub-Saharan African children with separated parents experience significantly amplified mortality risk [5, 16, 18] than their peers whose parents remain in union. Clark and Hamplová [16], for example, found in 9 SSA countries (Ethiopia, Kenya, Malawi, Tanzania, Congo “DRC”, Liberia, Nigeria, Sierra Leone, and Zambia) that union dissolution is negatively associated with child survival. SSA children with separated parents are also more likely to be malnourished [17], have lower probability of entering school [19], lower probability of achieving university [11], and more likely to be poor [14]. In Abeokuta metropolis (Nigeria), children with separated parents are prone to drug addiction, armed robbery, commercial sex workers and other forms of criminal activity [20]. The same study also established that children who grow up in a single parent family are more likely to be used for trafficking, rituals, and house helps than their peers who grow up with both parents. In short, understand the underlying factors and mechanisms of action of union dissolution in SSA is not only a moral obligation, but also, an essential mean to guide actions toward human development improvement especially at the young ages.

Meanwhile, despite the mounting interest in explaining trends and differentials in union transformation in SSA during the past decades, evidences of the ethnicity membership variations in union dissolution remain fragmentary and unknown. As a result, the role of ethnicity membership in unions dissolution variations remains obscured in this region including Senegal. In Senegal, underlying factors and mechanisms of unions transformation remain under investigated. Although predominantly Muslim, the Senegalese's ethno-linguistic composition is much complex comprising many ethno-linguistic groups among which Wolof (Wolof, and Lebou), Pulaar (Fula, Laobe, Peulh, Toucouleur), Sereer, Diola, Manding (Malinke, Manding, Soce), Other (Balante, Bambara, Bassari, Conagui, Khassonke, Mancagne, Manjaag, Maure, Sarakhole, Other) [21]. Each ethnic group with its own customs and dialect. The largest single ethnic group is the Wolof, who counts for over one-third of the population [22].

Studies examining families' transformation in general, and the union dissolution in particular, within Senegal are scarce. Until the eve of independence, the investigation of family changes held little attention of researchers as well as Senegalese policymakers. For instance, the results of Dakar's 1955 census paid little attention to the subject [23]. Moreover, the role of the ethnic background, well known in sociodemographic changes, remain underexplored in the evolution of family

patterns studies in SSA in general and Senegal in particular. This study aims to examine variations in first unions dissolution between ethnic groups within Senegal. It covers the whole country, in reverse to some past studies which focused on Dakar (capital of the country) [24]. The present study investigates ethnic variations in the dissolution of first union in Senegal, focusing on five ethnic groups: Lebou, Peuhl, Sereer, Toucouleur and Wolof. It attempts to examine the specific effect of ethnicity and to identify underlying mechanisms of action of ethnic variations in union dissolution among men and women.

2. Literature review

This section is organized into two parts. The first section showed differences between ethnic groups and underlying factors that might intermediate ethnicity and union dissolution (potential intermediate variables), while the second one focused on factors that are not likely related to ethnic differences (confounding variables) but, which might induce union dissolution differences.

2.1 Ethnicity differences and potential intermediate variables for union dissolution

Some studies have provided evidence on the relationship between ethnicity and union dissolution in SSA [3, 25, 26]. In Ghana, matrilineal ethnic groups have significant higher dissolution rates than patrilineal groups [1]. Evidence at subnational level (in Nigeria), also showed the importance of ethnicity in union dissolution [25].

In Senegal, variations between regions and ethnic groups in classic sociodemographic changes (mortality, fertility, etc.) are well known. Studies investigating the underlying factors with sociodemographic changes in Senegal, have consistently shown great variation in mortality and fertility between regions and between ethnic groups [27]. The Senegalese 1988 census data, have shown that fertility rates are highest among the Sereer, while infant mortality rate is at its lowest among the Peuhl [28]. In 2002, cumulated fertility was at its highest level (6.3) among the Sereer and lowest among the Wolof (5.6) [29]. Senegal's census data of 1988, revealed distinct patterns among ethnic groups. The Sereer are among the most flexible and non-resistant ethnic groups [21]. Remarriages persist in Senegal. Therefore, the proportion of separated women in Senegal is low at a given time. It was estimated at 4% in 1997 [30], 4.2% in 2005 [31] and 2011 [32]. It is shown to be more frequent in the urban areas, especially at Dakar. About one third of first unions at Dakar ended up by dissolution and followed in majority by remarriage. Most of first unions dissolution were initiated with the purpose of remarriage [24]. Also, polygamy is well known in Senegal. However, relative to other sub-Saharan African countries, first union dissolution is far lower in Senegal. In rural Malawi, after 25 years, almost 65 percent of the first unions have been dissolved [33].

Institutionally, unions formation and the process of their subsequent dissolution were recorded by both the Senegalese civil law and the Islamic law. The colonial legislation through the Mandel Decree of 15 June 1939 fixed the minimum age for first union at 14 years for women and 16 years for men and required the consent of the spouses as key requirement as the Islamic law also stated. Later, in 1990, the Family Code brought the minimum age for union to 16 for girls and 20 years for men. With regards to unions dissolution, it is institutionalized in Senegal. It is stated in the Senegalese civil law in 1972 (Family Code), and later considered as a fact and

not as a fault. Before, it was stigmatized and considered as a social risk since it causes single parenthood [34] with its numerous consequences. It may be dissolved either by the justice, or by repudiation (the more frequent). In 1972, the law has given the women the right to initiate union dissolution if she wants [35].

Despite, such legislation, variations between ethnic groups about family patterns persist. Preferential unions and early age unions exist in almost all Senegalese ethnic groups [23] even though they have declined over time. In 1960 in Pikine (Senegal) among current unions, 40% were compelled unions, 37% after the agreement of the young girls, and only 23% were the young girls' own choice [36]. With cultural modernism, ethnically heterogeneous unions become more and more common among the younger generations in particular among the most acculturated [37]. Among some ethnic groups like Sereer, the process of union formation remains predominately managed at family level. The Sereer women are free to choose their partners [36]. Even though, the choice of partners has been made flexible over time, parental consent still required. Parents ensure the respect of alliance rules [4], and play key roles to ensure union stability. Under this setting, in case union dissolution occurs, the wife is considered failing in her main duties, especially towards the family in law [23]. Among the Toucouleur, it is customary to never ask consent of the girl especially when she is virgin. In this ethnic group women's first union is the most compelled. Among the Peuhl, men could get married at age 14 and girls at age 11 [23].

Furthermore, the Senegalese 2002 census report, has shown spatial variations in some indicators such as education and nuptiality, linked to the variation in ethnic compositions between areas. For instance, in areas like Tambacounda, Kolda and Matam, predominantly Peuhl, the median age at first union was lower than elsewhere in the country and was explained by the early age at union/marriage which characterizes the Peuhl ethnic group who were the majority ethnic group in these areas. In addition, these areas (Tambacounda, Kolda and Matam, predominantly Peuhl), less urbanized, showed the lowest education level in the Country [29]. The fact that the Peuhl live mostly in less urbanized areas is in agreement with their main occupation – beef breeding. The same report also revealed important variations in union dissolution rates between the place of residence and between age groups. In rural area, union dissolution rates were high between 30-49 years and lower, otherwise.

Childlessness within the first marriage if found to have strong impact on union stability [3, 25, 26, 33, 38–43]. This result is consistent with almost all of the previous studies and is in agreement with the purpose of union formation everywhere, especially in SSA. The family that emerge from a union has some basic functions which makes it unique [44]. Among those functions, conception and birth [45]. Some societies used to validate the union after the first positive pregnancy experience of the couple. For instance, in Ivory Coast, it was a tradition among the young Dagara and Lobi women to prove their fertility through childbearing before marriage [46]. In the Wolof culture (in Senegal), marriage relied essentially on procreation. In this society, in cases of polygamy, the first wife has authority over all other cowives. But she will lose her place if she doesn't conceive.

Several studies reported the early age at first union among the leading risk factors for union dissolution [1, 3, 26, 38, 43]. At very young age, many grooms are too young to be able to carry the heavy load responsibilities involved in marital life. As a result, union dissolution is likely to be more common among couples who are poorly prepared to undertake such responsibilities [39]. In addition, a large age difference between spouses significantly reduces the risk of union dissolution and may be an indication of a greater submissiveness of women to the authority of their

husband [33]. Marital history impacts union stability [39, 47]. Primary unions (where the two partners had never been in union) are more unstable than those where at least a partner had ever been in union (being currently in union, or separated, or widowed). In other circumstances, polygyny was found among union dissolution accelerators [24, 33]. The risk of union dissolution increases when a woman inter union into a household where other wives are present.

Education was also found with significant influence on union instability. In some cases, the relationship between union dissolution and female education is found to be negative [1, 38, 42]. Under other circumstances its influence appears to be non-linear, with the lowest union dissolution rates observed among uneducated women and among the highest educational groups [3, 26, 43, 48].

2.2 Potential confounding factors for union dissolution

Social acceptance/recognition of separation is considered as an important risk factor in the increasing in unions dissolution rates in Africa in this 21st century [40] even though, evidences aren't consistent about its evolution over time in SSA countries. While some found a stable or even a decline in unions dissolution among women in SSA countries [1, 3], others point to the rising number of SSA women who are currently separated [17, 41, 48]. For example, Adjmagbo et al. [3] found no significant variation in unions dissolution among generations of women (three generations were considered: those born before 1972, between 1972-1981 and after 1982) in two West African cities Cotonou (Benin republic), and Lome (Togo). This study reported a decline in unions dissolution over time (by considering the same generations as for women) among men in Lome (Togo) and no significant variation in Cotonou (Benin republic). In Lome (Togo), men born between 1972 and 1981 were less likely to experience union dissolution compared to those born before 1972. Another study in West Africa (Burkina Faso) reported a rising in the risk of unions dissolution among young women cohort of union - women's first unions that took place between 1975-1989 and 1990-2000 were more likely to be dissolved compared to those taking place before 1975 [26]. The decline in the level of involvement of families in the matrimonial life of the younger generations [49] is one of the explanations of the latter finding. The young generations become more and more master of their matrimonial life.

Furthermore, on the other hand, Dial [35] categorized the causes of women's union dissolution into three categories including material causes, problems of couple, and familial causes. Material causes of divorce, refer to, among other, the incapability of the husband to take good care of the wife and also his inability to meet the material needs of the woman. Causes pertaining to the lack of love in the couple and other factors behind union deterioration were cited under couple problems for unions dissolution. The presence of family members (family in law and other relatives) in the household was found to increase the risk of union dissolution and considered among family causes. The co-residence of the spouses is a much stronger covariate of union dissolution. Union with husband staying usually in the household have lower dissolution probability [33].

Union dissolution was also found to be closely associated with women's socio-economic status [1, 26, 33, 35, 50]. Women's socioeconomic independence significantly increases the likelihood of divorce, especially among couples with children. Urbanization is associated to higher union dissolution risk in SSA [1, 25, 26]. In Senegal, the continuing local migration toward the capital (Dakar) remains a key factor in changes in family patterns [35]. It remains among the leading causes of the declining of parental control over the young generations about matrimonial issues [4].

3. Data and methods

3.1 Data

The study draws on data from the survey “vulnerabilities and chronic poverty in Senegal” conducted in 2008–2009. It used mixed methods design combining quantitative and qualitative approaches. Qualitative approach consisted of collection of respondents’ life narration while the quantitative approach relied on collection of quantitative biographies. This paper used data from the quantitative approach of the study. The study was nationally representative with two-stage cluster sampling drawn from the study “enquête de suivi de la pauvreté (EPS, 2006)”, which was based on national census bodies. At the first stage, districts (75) were selected and households (16 per district) at second degree. Thus, 75 districts were sampled and 1,200 (75*16) households were reached. The study reached its initial sample size (a total of 2,400 respondents on account of 2 respondents per household), by adopting a replacement strategy in case of unavailability of any sampled household. The quantitative approach, conducted during 6 months, used two types of questionnaire. Household questionnaire and biographic questionnaire. The biographic questionnaire was preceded by the AGEVEN slip. Data were cleaned and all datasets were merged. The merged data consisted of 2,048 individuals instead of 2,400 initially investigated (352 individuals were removed due to large dating inconsistencies) [51]. Respondents (including men and women) were aged 10 years or above at the time of the survey. For each union, among others, its rank, and the marital status of partners before the union were collected. Likewise, the outcome of the union (ongoing or dissolved or widowhood), and the date of its termination (if any) were collected.

3.2 Methods

Two types of methods relating to event history analysis were employed. These are Kaplan-Meier comparative curves (at descriptive level) and Cox semi-parametric regression models (at multivariate level). The Kaplan Meier curves were used to explore the comparative survival curves of first unions dissolution according to the five ethnic groups. This method doesn’t allow to explore the influence of several independent variables simultaneously. It considers the study population as homogeneous by estimating the risk distribution for the whole population without taking into account the influence of individual characteristics. The biographical approach allows, at multivariate level, to estimate the role of each characteristic on the risk of occurrence of the event over time [52]. Proportional hazards regression using a partial maximum likelihood function to estimate the covariate parameters in the presence of censored time to failure data [53] has become widely used for conducting survival analysis [54]. Cox proportional hazard models present the advantage to highlight potential differences in the risk of divorce by a wider number of explanatory variables. Cox models take into account time change variables, too. Past studies have also adopted this approach while assessing union dissolution [26, 33]. The hazard of divorce for an individual at a given time t is a function of a baseline hazard function that left unspecified, and a linear function of a set of fixed covariates that are exponentiated [55, 56]. The hazard ratio (e^β) can be interpreted as the ratio of the estimated hazard for those with value 1 to the reference category. For quantitative covariates, we subtract 1 from the hazard ratio and multiply by 100 to obtain the estimated percent change in the hazard rate for each one-unit increase in the covariate [55].

The adequacy of Cox semi parametric proportional hazards regression depends on how well one of its major assumptions have been heeded. It is the proportional hazards assumption. This assumption has been checked. At least the main independent variable (ethnicity), almost, met that assumption.

3.3 Conceptualisation of the event under study: 1st unions' dissolution

This study investigated respondents' first unions. This union may be a second or higher rank for the partner. The study took into account all types (legally formalized or non-legally formalized/consensual union) since the survey did not distinguish cohabiting unions from formal ones. The study took into account all kinds of union dissolution: either legally or repudiation. Throughout the text, union dissolution is preferred not divorce. A union is at risk of dissolution from the moment of 1st religious marriage/cohabitation and remains at risk until its dissolution, or until the time of the survey (when it doesn't occur), when it is removed from the risk set without contributing to the count of events. **Figure 1** presents the conceptualization of the first unions' dissolution.

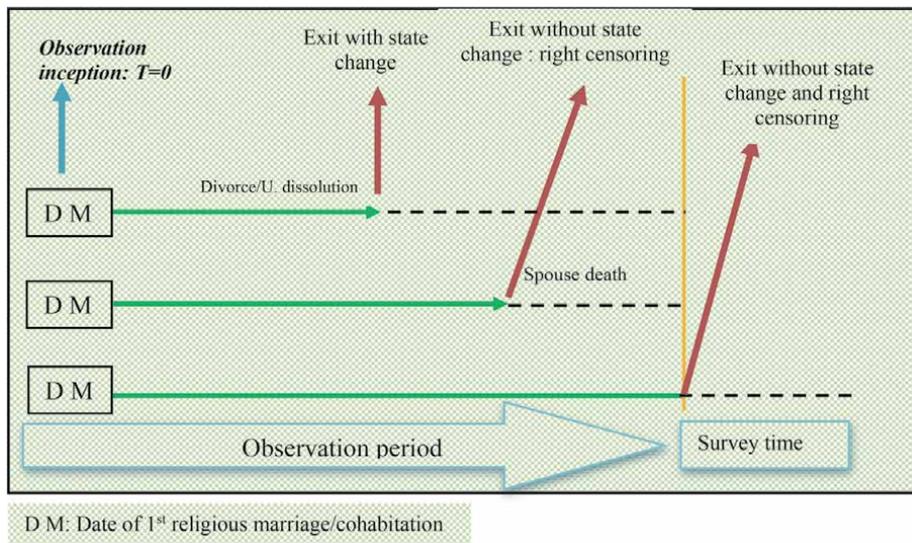


Figure 1.
 Conceptualization of the event under study: 1st unions' dissolution.

3.4 Variables and expected outcomes

3.4.1 Dependent variable

The dependent variable associated with this event is a time variable, measured for each individual subject at risk. It equals to either the duration of observation (if the event does not occur until the time of the survey) or the duration at the time of event (if it occurs). The time is measured in year.

3.4.2 Independent variables

Independent variables included based on past studies and their availability in the data were: ethnicity (main independent variable), place of residence,

socioeconomic status, existence of domestic/servant in the household, education, age at first union, partner's marital status, knowledge of serious mishap/disaster, times of dining together daily, de-cohabitation, birth cohort, cumulated fertility.

3.5 Analytical strategy

The study adopted an analytical strategy guided by the searching for mediating causal relationships. It distinguished: main independent variable X (ethnic group), potential intermediate variables Z_s (Age at first union, education, cumulated fertility, place of residence, and birth cohort), and a series of confounding variables W_k (Socioeconomic status, existence of domestic/servant, marital status, knowledge of serious mishap/disaster, times of taking meals together daily, and de-cohabitation). The influence of confounding variables was simply controlled. The strategy involved the estimation of several equations.

1. a single equation $Y = f(X)$ for the gross effect of ethnic group and one equation $Y = f(Z)$ for each potential intermediate variable for the gross effect of each of the potential intermediate variables;
2. a series of equations $Y = f(Z, X)$ for the effect of each potential intermediate variable net of the effect of ethnic group. If a variable mediates the effect of ethnic group, the effect of this variable net of that of ethnic group should be lower than its gross effects whereas the net effect of ethnic group should be lower than its gross effect;
3. a series of equations $Y = f(Z, X, W_k)$ for the effect of each potential intermediate variable net of the effect of ethnic group and all control variables W_k .
4. a single equation including all potential intermediate variables and all control variables for the net effects.

All analyses were performed separately for men and women.

4. Results

4.1 Sample characteristics

Table 1 showed percent distribution of the study population by selected background characteristics. There were five ethnic groups represented in the sample, the top first was Wolof (44.9%), the majority ethnic group in the country, while 22.3%, 15.0%, 11.0% and 6.8% were the Peuhl, the Sereer, the Toucouleur, and the Lebou, respectively. Half of respondents (51.6%) lived in rural area. They were born between 1918 and 2000. The average age of respondents at their first marriage was 22.6 ± 0.18 years. Most (88%) of respondents did not have domestic servant in their household. Forty-one percent (41.5%) of respondents did not have any formal education while 30.8% attended the secondary or higher-level and 27.7% attended the primary level of education. Most of respondents (81.1%) got their first union with a partner who had never been in union. Among respondents, half was male. The majority of respondents (70%) had at least three children at the time of the survey.

Variable	Frequency	Percent
Ethnic groups (1,469)		
Wolof	659	44.9
Lebou	100	6.8
Toucouleur	162	11.0
Peuhl	328	22.3
Sereer	220	15.0
Place of residence (1,474)		
Urban	713	48.4
Rural	761	51.6
Socio-economic status (1,474)		
Non-poor	610	41.4
Poor	864	58.6
Existence of domestic/servant (1,447)		
No	1269	87.7
Yes	178	12.3
Education level (1,433)		
Uneducated	595	41.5
Primary	396	27.7
Secondary or above	442	30.8
Age at first union/marriage (1,460) Mean = 22.6±0.18		
Less than 18 years old	354	24.2
18-25 years old	658	45.1
Above 25 years old	448	30.7
Partner's marital status at the union (1,457)		
Single	1182	81.1
In union/ever been in union	275	18.9
Knowledge of serious mishap/disaster (1,474)		
Never	761	51.6
Before 35 years old	213	14.5
After 34 years old	500	33.9
Times of taking meals together daily (1,398)		
Three times or more	1260	90.1
Twice or less	138	9.9
De-cohabitation (non-co-residence after union) (1,379)		
No	1133	82.2
Yes	246	17.8
Birth cohort (1,474)		
Before 1954	314	21.3
1954-64	578	39.2
1965 or above	582	39.5

Variable	Frequency	Percent
Cumulated fertility (1,474)		
0	147	10.0
1	131	8.9
2	158	10.7
3 or above	1,038	70.4
Sex (1,474)		
Male	740	50.2
Female	734	49.8

Source: Estimations based on data from the survey "vulnerabilities and chronic poverty in Senegal", 2008-2009.

Table 1.
Description of study population by selected variables.

4.2 Sample description by potential intermediate variables breakdown by the main independent variable (ethnicity)

Table 2 showed the distribution of the study population by potential intermediate variables according to the main independent variable. Corresponding p-value based on Pearson chi-square test were also presented. Except birth cohort (p-value = 0.274), all other intermediate variables seem to be statistically associated to ethnic group. The Peuhl involved in the present study lived, in majority, in rural area (74.4%), were uneducated (57.5%), were young (born after 1964: 57%). With regards to Wolof, slightly more than half (53.7%) lived in urban area, 40% were educated (secondary or above), 50% was born after 1964 and 44% went into union between 18 and 25 years. Most (73.1) of Wolof had three or more children at the time of the survey. The Sereer were half (52.3%) rural dweller, uneducated (55%), born after 1964 (55%) and were most (73%) with at least three children and went into their first union between 18 and 25 years (48%). More than half of Toucouleur (58%) lived in urban area, 67% had at least three children, 37% was uneducated, 54% born after 1964. Relative to other ethnic groups, the Peuhl and the Sereer were the least educated (57% and 55% respectively were uneducated) ethnic groups, they lived in majority in rural areas (74% and 52% respectively). Except the Lebou (47%) all respondents from other ethnic groups were most (more than half) young, born after 1964. With regards to fertility, most of subjects investigated regardless of the ethnic background were with at least three children at the time of the survey.

4.3 Prevalence and comparative curves of union dissolution

Before elaborating on the net effects of the searching of potential intermediate variables of union dissolution, it is worth looking at the prevalence of union dissolution and the probabilities of surviving in union in the five ethnic groups. **Figure 2** showed the levels of first unions' dissolution across the five ethnic groups. The discrepancy between the different ethnic groups is striking. The highest level (20%) of first unions' dissolution is noticed among the Lebou and the lowest (9%) was recorded among the Peuhl. The proportion of union dissolution is estimated at 11.4, 11.7 and 12.4 among the Sereer, the Toucouleur and the Wolof, respectively. Overall, the difference among all the five ethnic groups is significant at 10% level (Test

Variable (n)	Ethnic group: n (%)					p-value*
	Wolof	Lebou	Toucouleur	Peuhl	Sereer	
Age at first union (1,455)						
Less than 18 years	139 (21.4)	24 (24.0)	44 (27.3)	94 (28.8)	52 (24)	0.048
18-25 years	291 (44.7)	46 (46.0)	61 (37.9)	151 (46.3)	105 (48.4)	
26 or above	221 (33.9)	30 (30.0)	56 (34.8)	81 (24.8)	60 (27.6)	
Cumulated fertility (1,469)						
0	49 (7.4)	15 (15)	18 (11.1)	37 (11.3)	28 (12.7)	0.041
1	49 (7.4)	9 (9)	18 (11.1)	36 (11)	18 (8.2)	
2	79 (12)	12 (12)	17 (10.5)	36 (11)	13 (5.9)	
3 or above	482 (73.1)	64 (64)	109 (67.3)	219 (66.8)	161 (73.2)	
Place of residence (1,469)						
Urban	354 (53.7)	71 (71)	95 (58.6)	84 (25.6)	105 (47.7)	0.000
Rural	305 (46.3)	29 (29)	67 (41.4)	244 (74.4)	115 (52.3)	
Education (1,428)						
Uneducated	209 (32.3)	28 (29.1)	59 (37.1)	181 (57.5)	116 (55)	0.000
Primary	178 (27.5)	45 (46.9)	54 (34)	65 (20.6)	53 (25.1)	
Secondary or +	260 (40.2)	23 (24)	46 (28.9)	69 (21.9)	42 (19.9)	
Birth cohort (1,469)						
Before 1954	156 (23.7)	20 (20)	29 (17.9)	59 (18)	42 (19.1)	0.274
1954-64	172 (26.1)	33 (33)	44 (27.2)	82 (25)	56 (25.5)	
After 1964	331 (50.2)	47 (47)	89 (54.9)	187 (57)	122 (55.5)	

p-value based on Person chi2 test.
Source: Estimations based on data from the survey "vulnerabilities and chronic poverty in Senegal", 2008-2009.

Table 2.
 Description of study population by potential intermediate variables breakdown by the main independent variable

of proportions equality¹, p-value=0.08). Likewise, some differences are significant between groups taken by twos.

Based on Kaplan Meier comparative survivor curves, the probabilities of surviving of first unions in the five ethnic groups (**Figure 3**) highlight discrepancies between the different ethnic groups. Though still uncontrolled for other factors, these differences are statistically significant (log-rank test = 10.8 and Pr = 0.028). Yet, the Lebou's first unions seem unstable. Their survival curve is below that of the four other ethnic groups. After 20 years, about 95 percent of the first unions among the Lebou remains intact. The Lebou were the less represented in these data while the Wolof were the most represented. However, by considering all ethnic groups without Lebou, the statistical differences regarding the survivor functions noticed earlier disappear (log-rank test = 1.69 and Pr = 0.639). The differences remain (log-rank = 10.28 and Pr = 0.016) when the statistical test is tested without the majority ethnic group (Wolof).

¹ 5-sample test for equality of proportions without continuity correction (prop.test() with R software).

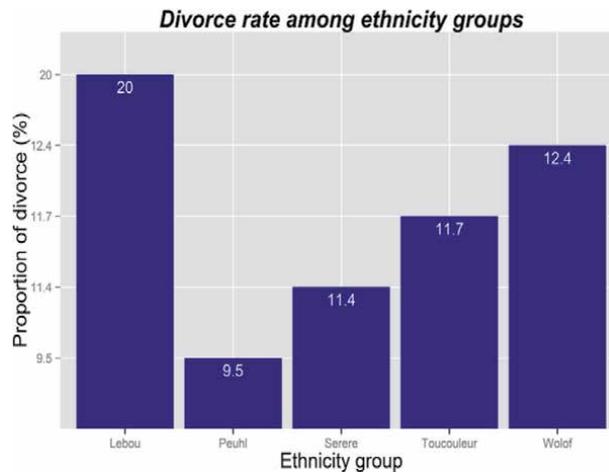


Figure 2. Union dissolution rates among the five ethnic groups. Source: Estimations based on data from the survey “vulnerabilities and chronic poverty in Senegal” 2008-2009.

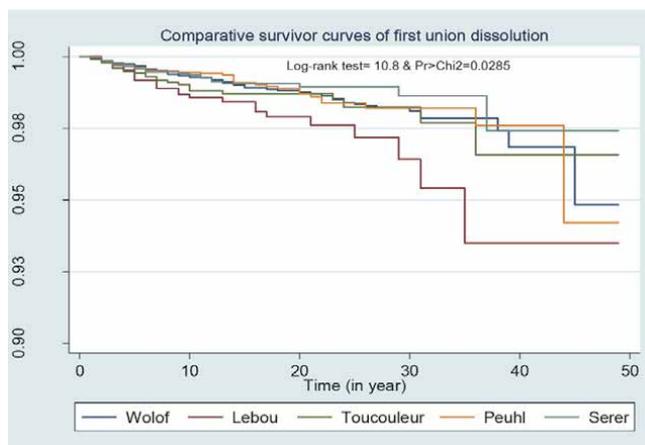


Figure 3. Kaplan Meier survival curves of first unions’ dissolution. Source: Estimations based on data from the survey “vulnerabilities and chronic poverty in Senegal” 2008-2009.

4.4 Ethnic variations in the hazards of union dissolution: risk factors and underlying mechanism of action

Table 3 presented unadjusted hazard ratios (Gross effects) of first union dissolution of the main independent variable and all potential intermediate variables. It also showed the adjusted hazard of union dissolution of each potential intermediate variable controlling for ethnic groups. The unadjusted equations showed no statistically significant ethnicity difference. In addition, the pairwise comparisons of the hazards of union dissolution between ethnic groups showed no significant difference. Among the potential intermediate variables, except the age at first union, all other variables were significantly associated to first union dissolution. Findings also revealed a negative and linear relationship between union dissolution and the

Variable (Reference)	Gross effects		Age at first union/marriage		Cumulated fertility		Place of residence		Education		Birth cohort	
	M	F	M	F	M	F	M	F	M	F	M	F
Ethnic group (<i>Peuhl</i>)												
Wolof	1.2	1.0	1.2	1.0	2.1**	1.1	1.0	0.8	1.4	1.0	1.4	1.0
Lebou	2.0	1.9	2.1*	1.9*	4.2**	2.1*	1.8	1.4	2.3*	1.5	2.7*	2.2
Toucouleur	1.0	1.6	1.0	1.5	1.0	1.7	0.9	1.1	1.2	1.2	1.2	1.8
Sereer	1.0	0.8	0.9	0.7	1.5	1.0	0.9	0.7	1.0	0.7	1.2	0.8
Age at first union/marriage (< 18)												
18-25 years old	0.8	1.0	0.8	1.0								
Above 25 years old	1.0	1.7	0.9	1.6								
Cumulated fertility (3 or above)												
0	20.2**	7.8**			26.0**	7.6**						
1	16.8**	10.4**			21.6**	10.6**						
2	8.7**	4.1**			9.9**	4.1**						
Place of residence (<i>Urban</i>)												
Rural	0.6**	0.3**					0.6**	0.4**				
Education level (<i>Uneducated</i>)												
Primary	0.8	2.0**							0.7	1.8**		
Secondary or above	0.8	0.2**							0.7	0.2**		
Birth cohort (<i>Before 1954</i>)												
1954-64	1.6*	1.0									1.6*	1.0
1965 or above	2.9**	2.9**									3.3**	3.0**

Source: Estimations based on data from the survey "vulnerabilities and chronic poverty in Senegal", 2008-2009.
 *Significant at 5 % level.
 *Significant at 10%.
 **Means significant at 1 % level.

Table 3.
 Hazard of first union dissolution: gross effects, and net effects by controlling for the joint effects of each potential intermediate variable and that of ethnic groups (Cox model, under STATA 13).

cumulated fertility, especially among men. Relative to those with three or more children, the hazard ratio of union dissolution is higher among those with fewer or no children [For men: HR = 20.2 and 8.7 among men with no children and those with 2 children, respectively; among women they were 7.8 and 4.1 respectively]. The gross hazard of union dissolution is negatively associated to female education [HR = 2 for less educated (primary level) women against 0.2 among more educated (secondary or above) women]. Union dissolution risks are also higher among young generations (born after 1964), relative to their older (born before 1954): [HR = 2.9 among both men and women]. The hazard of union dissolution is lower in rural area: [HR = 0.6 for men and 0.3 for women].

However, when estimating the difference between ethnic groups while estimating those of cumulative fertility, education and birth cohort, net differences among ethnic groups appear and the initial differences (gross effects) across cumulated fertility categories, within education levels and within birth cohorts remain. Controlling for the effect of place of residence did not induce ethnic variations though

differences between urban and rural areas remained. The age at first union remained non-significant and failed to induce ethnic differences while controlling the joint effects. The age at first union has no significant impact on union dissolution, though ethnic differences in age at first union exist in Senegal. When controlling the joint effects of ethnicity and that of cumulated fertility, the effect of the various levels of cumulated fertility change a bit while the hazards of union dissolution are higher among Wolof (Men) and Lebou (Men and women). In other words, for a given level of cumulated fertility, the hazard of union dissolution was higher among the Wolof (men) and still higher among the Lebou (men) than among the three other ethnic groups. However, the pairwise comparisons of the hazards of union dissolution between ethnic groups showed significant differences in the hazards only between Lebou and Peuhl (HR of Peuhl = 1.0 and Lebou = 4.2) and between Toucouleur and Lebou (HR of Toucouleur = 1.0 and that of Lebou = 4.2).

By estimating the joint effect of ethnic groups and education, the hazard of union dissolution becomes higher among Lebou (men). In other words, for a given level of education, the hazards of union dissolution were visibly higher among the Lebou than among the four other groups. Despite such result, pairwise comparisons of the corresponding hazards between ethnic groups reported no significant difference. The net effect of birth cohort by controlling that of ethnic groups also showed similar results. For a given birth cohort, the hazards of dissolution were higher among the Lebou (men) than among men from the other four ethnic groups: [HR = 2.7 among the Lebou and less than 1.5 for each of the four other ethnic groups]. Only the differences between female from Wolof and Lebou (HR of Wolof = 1.0 and Lebou = 1.7) were significant. In the meantime, the hazards of union dissolution still higher among the young generations (relative to older generations).

Table 4 presented the net effects between ethnic groups while controlling for the joint effects of each potential intermediate variables and all control variables. The influence of each of the four potential intermediate variables significant in previous equations viz. cumulated fertility, place of residence, education, and birth cohort remained. When estimating the effect of ethnic groups and those of education and all control variables the net differences between ethnic groups found earlier (in the equation involving ethnic groups and education) become non-significant though the net differences within education categories remained. In the equations involving cumulated fertility and birth cohort the net differences between ethnic groups found above (equations involving ethnic groups and each potential intermediate variable) remained. In other words, for a given level of cumulated fertility, the hazard of union dissolution remains higher among the Wolof (hazard for men = 2.4) and still higher among the Lebou (hazard for men = 4.5) than among the three other ethnic groups even after controlling for the joint effects of cumulated fertility and all control variables. Likewise, for a given birth cohort, the hazard of union dissolution remained higher among the Lebou men (hazard = 2.4) than among the four other ethnic groups. In the meantime, the net differences within cumulated fertility categories and those between the birth cohorts remained. In the equation involving the levels of cumulated fertility, pairwise comparisons of the hazards of union dissolution between ethnic groups showed the following differences among men as statistically different: Wolof vs Peuhl (HR : 2.4 vs 1.0), Lebou vs Peuhl (HR 4.5 vs 1.0), and Toucouleur vs Lebou (HR: 1.1 vs 4.5). Lebou and Wolof men had higher hazards. As in the case of age at first union, equations involving place of residence and education did not show any net difference between ethnic groups. Then, our assumptions forecasting differences between ethnic groups in term of age at first union, place of residence and education as intermediate variables were inconsistent. No significant difference in

Variable (Reference)	Gross effects		Age at first union		Cumulated fertility		Place of residence		Education level		Birth cohort	
Ethnic group (<i>Peuhl</i>)												
Wolof	1.2	1.0	1.0	0.9	2.4**	1.0	1.0	0.8	1.2	1.1	1.2	1.0
Lebou	2.0	1.9	1.9	1.4	4.5**	1.3	1.9	1.2	2.2*	1.3	2.4*	1.7
Toucouleur	1.0	1.6	0.8	1.2	1.1	1.3	0.8	1.0	1.0	1.1	1.0	1.6
Sereer	1.0	0.8	0.6	0.7	1.3	0.9	0.7	0.7	0.7	0.7	0.8	0.8
Age at first union/marriage (< 18)												
18-25 years old	0.8	1.0	0.6	0.8								
Above 25 years old	1.0	1.7	0.7	1.2								
Cumulated fertility (3 or above)												
0	20.2**	7.8**			34.5**	8.1**						
1	16.8**	10.4**			26.1**	11.7**						
2	8.7**	4.1**			9.7**	3.6**						
Place of residence (<i>Urban</i>)												
Rural	0.6**	0.3**					0.6*	0.4**				
Education level (<i>Uneducated</i>)												
Primary	0.8	2.0**							0.6	1.6*		
Secondary or above	0.8	0.2**							0.7	0.2**		
Birth cohort (<i>Before 1954</i>)												
1954-64	1.6*	1.0									1.6*	0.9
1965 or above	2.9**	2.9**									3.0**	3.1**
Socio-economic status (<i>Non-poor</i>)												
Poor			1.0	0.8	1.3	0.7	1.2	1.0	1.0	0.8	1.0	0.8
Existence of domestic/servant (<i>No</i>)												
Yes			1.0	1.8*		1.3		1.4	1.3	1.5	1.2	1.9*
Partner's marital status at the union (<i>Single</i>)												
In union/ ever been in union/married			1.0	1.2	0.9	1.0	0.9	1.1	0.9	1.0	1.0	1.3
Knowledge of serious mishap/disaster (<i>No</i>)												
Yes			1.0	0.9	1.1	0.7	1.1	0.9	1.2	1.0	1.1	1.0
Times of dining together daily (<i>Three times</i>)												
Twice or less			2.6**	1.5	1.6	1.4	2.3**	1.2	2.7**	1.3	2.5**	1.5
De-cohabitation (stopping living together) (<i>No</i>)												
Yes, job			1.2	0.4	0.9	0.4	1.2	0.5	1.1	0.4	1.2	0.4
Yes, migration of partner			1.1	0.8	1.1	0.7	1.2	0.8	1.0	0.6	1.1	0.7
Yes, couple problems			3.7**	1.8	4.1**	2.4*	3.4**	1.8	4.3**	1.5	3.9**	1.6

Source: Estimations based on data from the survey "vulnerabilities and chronic poverty in Senegal", 2008-2009.

**Significant at 5% level.

*Significant at 1% level.

†Significant at 10%.

Table 4.
 Hazard of first union dissolution: gross effects and net effects by controlling the joint effect of each potential intermediate variable, ethnic groups, and all control variables (Cox model, under STATA 13).

the pairwise comparisons of the hazards between ethnic groups was noticed in the equations involving other potential intermediate variables (place of residence, age at union and birth cohort). Among control variables, only “times of taking meals together daily” and “reason for stopping living together” showed significant difference among men. The hazards of union dissolution were higher among men who reported taking meals twice of fewer daily in their household and among those who stopped living together with their partners due to problems in their couple.

Table 5 presented net effects of the hazards of union dissolution between ethnic groups while taking into account all potential intermediate and control variables in a single equation. It reveals that ethnicity variations remained especially among men. Men in Wolof and Lebou ethnic groups had 2.6 times more chance and 5.6 times more chance, respectively to experience union instability relative to the Peuhl (men), keeping all study variables constant. In addition of ethnicity variations, the influence of 4 selected intermediate variables (cumulated fertility, place of residence, education, and birth cohort) reported earlier with significant effects remained. Increasing cumulated fertility reduced the hazard of union dissolution: relative to those with three or more children the hazard ratio is about 41 times among men with no children and 11 times among men with two children. Among women they were 6.5 and 3.3, respectively. More educated women (with secondary or above) was about 80% less likely to experience union dissolution while a young woman (born after 1964) had 2.2 times more risk to experience union instability. It was further discovered that only 1 out of 6 control variables (reason for stopping living together) was statistically significant after controlling for all study variables. Men who reported problems of couple as motive of stopping living with their partner were 3.7 times more likely to have union dissolution. The pairwise comparisons of the hazards of union dissolution between ethnic groups (after controlling for all study variables) showed the following differences among men as statistically different: Wolof vs Peuhl (HR : 2.6 vs 1.0), Lebou vs Peuhl (HR: 5.2 vs 1.0), Toucouleur vs Lebou (HR: 1.2 vs 5.2), and Sereer vs Toucouleur (HR: 1.1 vs 1.2).

5. Discussion

This study examined variations in first unions' dissolution among five Senegalese ethnic groups viz. Lebou, Peuhl, Sereer, Toucouleur, and Wolof using biographical data of the survey “vulnerabilities and chronic poverty in Senegal” conducted in 2008-2009.

The rate of first union dissolution ranked from 9.5% (among the Peuhl) to 20% (among the Lebou) in the current study area. It was lower relative to corresponding national estimates based on demographic and health surveys (23.4%) and also low relative to the levels observed in other sub-Saharan countries such as Congo Brazaville (51.0%), Central African Republic (50.0%). Union dissolution rate in Senegal was high relative to the levels observed in other SSA countries such as in Burkina Faso (17.2%), in Benin (17.9%) [1].

The present study adopted an analytical strategy aiming the searching of potential intermediate variables of ethnicity differences in union dissolution. It consisted of performing a series of equations at four different stages suspecting that differences between ethnic groups in union dissolution could be mediated by some other variables identified as intermediate variables (age at first union, place of residence, cumulated fertility, education, and birth cohort). Unadjusted hazard ratios (gross effects) failed to report ethnicity differences in union dissolution. However, ethnicity variations became visibly apparent only after controlling for some of potential variables suspected being intermediates variables and confounding variables (in

Variable (Reference)	Gross effects		Net effects	
	M	F	M	F
Ethnic group (<i>Peuhl</i>)				
Wolof	1.2	1.0	2.6**	1.3
Lebou	2.0	1.9	5.2**	1.5
Toucouleur	1.0	1.6	1.2	1.4
Sereer	1.0	0.8	1.1	0.8
Age at first union/marriage (< 18)				
18-25 years old	0.8	1.0	0.7	0.8
Above 25 years old	1.0	1.7	0.7	0.6
Cumulated fertility (3 or above)				
0	20.2**	7.8**	41.0**	6.5**
1	16.8**	10.4**	32.0**	11.2**
2	8.7**	4.1**	10.9**	3.3**
Place of residence (<i>Urban</i>)				
Rural	0.6**	0.3**	0.6 ⁺	0.6 ⁺
Education level (<i>Uneducated</i>)				
Primary	0.8	2.0**	0.6 ⁺	1.5
Secondary or above	0.8	0.2**	0.8	0.2**
Birth cohort (<i>Before 1954</i>)				
1954-64	1.6 ⁺	1.0	1.0	0.8
1965 or above	2.9**	2.9**	1.6	2.2 ⁺
Socio-economic status (<i>Non-poor</i>)				
Poor			1.6 ⁺	0.8
Existence of domestic/servant (<i>No</i>)				
Yes			1.3	1.0
Partner's marital status at the union (<i>Single</i>)				
In union/ ever been in union/married			0.9	0.9
Knowledge of serious mishap/disaster (<i>No</i>)				
Yes			1.2	0.8
Times of dining together daily (<i>Three times</i>)				
Twice or less			1.5	1.3
De-cohabitation (stopping living together) (<i>No</i>)				
Yes, job			1.0	0.3
Yes, migration of partner			1.1	0.5 ⁺
Yes, couple problems			3.7**	2.0

Source: Estimations based on data from the survey "vulnerabilities and chronic poverty in Senegal", 2008-2009

**Significant at 5 % level.

*Means significant at 1 % level.

⁺Significant at 10%.

Table 5.
 Hazard of first union dissolution in Senegal: net effect by controlling all study variables (Cox model, under STATA 13).

some bivariate and multivariate equations). At bivariate level, when estimating the difference between ethnic groups while estimating those of cumulated fertility, education and birth cohort net differences between ethnic groups appeared. These results were uncommon and reversed our expectations regarding the structure of relationships between ethnicity and selected variables. When estimating the effect of either education or birth cohort the hazard of union dissolution was higher among the Lebou than among the four other ethnic groups. When controlling for the cumulated fertility, the hazard of dissolution was higher among the Wolof men and still higher among the Lebou men than among the three other ethnic groups. This means that there are cultural differences between the ethnic groups that cannot only be explained by standard sociological and demographical variables, but that become apparent only when taking the effect of these standard variables viz. education, cumulated fertility and birth cohort into account.

It was further discovered, after controlling for the effects of all study variables (intermediate and control variables) in a single equation, that the hazard of dissolution was higher among the Wolof men and still higher among the Lebou men than among the three other ethnic groups. In Senegal, though all ethnic groups place important value on procreation (cumulated fertility varying between 5.6 among the Wolof and 6.3 among the Sereer according to the 2002 census report), some ethnic specificities exist. For instance, in the Wolof culture where union essentially based on procreation in cases of polygamy (however legalized), the first wife has authority over all other wives. But she will lose her place if she doesn't conceive. If lack of procreation will lead to a loss of authority of the first wife, possibly it may induce a higher union dissolution risk and, then, could contribute to the higher union dissolution hazard observed among the Wolof men while controlling for the effect of cumulated fertility. With regards to the Lebou, first, they were the less represented (only 100 subjects) in the study sample. The Lebou have a dissolution rate higher than what would be expected from their composition along the standard variables (cumulated fertility, education and birth cohort) inducing net differences between the ethnic groups. However, their composition according to the place of residence may contribute to their higher dissolution hazard. Results showed that living in urban area increased the hazard of union dissolution and the Lebou involved in the present study lived in majority (71%) in urban area relative to other ethnic groups.

With regards to the Peuhl, they were the least acculturated – less educated, lived in majority in rural area. This could account for their lower union dissolution hazard. Also, the Peuhl's unions are too often, the most ethnically homogeneous. Even though, the Peuhl were known for their early age at union, this variable did not impact union stability in Senegal.

In Senegal, the colonial legislation through the Mandel Decree of 15 June 1939 and the Islamic law required the consent of the spouses as a key union requirement. Female from Sereer ethnic group are allowed to choose their partner. This could contribute to their lower union dissolution hazard similar to that of the Peuhl. In reverse, among the Toucouleur, despite the requirement of consent as condition of validity of unions, it is customary to never ask consent of the girl especially when she is virgin. But, they were found with lower hazard of union dissolution similar to that of the Peuhl. This could be explained by their education and place of residence. About 3 out of every 5 Toucouleur lived in rural area and 37% was uneducated.

Studies examining the influence ethnicity searching for potential intermediate variables as adopted here are very scarce especially in Senegal. However, ethnic variations in union dissolution reported by the present study was in agreement with past studies [25, 26, 33, 57] looking at ethnicity as mere control variable. In Cameroon, Wakam [57] found that unions of some ethnic groups such as Bamileke, Mbembe and Bakosi-Mbo are more stable than those of Maka, Baya, Kaka and Fang.

In Burkina Faso, ethnicity differences in first unions dissolution were reported among women. Compared to the Gourmantché, Peuhl, Gourunsi, Bobo-Bwa, and Lobi-Dagari, the Mossi women showed a lower risk of first union dissolution [26]. Ethnically homogenous unions were less likely to experience separation in rural Malawi [33], and in Burkina Faso [26].

Fertility was a key factor for union stability in Senegal. The importance of procreation as a goal of the conjugal union is valued in Senegal. The Senegalese 2002 census report reported high fertility level among the ethnic groups. The highest cumulated fertility (6.3) was recorded among the Sereer and the lowest (5.6) among the Wolof. However, the key role of procreation in union stability reported by the present study is in agreement with past studies' findings. Childbearing plays a key role in matrimonial life [58], especially on the union's stability [39, 48]. According to a traditional thinking based on fertility test of the couple, once in union, African woman has to prove her ability to contribute to the descendant perpetuation [58] that constitutes afterwards an old age insurance for the parents [59, 60]. Even in rural Bangladesh, it was reported a lower contraceptive use before first birth [39]. In other circumstances, the lack of childbearing and even of a boy influenced the formalization of consensual union in West Africa [3]. Alam et al. [39] reported similar results in Bangladesh. Some societies used to validate the union after the first birth of the couple. For instance, it was a tradition among young Dagara and Lobi women from Ivory Coast to prove their fertility through childbearing before marriage [46].

Though the place of residence failed to mediate ethnic differences, its influence was found, however, determinant for union stability. Residence in rural area decreased the hazard of union dissolution. Such evidence is consistent with Takyi [48]. It is, also, in agreement with the statement of Kulu and Boyle underlying the necessity of examining variations in union dissolution across areas [61]. Perhaps, social disorganization thesis based on the key role that play acculturation factors (urbanization, etc.) in union dissolution explained by Takyi [48], could account for the spatial variations in union dissolution. Despite such result, evidences are not consistent. In Burkina Faso, the place of residence didn't make any difference in first union dissolution [26].

Education was found among standard variables making net differences between ethnic groups apparent only after controlling for their effects. Increasing education decreases the hazard of union instability, especially among more educated (secondary or above) women, keeping all other study variables constant. However, unadjusted hazard ratio and the net effects of education without other potential intermediate variables (equations: education + ethnicity, and education + ethnicity + all control variables) reported a higher union dissolution risk among less educated (primary level) and lower risk among well-educated (secondary or above) relative to uneducated women. These findings, however, were in agreement with past studies by Thiombiano and LeGrand [26]. In Burkina Faso Thiombiano and LeGrand reported higher risk of first union dissolution among women with primary education attainment after controlling the influence of individual characteristics. The influence of education in union dissolution varies across areas. While in Cotonou (Benin Republic) high union dissolution risk was reported among women from the first level of secondary school, in Lomé (Togo), no association was found [3].

The effect of birth cohort was found inconsistent with our expectation regarding its mediation effect. Little differences in the distribution of the study population by birth cohort breakdown by ethnic groups were noticed. Though the relationship between birth cohort and ethnic groups was not statistically significant (**Table 2**), after controlling for their effects, net differences between ethnic groups become apparent among men. In addition, it was further discovered that young women

(born after 1964) were more likely to have union dissolution relative to older people (born before 1954). Past studies [26] also reported similar findings regarding variations in dissolution hazard according to birth cohort. In Burkina Faso, the younger generations (between 1975 and 1989, and between 1990 and 2000) were more likely to have union dissolution than older people (marriage cohort before 1975). The influence of both the place of residence and generation were the consequences of socio-economic and technologic development (urbanization, etc.) reported by previous studies [23, 25, 40, 48, 49, 62]. According to some authors, urbanization and socio-economic development, among others, weaken social control of the older adults over the young. Evidences are inconsistent, however. Elsewhere, reverse effect of that one of our study was found. Adjamagbo et al. [3] found that men born between 1972-1981 in Lome (Togo) were less likely to experience union dissolution compared to older people born before 1972. The same study reported no significant variation in union dissolution according to the generation of birth in Cotonou (Benin republic) [3]. Older citizens cohort' unions were more stable because of strong involvement of families in their matrimonial life [49].

6. Limitations

I must acknowledge the limitations of this study. First, data from the biographic survey "Vulnerabilities and chronic poverty" conducted in Senegal in 2008-2009" used for the study were limited for this study; since it was not a specific study on family transformations. For instance, possible effect of ethnically heterogeneous unions on unions' stabilities were not possible. We couldn't distinguish formal (legally formalized) unions from informal ones (cohabiting/consensual/living together). Unions legally dissolved were not distinguishable from repudiation/informal dissolution. In a place where union formation is often an informal and fluid process [63], as it is the case for the context of the present study, identifying precise dates of union dissolution can be difficult, if not impossible [1]. Possibility of omitting previous unions is also acknowledged in this study. For instance, recent study in Malawi reported that 28.3% of men and 17.9% of women omitted at least a union. The same study reported that misreporting also affects marriage indicators and potentially analyses [64]. Thus, this study's findings may also be affected by memories biases since union dissolution as collected by the survey was recalled so many years, even decades ago. Little information was collected on the respondents' partners. In addition, this study was limited in terms of sample size. As result, two ethnic groups were not included in the study. Also, the Lebou found with the highest dissolution hazard was the least represented (only 100 subjects) in the study sample. All these limitations need to be taken into account while considering the study's findings.

7. Conclusion

This study investigated variations in first union dissolution among five ethnic groups viz. Wolof, Lebou, Peuhl, Sereer, and Toucouleur in Senegal using data from biographic survey "vulnerabilities and chronic poverty" conducted in 2008-2009. Its central goal was to examine the specific effect of ethnicity and to identify the underlying mechanisms of action of ethnic variations in union dissolution among men and women. Bivariate analyses based on Kaplan Meier comparative curves confirmed expected theoretical results with regards to the association of ethnicity and first unions' dissolution. Further analyses lied on hazard regressions models.

Results supported the fact that there were cultural differences between ethnic groups that not only cannot be explained by standard sociological and demographic variables, but that become apparent only when taking the effect of these standard variables. Indeed, unadjusted hazards reported no ethnic differences in union dissolution. Net differences between ethnic groups become apparent only after controlling for the effects of potential variables like cumulated fertility, education and birth cohort. The hazard of union dissolution was higher among the Lebou men and in some extent higher among the Wolof men than among other groups.

Though the place of residence does not act as intermediate variable, it remains a key factor for union stability. Ethnic differences regarding age at first union exist in Senegal, but, the age at first union does not neither shape union instability, nor mediate ethnic differences in union dissolution. Hazard regression adjusted for all studies variables (potential intermediate variables and control variables) revealed ethnicity differences in union dissolution especially among men. However, despite the present study clarified some aspects regarding underlying mechanisms of action of ethnic variations in hazard of union dissolution, large-scale and more detailed data covering all Senegalese ethnic groups are needed for better understanding of the complexity and the persistence of domestic and matrimonial customs and traditions in matrimonial relationships.

The present study's findings support the need for policy interventions to be strengthened toward reproductive health issues and infertility solving in particular. Encouraging younger generations to get into union at higher age (after 18 year olds) will also increase the rate of union stability in the study settings.

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The Age-Sex Structure of Religion as a Determinant of the Social Inclusion of Internal Migrants in Maroua

Nanche Billa Robert

Abstract

We set out to find out how the sex-age structure of religion of internal migrants influences their integration in the socio-economic activities of Maroua. We used the exponential non-discriminative snowball sampling method to collect data in which each new referral provided us with more data for referral until we got enough number of subjects for the sample. We concluded that: if one is a Muslim, one will have a stable and progressing business because Muslims maintain a good relationship with their neighbors and they also practice a relationship of solidarity. However, the socio-economic activities of Catholics, Pentecostals and Protestants suffer because they lack the cultural capital that Muslims enjoy. However, age plays a major role: when they are 45–54 years old, the income of the internally migrated Muslims and Catholics drastically decline while that of Pentecostals and Protestants increases. Older Muslims and Catholics earn basically very low income unlike Protestants who earn very high salary. The income inequality among men is much higher than that among women. Generally, men have a more conflictual relationship with their neighbors than women and women diversify their relationship with the natives more than men.

Keywords: Religion, socio-economic activities, relationship, Catholics, Protestants, Pentecostals, Protestants, Muslims

1. Introduction

The socio-demographic situation of the Far North region of Cameroon of which Maroua is the headquarter is as follows: According to data from the 3rd census conducted in 2005 [1], the population of the Far North was estimated at 3,111,792 inhabitants which was about 17.8% of the Cameroon's total population. According to the report on demographic projections and the estimates of priority targets for various health programs and interventions, carried out by the National Institute for Statistics (NIS) in 2016 [2], the total population of the Far North increased to about 4,208,433 inhabitants. This population is made up of 50.3% women and 49.7% men. Enquête complémentaire: Enquête Camerounaise Auprès des Ménages¹

¹ Complementary Research: Cameroon Household Research.

(EC-ECAM) [3] show that 19.4% of the population is aged between 0 to 4 years, the age of 35.6% varies from 5 to 14 years, 33.2% are of working age (15–64) and only 2.8% are at least 65 years old. Therefore the Far North of Cameroon has a relatively younger population.

Considering the structure of the population by age, there emerges an economic dependency ratio of 1.19. However, it is in the Diamaré division where there are about (49.6%) which is relatively the largest number of people of working age are found in the Far North Region of Cameroon. There are about 8.1 percentage of widowed or divorced women in the Far North and about 10.4% in the Diamaré Division. In the Far North region about 1.2% of the people live with a disability and about 1.8% of them are in the Diamaré division. The average household size in the region is 6.3 people [4].

In 2014, the poverty rate (or incidence of poverty) in the Far North region was 74.3%; nearly double the national level. The poverty rate is higher in households headed by women (81.2%) than in those headed by men (22.9%). Poverty increases with the size of the household; rising from almost 28% in one-person per household to 86% in households of at least 8 people. The poverty rate seems to increase with the age of the head of household: 60.4% in households headed by a person under 35, 76.9% in households headed by someone who is about 35 to 64 years old and 83.2% in households headed by a person who is 65 and above. The level of poverty decreases as the level of education of the head of household increases: from 81% in households where the head has no schooling to 33% in those where the head has a higher educational level. Households headed by inactive people are the poorest (78.6%). The level of poverty among those headed by employed people is also high and stands at 74.2%. Poverty is higher in households headed by people working in the primary sector (85.1%) and the poverty rate is 64.3% and 32.1% in households where the head works in the secondary and tertiary sectors respectively.

About 96.5% of workers were self-employed in 2016, in the Far North region of Cameroon. There is the lack of formal employment opportunities that job seekers often face since the majority of workers are generally employed in the informal sector, which is a sector characterized by high levels of poverty, inequality and low-quality employment.

As of Thursday, February 4, 2021, Cameroon's current population was about 26,933,967 basing on the Worldometer elaboration of the latest United Nations data. In 2020 its population was estimated at 26,545,863 people at mid-year. UN data indicate that Cameroon population is equivalent to 0.34% of the total world population. About 56.3% of the population (14,941,523 people in 2020) live in the urban area and the average age in Cameroon is 18.7 years [5].

According to [6, 7] about 42.34% of the population of Cameroon is made up of 0–14 years: (male 5,927,640/female 5,820,226) and about 20.04% consists of those who are about 15–24 years: 20.04% (male 2,782,376/female 2,776,873) and about 30.64% are made up of those between 25 and 54 years: (male 4,191,151/female 4,309,483), there is also about 3.87% of those who are about 55–64 years: 3.87% (male 520,771/female 552,801) and finally about 3.11% are people about 65 years and over: 3.11% (male 403,420/female 460,248) (2020).

The 2005 census [8] describes religious demography in Cameroon by stating that 69.2%, 20.9%, 5.6%, 1.0%, 3.2% percent of the population is Christian, Muslim, animist, other religions, and those who have no religious affiliation in Cameroon respectively. Among the Christians, approximately 55.5%, 38%, 6.5% are Roman Catholic, Protestant, and other Christian denominations, including Jehovah's Witnesses and Orthodox churches respectively. The 2010 Pew-Templeton Global Religious Futures Project [9] found that 70.3%, 18.3%, 3.3%, 2.7%, 5.5% of the population was Christians, Muslims, animists, other religions and those with no

religious affiliation in Cameroon respectively. Of the Christians, 38.3%, 31.4% were Catholics and Protestants respectively and that there is a rising number of Christian revivalist churches (Pentecostals).

Christians are mostly found in the southern and western parts of Cameroon: Protestants are mainly found in the two Anglophone regions while the five southern Francophone regions are mostly Catholics. The Fulani (Peuhl) ethnic group are mostly Muslims and they primarily inhabit the northern Francophone regions; the Bamoun ethnic group are also mostly made up of Muslims in the West Region of Cameroon. Many Muslims, Christians, and members of other faiths also adhere to some aspects of animist beliefs.

The objective of this work is to examine how the religion of the internal migrants, that is people who have left other parts of Cameroon and have settled in Maroua which is in the Far North of Cameroon, a region predominated by Muslims influence their integration and their socio-economic activities.

2. Literature review

Religious demography is defined as the scientific and statistical study of the demographic characteristics of religious populations, by paying attention to their growth, distribution, development density, size, age-sex structure, migration, and vital statistics, including the altering of religious identity in a human populations and these characteristics are linked to other social and economic indicators.

Demographers do not limit themselves only to the study of basic demographic features of religion (age, sex, fertility, mortality), they also examine religion as a demographic characteristic of human populations which merits its own field of inquiry [9]. Since religion is important for projections, it is therefore a fundamental factor in demography, of future population growth and other social indicators [10].

Social inclusion clearly refers to disadvantaged people on the basis of their age, sex, race, ethnicity, origin, disability, or economic or other status. Social exclusion is the process by which, individuals or groups are fully or partly excluded from wholly participating in the society in which they live' [11]. Everyone stands the potential risk of social exclusion, however, some attributes or characteristics strengthen such a risk which are often associated to identity or group ascription. Kabeer (2006) [12] refers to this as groups of persons who identify their collective membership, beliefs and values and act in cooperative ways. Caste, ethnicity and religion are examples of such group identities while some are categories of people who are delineated basing on particular shared characteristic rather than collective values and lifestyle.

Members of these categories may not know each other and may share very little in common, apart from the fact that they are discriminated upon Jennie et al. [13]. Certain ingredients of exclusion are dynamic, multi-dimensional processes which are motivated by an imbalanced power relationships which interact across four main dimensions—economic, political, social and cultural—and at different levels include individual, household, group, community, country and global levels. This leads to a continuum of inclusion/exclusion characterized by uneven access to assets, capabilities and rights which result to health inequalities. People are excluded from some domains of life: social, economic, political, civic and spatial – and the salience of each part strongly depends on the country and local contexts and also on the stage of a person's life course. This means that, the concepts of social inclusion and social exclusion are multidimensional and depend on the context.

Age is not the only selective aspect of migration but also gender, education and other migrant characteristics. Interstate migration in America for example are made by college-educated professionals because their labour markets are often more

national than local [14]. Rural-to-urban migration is to an extent driven by better incomes and the migrants' expectation of a healthier life in urban areas as posited by neoclassical economists [15]. Nevertheless, income inequalities alone do not explain the phenomenon. Interstate movement is also an individual and family risk-diversification strategy and which builds upon pre-existing networks among other motives [16].

People move from one geographical area to another because of their entry into labour force or employment motives [17]. Therefore migration choices and employment are related. Intra-national migration is an answer to the gap that exists between an expected urban and a de facto rural income [18] and migrants think that they will have better-paying jobs at the destination. Therefore interregional migration is due to income variability [19].

The economic crisis that Cameroon faced during the 1980, to an increase of rural job-seekers to urban areas and as a result, the urban population grew. This was due to the fact that poverty severity is higher in the rural than urban areas. About 35.4% of individuals inhabiting cities are non-natives of those areas and migrants in urban areas represent only one-half of the urban population [20]. The inability of national economies to improve well-being appears to be deeply rooted not just in population redistribution, but in the socio-economic and political structures of several countries [21].

The above made us to ask the following questions: Does a migrant religious affiliation facilitate his inclusion in the socio-economic activities of Maroua? Does having a common membership or shared belief like religion facilitate the integration of migrants and their subsequent socio-economic activities? Do migrants who are Muslims profit from existing networks considering that Maroua is predominantly a Muslim community than the other religious denominations?

The major objective of this chapter is to find out how the religious affiliations of the population that have migrated and settled in Maroua for varied reasons influence either their exclusion or inclusion in the socio-economic activities of Maroua. We also set out to find how the sex-age structure of religion influences participants' integration and socio-economic activities.

3. Methodology

We used the exponential non-discriminative snowball sampling method or chain-referral sampling which is a non-probability sampling technique in which as [22] states, the samples have traits that are rare to find. We recruited the first subject that we identified as an internally displaced migrant and then he provided us with multiple referrals. Each new referral then provided us with more data for referral and so on, until we got enough number of subjects for the sample.

It was obviously difficult to find a list of all the details of the number of the internal migrants in Maroua. Therefore, we used this method because we were dealing with a population that is hard to locate or difficult to identify or find. More so, there was no pre-calculated list or demographic information of their details, therefore it was an immense pain contacting them in Maroua. As a result, referrals made it easier and quicker to find them as they came from reliable sources.

This sampling method as [22] states, involves a primary data source nominating other potential data sources that will be able to participate in the research studies. Snowball sampling method is purely based on referrals and that was how we were able to generate our sample. We closely examined and filtered the internally migrated population and we then conducted a research by administering a

questionnaire with them which were based on elements that made us to understand their integration and the way they were perceived in Maroua.

We analyzed the collected data using SPSS software which helped us to cross-tabulate the collected data.

4. Analyses of findings

4.1 Internal migrants' religion and their social relation with natives

We examine the bond that exists between internal migrants and their entourage. The question we ask was the extent to which religion has a considerable impact on internal migrants' relations with the natives?

Table 1 shows that 44.48%, 26.3%, 21.22%, 4.48%, 1.63% and 1.92% of migrants as a whole have a good neighborly relationship, maintain simple acquaintances with their neighbor, maintain relations of solidarity; have professional relationships; have no relationship with the neighborhood and finally have a conflicting relationship with the neighborhood respectively. We realize that migrants have a good neighborly relationship in most cases, however will this always be the case with the influence of religion?

With the influence of religion, we discovered that if one is a Muslim, the more one will maintain a good relationship with ones neighbors and one will also practice a relationship of solidarity. Equally, if one is a Catholic, one will have a good neighborly and conflicting relationship with ones neighbors. Pentecostals significantly maintain a professional and conflicting relationship with their neighbors. The animists on their part either have a conflicting relationship or no relationship with the neighborhood and finally the Protestants as for them maintain either normal relations with the neighborhood, or purely professional relations. Equally, just like the Pentecostals and the animists, the Catholics also have conflicting relationship with their neighbors.

Religion	Types of relations						Total
	Good Relations	Simple Acquaintance	Solidarity	Professional Relation	Confictual Relation	No Contact	
Muslim	33	19	19	1	0	0	72
	30,3%	28,8%	36,5%	9,1%	0%	0%	29,4%
Catholics	33	18	7	3	1	1	63
	30,3%	27,3%	13,5%	27,3%	33,3%	25,0%	25,7%
Pentecostals	3	10	6	3	1	1	24
	2,8%	15,2%	11,5%	27,3%	33,3%	25,0%	9,8%
Animists	1	1	3	0	1	1	7
	0,9%	1,5%	5,8%	0,0%	33,3%	25,0%	2,9%
Protestants	39	18	17	4	0	0	78
	35,8%	27,3%	32,7%	36,4%	0%	0,0%	31,8%
Total	109	66	52	11	3	4	245
	100%	100%	100%	100%	100%	100%	100%

Table 1.
Religion and types of relationship.

From the above we notice that Pentecostals just like animists do not have a good neighborly relationship, although Pentecostals significantly make some acquaintances, maintain good professional relationship with their co-workers. We therefore notice that the stricter people are in religious issues, the more they alienate themselves from other people in their neighborhood and may significantly have conflictual relationship with their neighbors.

In conclusion, if one is a protestant, one will have a good and professional relationship with ones neighbors or coworker, if one is a Muslim, one will have a good neighborly relation and a relationship of solidarity. If one is a Catholic, one will either have a good or a conflictual relationship with one's and Pentecostals have either a professional or conflictual relationship with their neighbors. Therefore apart from the Muslims and Protestants, the others having conflictual relationship with their neighbors.

4.1.1 The religion/age of the internal migrants and types of relationship

Here we examine whether the religion and age of a migrant influence his relationship with his neighbors.

Table 2 indicates that the internally immigrant Muslim diversify their relationship more in their neighborhoods when they are young. They significantly maintain a good relationship, solidarity and professional relation when they are between 15 and 24 years and 25–34 years old. As they get older, their relationship with their neighbors reduces and they simply practice solidarity and maintain good relationship with their neighbors. As they get older, they move from solidarity to a simply acquaintance.

As for Catholics who have internally migrated, their relationship with their neighbors is limited when they are young and when they are old, and diversified when they reach middle age. When they are young, they significantly practice only simple acquaintance and good relationship with their neighbors. At middle age, they still maintain good relationship with their neighbors and co-workers as well as also have conflicting relationship or no relationship at all with their neighbors. Contrarily to the Muslim, they become more united, that is, they practice solidarity when they get older.

Compared to the Muslims and the Catholics, the Pentecostals have a more diverse relationship with their neighbors. Unlike the others, their relationship with their neighbors is much more that of a simple acquaintance than a good relation. Contrarily to the Muslims and Catholics and even Protestants, they do not have a good neighborly relationship. Unlike the Muslim who do not have any conflicting relationship with their neighbors and the Catholics who have a conflicting relationship when they are adults, those who significantly have conflicting relationship among the Pentecostals, are younger people between 15 and 24 year. The Pentecostals maintain a much better professional relationship than the other denominations. Just like the Catholics, they practice more solidarity when they become old.

Animists do not significantly have a good relationship with their neighbor nor a simple acquaintance when they are young and old except when they become adults. They are in solidarity with their neighbourhoods and they also have conflicting relationship with them when they are middle-aged.

The Protestants practice good relationship with their neighborhoods and colleagues and are in solidarity with them. Unlike the Pentecostals, they significantly do not have any conflicting relationship with their neighbourhoods and are significantly in contact with them (**Table 3**).

The above analyses indicate that the age and religion of a migrant play an important part in his or her social integration in a community. The table below

Age	Religion	Type of Relationship with Neighbors					Total
		Good Relation	Simple Acquaintances	Solidarity	Professional Relation	Conflictual Relation	
15-24	Musulims	12	4	7	1	0	24
		35,3%	28,6%	33,3%	100,0%	0,0%	32,9%
	Catholics	4	4	1	0	0	9
		11,8%	28,6%	4,8%	0,0%	0,0%	12,3%
	Pentecostals	0	3	2	0	1	7
		0,0%	21,4%	9,5%	0,0%	100,0%	9,6%
	Animists	1	0	1	0	0	3
		2,9%	0,0%	4,8%	0,0%	0,0%	4,1%
	Protestants	17	3	10	0	0	30
		50,0%	21,4%	47,6%	0,0%	0,0%	41,1%
Total	34	14	21	1	1	73	
	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	
25-34	Musulims	13	11	4	0	0	28
		27,1%	28,9%	28,6%	0,0%	0,0%	26,4%
	Catholics	20	11	3	2	0	36
		41,7%	28,9%	21,4%	33,3%	0,0%	34,0%
	Pentecostals	2	6	2	2	0	12
		4,2%	15,8%	14,3%	33,3%	0,0%	11,3%
	Animists	0	0	1	0	0	1
		0,0%	0,0%	7,1%	0,0%	0,0%	0,9%
	Total	35	28	14	4	0	81
		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Age	Religion	Type of Relationship with Neighbors						Total
		Good Relation	Simple Acquaintances	Solidarity	Professional Relation	Conflictual Relation	No contact	
	Protestants	13	10	4	2			29
		27,1%	26,3%	28,6%	33,3%			27,4%
	Total	48	38	14	6			106
		100,0%	100,0%	100,0%	100,0%			100,0%
35-44	Muslims	5	2	7	0	0	0	14
		20,8%	18,2%	58,3%	0,0%	0,0%	0,0%	26,4%
	Catholics	9	3	0	1	1	1	15
		37,5%	27,3%	0,0%	50,0%	50,0%	50,0%	28,3%
	Pentecostals	1	0	2	0	0	0	3
		4,2%	0,0%	16,7%	0,0%	0,0%	0,0%	5,7%
	Animists	0	1	1	0	1	0	3
		0,0%	9,1%	8,3%	0,0%	50,0%	0,0%	5,7%
	Protestants	9	5	2	1	0	0	17
		37,5%	45,5%	16,7%	50,0%	0,0%	0,0%	32,1%
	6,00	0	0	0	0	0	1	1
		0,0%	0,0%	0,0%	0,0%	0,0%	50,0%	1,9%
	Total	24	11	12	2	2	2	53
		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
45-54 years	Muslims	3	0	1	0			4
		100,0%	0,0%	50,0%	0,0%			50,0%
	Catholics	0	0	1	0			1
		0,0%	0,0%	50,0%	0,0%			12,5%

Age	Religion	Type of Relationship with Neighbors					Total
		Good Relation	Simple Acquaintances	Solidarity	Professional Relation	Conflictual Relation	
	Pentecostals	0	1	0	1		2
		0,0%	100,0%	0,0%	50,0%		25,0%
	Animists	0	0	0	1		1
	Total	3	1	2	2		8
		100,0%	100,0%	100,0%	100,0%		100,0%
	Musulman	2	0	0			2
		100,0%		0,0%			40,0%
	Catholique	0	2				2
		0,0%	66,7%				40,0%
	Protestants	0	1				1
		0,0%	33,3%				20,0%
	Total	2	3				5
		100,0%	100,0%				100,0%
	Musulims	33	19	19	1	0	72
		30,3%	28,8%	36,5%	9,1%	0,0%	29,4%
	Catholics	33	18	7	3	1	63
		30,3%	27,3%	13,5%	27,3%	33,3%	25,7%
	Pentecostals	3	10	6	3	1	24
		2,8%	15,2%	11,5%	27,3%	33,3%	9,8%
	Animists	1	1	3	0	1	7
		0,9%	1,5%	5,8%	0,0%	33,3%	2,9%

Age	Religion	Type of Relationship with Neighbors						Total
		Good Relation	Simple Acquaintainces	Solidarity	Professional Relation	Conflictual Relation	No contact	
Protestants		39	18	17	4	0	0	78
		35,8%	27,3%	32,7%	36,4%	0,0%	0,0%	31,8%
6,00		0	0	0	0	0	1	1
		0,0%	0,0%	0,0%	0,0%	0,0%	25,0%	0,4%
Total		109	66	52	11	3	4	245
		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 2.
Religion/age of internal migrants and type of relationship.

Respondents' Age		Value	df	Asymp. Sig. (2-sided)
15–24 years	Pearson Chi-Square	39,180 ^b	20	,006
25–34 years	Pearson Chi-Square	15,669 ^c	12	,207
35–44 years	Pearson Chi-Square	53,137 ^d	25	,001
45–54 years	Pearson Chi-Square	5,000 ^f	2	,082
> 55 years	Pearson Chi-Square	106,136 ^a	25	,000

Table 3.
Religion/age and levels of Asymptotic 2-sided significance.

indicates three major areas where there are significant relationship especially when these internally migrated people are young and middle age. Generally, there is a very significant relationship between age, religion and relationship with ones neighbors.

4.1.2 *The religion/sex of the internal migrants and types of relationship*

Table 4 shows that generally internally migrated women decide not to have any contacts with the natives who are their neighbors and this is significantly so with the Catholic women, Pentecostal women and women who are animists. Generally, men have a conflictual relationship with their neighbors significantly men who are Pentecostals and animists. Muslims generally practice solidarity whether men or women. Women seem to diversify their relationship with their native neighbours than men significantly Catholic and Pentecostals women. While Catholic women significantly have good relation with the natives, Pentecostals women significantly practice solidarity. It is worth noting that all although Catholic women significantly have good relationship with the natives, they also significantly have a very difficult relation with them because they significantly are in conflict with them or may significantly decide not to contact the natives. There is a very significant relationship between the gender of a religious person and their social relationship with their neighbors. (Pearson Chi-Square: Value = 188,381^b Diff = 25, Asymp Sig. (2-sided) = .000) for men and (Pearson Chi-Square: Value = 45,515^c Diff = 20, Asymp Sig. (2-sided) = .001).

Futhermore, we also examine the relationship that exists between religion and number of visitors that internally migrated persons received in Maroua. We discovered that, their integrations is influenced by religion because the number of visitors they have varies with religion. About 46.93% receive 1–3 visitors, 27.34% receive 4–6 visitors at their homes. 17.14% have more than 10 visitors and finally 7.75% receive 7–9 visitors. Averagely, migrants receive 1–3 visitors in most cases. However, with the influence of religion, we notice that a Muslim has the highest number of visitors which varies between 7 and 9 and more than 10 per day. Catholic internally migrants significantly receive a number of 1–3 visitors and Pentecostals significantly receive about 4–6 visitors. Animists significantly receive 1–3 visitors and sometimes more than 10 visitors and a Protestant significantly receives about 1–3 and 7–9 visitors.

4.2 Religion and socio-economic activities

In this section, we examine whether ones' socio-economic activities is influenced by religion and then we proceed to find whether their ages and gender make a difference in their socio-economic activities.

Sex	Religion	Types of Relations with neighbors						Total
		Good Relation	Simple Acquaintances	Solidarity	Professionnal Relation	Conflicting Relation	NO contact	
Men	Muslims	27	15	17	1	0	0	60
		43,5%	34,1%	40,5%	16,7%	0,0%	0,0%	38,2%
	Catholics	16	10	7	1	0	0	34
		25,8%	22,7%	16,7%	16,7%	0,0%	0,0%	21,7%
	Pentecostals	0	6	4	1	1	0	12
		0,0%	13,6%	9,5%	16,7%	50,0%	0,0%	7,6%
	Animists	1	1	3	0	1	0	6
		1,6%	2,3%	7,1%	0,0%	50,0%	0,0%	3,8%
	Protestants	18	12	11	3	0	0	44
		29,0%	27,3%	26,2%	50,0%	0,0%	0,0%	28,0%
Women	Others	0	0	0	0	0	1	1
		0,0%	0,0%	0,0%	0,0%	0,0%	100,0%	0,6%
	Total	62	44	42	6	2	1	157
		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
	Muslims	6	4	2	0	0	0	12
		12,8%	18,2%	20,0%	0,0%	0,0%	0,0%	13,6%
	Catholics	17	8	0	2	1	1	29
		36,2%	36,4%	0,0%	40,0%	100,0%	33,3%	33,0%
	Pentecostals	3	4	2	2	0	1	12
		6,4%	18,2%	20,0%	40,0%	0,0%	33,3%	13,6%
Animists	0	0	0	0	0	1	1	
	0,0%	0,0%	0,0%	0,0%	0,0%	33,3%	1,1%	

Sex	Religion	Types of Relations with neighbors						Total
		Good Relation	Simple Acquaintances	Solidarity	Professionnal Relation	Conflicting Relation	NO contact	
	Protestants	21	6	6	1	0	0	34
		44,7%	27,3%	60,0%	20,0%	0,0%	0,0%	38,6%
	Total	47	22	10	5	1	3	88
		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 4.
Gender, religion and types of relation with neighbors.

Religion	Internal migrant socio- economic state					Total
	Progressing	Stable	Regressing	Instable	Other	
Muslims	17	28	6	5	0	56
	33,3%	31,5%	23,1%	17,9%	0,0%	28,7%
Catholics	11	23	8	11	0	53
	21,6%	25,8%	30,8%	39,3%	0,0%	27,2%
Pentecostals	6	5	2	5	0	18
	11,8%	5,6%	7,7%	17,9%	0,0%	9,2%
Animists	1	3	1	0	0	5
	2,0%	3,4%	3,8%	0,0%	0,0%	2,6%
Protestants	16	29	9	7	1	62
	31,4%	32,6%	34,6%	25,0%	100,0%	31,8%
Other	0	1	0	0	0	1
	0,0%	1,1%	0,0%	0,0%	0,0%	0,5%
Total	51	89	26	28	1	195
	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 5.
Religion and socio-economic activities in Maroua.

Table 5 shows that Muslims have a stable and progressing business unlike the Catholics who have a regressing and instable economic activities in the town of Maroua. This certainly is because as we have seen above, if one is a Muslim, the more one will maintain a good relationship with ones neighbors and one will also practice a relationship of solidarity. That of the Catholics regress because their social inclusion is not as smooth as that of Muslims because Catholics do not only have a good neighborly relationship with natives but also a conflicting one too which certainly hampers their business activities.

Although Pentecostals do not significantly have a good relationship with the natives, they slightly have progressing socio-economic activities but their economic activities are to a greater extent significantly instable. However, Pentecostals significantly maintain a professional and conflicting relationships which certainly affect their economic activities. Animists and protestants have economic activities which are averagely doing well because they significantly have businesses that are stable and regressing. Then we draw the following conclusion from the table: if one is a Muslim, one will have a stable and pregrssing business because one is well-integrated in the town of Maroua. If one is not well-integrated in the town of Maroua, hardly will one have a well-established economic activity.

Table 6 is quite revealing because it shows that the economic activities of male is not really same with that of the female. For example Muslims who generally significantly have a well-established activities, that is, activities which are progressing and stable, seems not to be so with Muslims males and females. The health of the economic activities of male Muslims is diverse. Similarly, women who are animists seem to significantly have progressing business than men who are animists because male animists have stable and regressing economic activities. Equally, Protestants males have instable economic activities while Protestant females have diverse forms of economic activities: they are significantly progressing, stable and regressing. Contrarily to the Muslims, animists and Protestants where the female Muslims economic activities strive better than that of the male, it is instead the economic

Sex	Religion	The situation of migrants' activities					Total	
		Progressing	Stable	Regressing	Instable	Other		
Male	Muslims	13	24	6	5	0	48	
		39,4%	40,7%	42,9%	21,7%	0,0%	36,9%	
	Catholics	6	12	3	7	0	28	
		18,2%	20,3%	21,4%	30,4%	0,0%	21,5%	
	Pentecostals	5	2	0	4	0	11	
		15,2%	3,4%	0,0%	17,4%	0,0%	8,5%	
	Animists	0	3	1	0	0	4	
		0,0%	5,1%	7,1%	0,0%	0,0%	3,1%	
	Protestants	9	17	4	7	1	38	
		27,3%	28,8%	28,6%	30,4%	100,0%	29,2%	
	Other	0	1	0	0	0	1	
		0,0%	1,7%	0,0%	0,0%	0,0%	0,8%	
	Total	33	59	14	23	1	130	
			100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Female	Muslims	4	4	0	0		8	
		22,2%	13,3%	0,0%	0,0%		12,3%	
	Catholics	5	11	5	4		25	
		27,8%	36,7%	41,7%	80,0%		38,5%	
	Pentecostals	1	3	2	1		7	
		5,6%	10,0%	16,7%	20,0%		10,8%	
	Animists	1	0	0	0		1	
		5,6%	0,0%	0,0%	0,0%		1,5%	
	Protestants	7	12	5	0		24	
		38,9%	40,0%	41,7%	0,0%		36,9%	
	Total	18	30	12	5		65	
			100,0%	100,0%	100,0%	100,0%		100,0%

Table 6.
Religion/gender and socio-economic activities.

activities of the male Pentecostals that are doing better because their activities are significantly progressing and instable while that of female Pentecostals are regressing and instable. Therefore the economic activities of Pentecostal males are better than Pentecostal female. They are also somehow significantly regressing when the males are singled out from the females while the female Muslims seem to significantly have flourishing socio-economic activities. This is not so with the Catholics where both male and female Catholics significantly have regressing and instable economic activities.

It is worth-noting that 64.7% internally migrated Catholic women in Maroua are civil servant and they formed about 78.6% of total internally migrated women who are civil servants. The female Muslims are hardly civil servants. Equally, 66.7% of female Pentecostals are civil servants and form about 14.3% of total females who are civil servants. Only about 11.1%, 100%, 0% and 60% of female Muslims, Catholics, Pentecostals and Protestants do business respectively. Therefore more Catholic

internally migrated women do business follow by Protestant women. Considering women as a whole, 10%, 30%, 0% and 60% of Muslims, Catholics, Pentecostals and Protestants do business. Generally, more women who do business are Protestants.

Generally, 61.5%, 0%, 7.7% and 30.8% of men who do business in Maroua are Muslims, Catholics, Pentecostals and Protestants respectively. Despite the differences, there is no correlation between the activities of migrants and the gender/ religion connection (Pearson Chi-Square for men: Value = 16.723, Diff = 20, Asymp Sig. (2-sided) = .671) and for women it is (Pearson Chi-Square: Value = 12,270^c Diff = 12, Asymp Sig. (2-sided) = .424).

Table 7 shows that when internally migrated Muslims start their business, it is stable but as time goes on or as they become older their socio-economic activities

Age	Religion	The Situation of migrant's Activities					Total
		Progressing	Stable	Regressing	Instable	Other	
15-24	Muslims	4	11	1	3	0	19
		28,6%	45,8%	25,0%	37,5%	0,0%	37,3%
	Catholics	2	1	1	2	0	6
		14,3%	4,2%	25,0%	25,0%	0,0%	11,8%
	Pentecostals	1	3	0	1	0	5
		7,1%	12,5%	0,0%	12,5%	0,0%	9,8%
	Animists	1	0	0	0	0	1
		7,1%	0,0%	0,0%	0,0%	0,0%	2,0%
	Protestants	6	9	2	2	1	20
		42,9%	37,5%	50,0%	25,0%	100,0%	39,2%
Total	14	24	4	8	1	51	
	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	
25-34	Muslims	8	9	1	2		20
		32,0%	24,3%	9,1%	18,2%		23,8%
	Catholics	6	15	3	7		31
		24,0%	40,5%	27,3%	63,6%		36,9%
	Pentecostal	4	1	2	1		8
		16,0%	2,7%	18,2%	9,1%		9,5%
	Animists	0	1	0	0		1
		0,0%	2,7%	0,0%	0,0%		1,2%
	Protestants	7	11	5	1		24
		28,0%	29,7%	45,5%	9,1%		28,6%
Total	25	37	11	11		84	
	100,0%	100,0%	100,0%	100,0%		100,0%	
35-44	Muslims	4	6	2	0		12
		40,0%	26,1%	22,2%	0,0%		24,5%
	Catholics	3	6	4	1		14
		30,0%	26,1%	44,4%	14,3%		28,6%
	Pentecostals	1	0	0	2		3
		10,0%	0,0%	0,0%	28,6%		6,1%

Age	Religion	The Situation of migrant's Activities					Total	
		Progressing	Stable	Regressing	Instable	Other		
	Animists	0	2	1	0		3	
		0,0%	8,7%	11,1%	0,0%		6,1%	
	Protestants	2	8	2	4		16	
		20,0%	34,8%	22,2%	57,1%		32,7%	
	Other	0	1	0	0		1	
		0,0%	4,3%	0,0%	0,0%		2,0%	
	Total	10	23	9	7		49	
		100,0%	100,0%	100,0%	100,0%		100,0%	
	45-54 years	Muslims	1	2		0		3
			100,0%	50,0%		0,0%		42,9%
Catholics		0	0		1		1	
		0,0%	0,0%		50,0%		14,3%	
Pentecostals		0	1		1		2	
		0,0%	25,0%		50,0%		28,6%	
Protestants		0	1		0		1	
		0,0%	25,0%		0,0%		14,3%	
Total		1	4		2		7	
		100,0%	100,0%		100,0%		100,0%	
>55 years	Muslims	0	0	2			2	
		0,0%	0,0%	100,0%			50,0%	
	Catholics	0	1	0			1	
		0,0%	100,0%	0,0%			25,0%	
	Protestants	1	0	0			1	
		100,0%	0,0%	0,0%			25,0%	
	Total	1	1	2			4	
		100,0%	100,0%	100,0%			100,0%	

Table 7.
Religion/age and socio-economic activities.

will not only be stable, it will also progress, that is when they are about 25–54. However, when they are old, their socio-economic activities will dwindle.

As for the Catholics when they set up a socio-economic activity, the activity will significantly be either slightly progressive, and mostly regressive or instable. Those at middle age have mostly regressing activities and those above 54 have stable activities.

As for Pentecostals, their youth significantly have stable and instable socio-economic activities meaning that only half of the activities that they set up at this age succeed and the activities set up by those who are about 25–34 and 35–44 years are either significantly progressing or regressive or instable. Those in the middle age have activities that are regressing and they decide to abandon them when they get older.

Animists usually set up progressing socio-economic activities when they are about 15–24 years old when they reach 25–34 year old the activity becomes stable

but in their middle age the activity will either be significantly stable or regressive. Most often, they hardly continue the activities as they get older.

The Protestants do have significantly progressive and regressive activities when they are about 15–24 years old. Although when they are about 25–34, their activities become either regressive and instable, they put in an effort when they are about 35–44 and it becomes significantly either stable and instable. It is worth-noting that it progresses when they get older. The difference that the internally migrated Protestants made is that they do not give up their activities like the animists do, neither do their activities regress like for the Muslims who start up very well but relax as they get older and their activity regresses, neither are they like the Catholics who have stable activities rather theirs make progress. However, despite these differences, there is no correlation between age/Religion and socio-economic activities.

Table 8 shows that for all the age groupings, there is no significant relationship.

4.3 Religion and income

In this section we examine whether internally migrated people’s level of integration and socio-economic stability influence the amount they earn per month. Then we consider the age/gender structure of religion influence on the income that people earn in the city of Douala.

The below table (**Table 9**) shows that the Muslims and the Protestants significantly earn the highest income in the town of Maroua. This is not surprising especially for the Muslims because as compared to the other religious denominations, the Muslims significantly have stable socio-economic activities. Equally, they are well-integrated in Maroua and live in solidarity with the natives of the town probably because Maroua is predominantly a Muslim community. Equally what is interesting about the Protestants is their resistance in socio-economic activities because as the others abandon their activities or their activities regress or become instable, the Protestants put in more efforts and his socio-economic activities flourishes. The difference between the two is that the Protestants only slightly earn higher whereas the Muslims make a stronger impact significantly. Furthermore, the Protestants also alongside with the animist significantly earn the lowest salary. This is because their activities fluctuate between stability and instability. That is among them, one can find people who significantly have stable activities and equally people who have unstable jobs.

The Pentecostals and the Catholics are significantly middle income earners. However, Pentecostals earn more than the Catholics because the Catholics also significantly earn lower salary than the Pentecostals. This is because the Catholics significantly have regressive and unstable activities although they are significantly civil servants. Those who have a major salary deficiency are the animists who significantly earn the lowest salary. It is worth-noting that the Catholics, animists

Respondents' age		Value	df	Asymp. Sig. (2-sided)
15–24 years	Pearson Chi-Square	9,459 ^b	16	,893
25–34 years	Pearson Chi-Square	13,148 ^c	12	,358
35–44 years	Pearson Chi-Square	16,950 ^d	15	,322
45–54 years	Pearson Chi-Square	5,542 ^e	6	,476
> 55 years	Pearson Chi-Square	8,000 ^f	4	,092

Table 8.
Different Levels of Asymptotic 2-sided significance.

Religion	Migrants' monthly earnings							Total	
	<37 000F	38 000-87 000F	88 000F- 138 000F	139 000- 189 000	190 000- 240 000	250 000- 300 000	310 000- 360 000		>370 000
Muslims	28	13	8	2	1	5	2	1	60
	25,9%	38,2%	34,8%	15,4%	11,1%	41,7%	40,0%	25,0%	28,8%
Catholics	27	9	8	5	3	3	1	1	57
	25,0%	26,5%	34,8%	38,5%	33,3%	25,0%	20,0%	25,0%	27,4%
Pentecostal	9	1	2	2	3	0	0	0	17
	8,3%	2,9%	8,7%	15,4%	33,3%	0,0%	0,0%	0,0%	8,2%
Animists	4	1	0	0	0	0	0	0	5
	3,7%	2,9%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	2,4%
Protestants	40	10	5	4	2	4	2	1	68
	37,0%	29,4%	21,7%	30,8%	22,2%	33,3%	40,0%	25,0%	32,7%
Others	0	0	0	0	0	0	0	1	1
	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	25,0%	0,5%
Total	108	34	23	13	9	12	5	4	208
	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 9.
Religion and monthly income.

and the Pentecostals have a conflicting relation with the native (Pearson Chi-Square: Value = 71,984^a Diff = 35, Asymp Sig. (2-sided) = .000).

The Protestants male significantly earn very high salary significantly above 370, 000frs CFA certainly due to their resistance in business as seen above. More so, the Catholic men significantly earn the second highest salary followed by the Muslim males. Therefore although the Muslims are much more integrated in Maroua, and they have stable and progressing activities, they do earn as much as the Catholics and the Protestants who are less integrated like them. However, more Catholic men than Muslim are civil servants.

This is puzzling because the Muslims have a stable and progressive job as compared to the other groups. The Pentecostals do not earn as high as the Muslims and those with the least earned incomes are animists. **Table 10** shows a huge income inequality among the various religious denominations and especially among the Catholics with the highest number of significant levels. Income inequality is found among the Protestants. The income inequality among the Muslims and the Pentecostals is lower than among the Catholics and the Protestants. The animist have the lowest income inequality because the earn the lowest too.

About 11.8%, 27.4%, 13.6%, 0%, 10.5%, of Muslims, Catholics, Pentecostals, animists and Protestants are civil servants while 13.2%, 4.8%, 4.5%, 0%, 13.2% of Muslims, Catholics, Pentecostals, animists and Protestants are business men. What is interesting here is that Catholics are not significantly business men but they significantly earn more than Muslims and that less Protestants work in the civil service but significantly earn more than the Catholics and the Muslims. Therefore, we can infer that the Protestants have a more business acumen than the Muslims and that the civil service pays better than business when one lacks business skills.

Sex	Religion	Migrants' monthly income										Total	
		<37 000F	38 000-87 000F	88 000F- 138 000F	139 000-189 000	190 000-240 000	250 000-300 000	310 000-360 000	>370 000				
Men	Muslims	21	13	7	2	1	5	1	1	1	51		
		28,4%	59,1%	53,8%	25,0%	25,0%	55,6%	33,3%	33,3%	33,3%	37,5%		
	Catholics	17	5	3	2	1	1	1	0	0	30		
		23,0%	22,7%	23,1%	25,0%	25,0%	11,1%	33,3%	0,0%	0,0%	22,1%		
	Pentecostal	7	0	1	1	1	0	0	0	0	10		
		9,5%	0,0%	7,7%	12,5%	25,0%	0,0%	0,0%	0,0%	0,0%	7,4%		
	Animists	3	1	0	0	0	0	0	0	0	4		
		4,1%	4,5%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	2,9%		
	Protestants	26	3	2	3	1	3	1	1	1	40		
		35,1%	13,6%	15,4%	37,5%	25,0%	33,3%	33,3%	33,3%	33,3%	29,4%		
Women	Other	0	0	0	0	0	0	0	0	1	1		
		0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	33,3%	0,7%		
	Total	74	22	13	8	4	9	3	3	136			
		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%		
	Muslims	7	0	1	0	0	0	1	0	0	9		
		20,6%	0,0%	10,0%	0,0%	0,0%	0,0%	50,0%	0,0%	0,0%	12,5%		
	Catholics	10	4	5	3	2	2	0	1	1	27		
		29,4%	33,3%	50,0%	60,0%	40,0%	66,7%	0,0%	100,0%	100,0%	37,5%		
	Pentecostal	2	1	1	1	2	0	0	0	0	7		
		5,9%	8,3%	10,0%	20,0%	40,0%	0,0%	0,0%	0,0%	0,0%	9,7%		

Sex	Religion	Migrants' monthly income										Total	
		<37 000F	38 000-87 000F	88 000F- 138 000F	139 000-189 000	190 000-240 000	250 000-300 000	310 000-360 000	>370 000				
	Animists	1	0	0	0	0	0	0	0	0	0	0	1
		2,9%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	1,4%
	Protestants	14	7	3	1	1	1	1	1	1	1	0	28
		41,2%	58,3%	30,0%	20,0%	20,0%	20,0%	33,3%	50,0%	50,0%	50,0%	0,0%	38,9%
	Total	34	12	10	5	5	5	3	2	1	1	1	72
		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

Table 10.
 Gender/religion and monthly income.

Among the women we discovered that the Muslim and Protestants women earn the highest income followed by the Catholics and then Pentecostals and as usual animists earn the lowest income among the internally migrated people in Maroua. Also interestingly, there is a significant huge income gap between the Muslim women, followed by Protestant women because they significantly earn the highest and the lowest salary as well and then Catholic and Pentecostal women and lastly women who are animists. Compared to the men (Pearson Chi-Square: Value = 63,026^b Diff = 35, Asymp Sig. (2-sided) = .003) the income inequality among the men is much higher than that among women (Pearson Chi-Square: Value = 21,859^c Diff = 28, Asymp Sig. (2-sided) = .788).

Table 11 below indicates that young Muslims significantly earn very high income (they significantly earn 250 000–300 000) distinguishing themselves from the youth of the other religious groupings and they are followed far behind by the Protestants (who significantly earn 139,000–189, 000). Young Pentecostals significantly earn 88 000frs- 138 000frs. The Catholic youth significantly earn between 38 000–87 000frs while the animists earn below 37,000frs CFA. Compared to the other youth, there is a high income inequality among Muslims than among the other age groups.

Between 25 and 34, there is no significant change in what young Muslims earn as compared to those who are much younger. Those who make a major change are the Catholics who significantly earn higher than the Muslims adolescents significantly followed by the Muslims and Protestants. There is also change with Pentecostals who significantly are middle income earners and the animists significantly earn the lowest salary. We also noticed that there is a significant income inequality among the Protestants followed by the Protestants and the Catholics.

As the Muslims reach adulthood, they significantly make more money than the other religious denomination. They do not significantly earn low salary as compared to the other religious groupings. It is interesting to note that the Pentecostals and the animists stagnate while the Muslims make leaps ahead of them. We equally noticed a high income gap between the Muslims, Catholics and Protestants. A major change takes place among the youth when they are 45–54 years old, the income of the internally migrated Muslims and Catholics drastically significantly decline while that of the Pentecostals and Protestants increased. Older Muslims and Catholics earn basically very low income unlike the Protestants who earn very high salary.

Table 12 shows that there is no significant relationship among the various age groupings and income. Therefore age does not play any significant role to influence income difference.

4.4 Theoretical implication

Here we use the concept of social capital developed by Pierre Bourdieu [23] to analyze our results. According to him, social capital is the total of actual or personal assets which are related to having a long-lasting network of more or less institutionalized relationship of mutual acquaintance and identification –or in other words to membership in a group which offers each of its members with the support of the collectivity-owned capital a qualification which make them eligible to credit in the various senses of the word. Therefore, social capital refers to individuals' networks, the social relationships and alliances that attach them in all kinds of direct as well as indirect and informal ways to opportunities that can improve their stock of capital (whether economic, social or cultural capital or any combination thereof).

Fulani (Peuhl) ethnic group is mostly made up of Muslims and they live primarily in the northern Francophone regions. We discovered that if one is a Muslim, the more one will maintain a good relationship with ones neighbors and one will

Age	Religion	Migrants' Monthly Income										Total	
		<37 000F	38 000-87 000F	88 000F- 138 000F	139 000-189 000	190 000-240 000	250 000-300 000	310 000-360 000	>370 000				
15-24	Muslims	13	5	2	0	0	1						21
		28,9%	55,6%	66,7%	0,0%	0,0%	100,0%						35,6%
	Catholics	4	3	0	0	0	0						7
		8,9%	33,3%	0,0%	0,0%	0,0%	0,0%						11,9%
	Pentecostal	5	0	1	0	0	0						6
		11,1%	0,0%	33,3%	0,0%	0,0%	0,0%						10,2%
	Animists	2	0	0	0	0	0						2
		4,4%	0,0%	0,0%	0,0%	0,0%	0,0%						3,4%
	Protestants	21	1	0	1	0	0						23
		46,7%	11,1%	0,0%	100,0%	0,0%	0,0%						39,0%
	Total	45	9	3	1	1	1	100,0%	100,0%	100,0%	100,0%	100,0%	59
25-34	Muslims	10	6	4	0	0	1						22
		25,0%	37,5%	36,4%	0,0%	0,0%	16,7%						25,3%
	Catholics	16	3	4	4	1	3						32
		40,0%	18,8%	36,4%	57,1%	25,0%	50,0%						36,8%
	Pentecostal	2	0	1	1	2	0						6
		5,0%	0,0%	9,1%	14,3%	50,0%	0,0%						6,9%
	Animists	0	1	0	0	0	0						1
		0,0%	6,2%	0,0%	0,0%	0,0%	0,0%						1,1%
	Protestants	12	6	2	2	1	2						26
		30,0%	37,5%	18,2%	28,6%	25,0%	33,3%						29,9%

Age	Religion	Migrants' Monthly Income										Total
		<37 000F	38 000-87 000F	88 000F- 138 000F	139 000-189 000	190 000-240 000	250 000-300 000	310 000-360 000	>370 000			
	Total	40	16	11	7	4	6	2	1	87		
		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
35-44 years	Muslims	2	2	1	1	1	3	1	1	12		
		11,1%	22,2%	14,3%	33,3%	25,0%	60,0%	50,0%	50,0%	50,0%	24,0%	
	Catholics	5	3	3	1	2	0	1	0	15		
		27,8%	33,3%	42,9%	33,3%	50,0%	0,0%	50,0%	0,0%	30,0%		
	Pentecostal	2	1	0	0	0	0	0	0	3		
		11,1%	11,1%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	6,0%		
	Animists	2	0	0	0	0	0	0	0	2		
		11,1%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	4,0%		
	Protestants	7	3	3	1	1	2	0	0	17		
		38,9%	33,3%	42,9%	33,3%	25,0%	40,0%	0,0%	0,0%	34,0%		
	Other	0	0	0	0	0	0	0	1	1		
		0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	50,0%	2,0%		
	Total	18	9	7	3	4	5	2	2	50		
		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
45-54 years	Muslims	1		1	1	0				3		
		100,0%		50,0%	50,0%	0,0%				42,9%		
	Catholics	0		1	0	0				1		
		0,0%		50,0%	0,0%	0,0%				14,3%		
	Pentecostals	0		0	1	1				2		
		0,0%		0,0%	50,0%	100,0%				28,6%		

Age	Religion	Migrants' Monthly Income							Total	
		<37 000F	38 000-87 000F	88 000F- 138 000F	139 000-189 000	190 000-240 000	250 000-300 000	310 000-360 000		>370 000
	Protestants	0	0	0	0	0	0	0	1	1
		0,0%		0,0%	0,0%	0,0%	0,0%	0,0%	100,0%	14,3%
	Total	1	2	2	2	1	1	1	1	7
		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
> 55 years	Muslims	2						0	0	2
		50,0%						0,0%	0,0%	40,0%
	Catholics	2						0	0	2
		50,0%						0,0%	0,0%	40,0%
	Protestants	0						1	1	1
		0,0%						100,0%	100,0%	20,0%
	Total	4						1	1	5
		100,0%						100,0%	100,0%	100,0%

Table 11.
 Age/religion and monthly income.

Respondents' Age		Value	Df	Asymp. Sig. (2-sided)
15–24 years	Pearson Chi-Square	16,689 ^b	16	,406
25–34 years	Pearson Chi-Square	28,969 ^c	28	,414
35–44 years	Pearson Chi-Square	40,739 ^d	35	,233
45–54 years	Pearson Chi-Square	13,417 ^e	12	,339
>55 years	Pearson Chi-Square	5,000 ^f	2	,082

Table 12.
Age/religion and monthly income level of Asymptotic 2-sided significance

also practice a relationship of solidarity with them. Furthermore, we discovered that Muslims have a stable and progressing business unlike the Catholics who have a regressing and instable economic activities. This certainly is because, if one is a Muslim, the more one will maintain a good relationship with ones neighbors and one will also practice a relationship of solidarity. That of the Catholics regress because their social inclusion is not as smooth as that of Muslims because Catholics do not only have a good neighborly relationship with natives but also a conflicting one too which certainly hampers their business activities. Therefore since Maroua has a strong Muslim community, therefore other Muslim migrating to Maroua readily find a network because he can easily integrated in the predominant belief system which is the Islamic faith and as such they are easily integrated unlike those who are Catholics. That is why the Muslims immigrants hardly have any conflict with their neighbors unlike those from other religious denominations. The Muslims benefit from a social capital that the other do not have and consequently these Muslim migrants earn higher than the other immigrants of other denominations.

Elco van Burg [24] show that Protestant entrepreneurs have a stronger belief than employees that their work is a calling from God and that they have as a duty to add value to society through their work which better fit entrepreneurship than wage work. Equally, [25], established that US entrepreneurs are more likely to see God as personal and to pray, although they did not find differences in religious affiliation, belief in God, or religious service attendance between entrepreneurs and non-entrepreneurs. All these are related to Weber's thesis (1930) [26] that Protestantism positively affects economic behavior.

Equally in this work we found out that The Protestants do have significantly progressive and regressive activities when they are about 15–24 years old. Although when they are about 25–34, their activities become either regressive and instable, they put in an effort when they are about 35–44 and it becomes significantly either stable and instable. It is worth-noting that it progresses when they get older. The difference that the internally migrated Protestants made is that they do not give up their activities like the animists do, neither do their activities regress like for the Muslims who start up very well but relax as they get older and their activity regresses, neither are they like the Catholics who have stable activities rather theirs make progress. They resist in business, they do not give up like the others despite their very difficult starting.

5. Conclusion

The major objective of this chapter was to find out how the religious affiliations of the population that have migrated and settled in Maroua for varied reasons influence either their exclusion or inclusion in the socio-economic activities of

Maroua. We also set out to find how the sex-age structure of religion influences participants' integration and socio-economic activities.

We discovered that if one is a Muslim, the more one will maintain a good relationship with ones neighbors and one will also practice a relationship of solidarity with them. Equally, if one is a Catholic, one will have a good neighborly and conflicting relationship with ones neighbors. Pentecostals significantly maintain a professional and conflicting relationship with their neighbors. The animists on their part either have a conflicting relationship or no relationship with their neighbors and finally the Protestants maintain either normal relations with their neighbors or a purely professional one. Therefore, Pentecostals, animists and Catholics have conflicting relationship with their neighbors.

As a result, Muslims have a stable and progressing business unlike the Catholics who have a regressing and instable economic activities in the town of Maroua. This certainly is because, if one is a Muslim, the more one will maintain a good relationship with ones neighbors and one will also practice a relationship of solidarity. That of the Catholics regress because their social inclusion is not as smooth as that of Muslims because Catholics do not only have a good neighborly relationship with natives but also a conflicting one too which certainly hampers their business activities.

Although Pentecostals do not significantly have a good relationship with the natives, they slightly have progressing socio-economic activities but their economic activities are to a greater extent significantly unstable. However, Pentecostals significantly maintain a professional and conflicting relationships which certainly affect their economic activities. Animists and Protestants have economic activities which are averagely doing well because they significantly have businesses that are stable and regressing. Then we draw the following conclusion from the table: if one is a Muslim, one will have a stable and progressing business because one is well-integrated in the town of Maroua. If one is not well-integrated in the town of Maroua, hardly will one have a well-established economic activity like the Catholics.

Muslims and Protestants significantly earn the highest income in the town of Maroua. This is not surprising especially for the Muslims because as compared to the other religious denominations, the Muslims significantly have stable socio-economic activities. Equally, they are well-integrated in Maroua and live in solidarity with the natives of the town probably because Maroua is predominantly a Muslim community. Equally what is interesting about the Protestants is their resistance in socio-economic activities because as the others abandon their activities or their activities regress or become instable, the Protestants put in more efforts and his socio-economic activities flourishes. The difference between the two is that the Protestants only slightly earn higher whereas the Muslims significantly make a stronger impact. Furthermore, the Protestants also alongside with the animists significantly earn the lowest salary. This is because their activities fluctuate between stability and instability. That is among them, one can find people who significantly have stable activities and equally people who have unstable jobs.

The Pentecostals and the Catholics are significantly middle income earners. However, Pentecostals earn more than the Catholics because the Catholics also significantly earn lower salary than the Pentecostals. This is because the Catholics significantly have regressive and unstable activities although they are significantly civil servants. Those who have a major salary deficiency are the animists who significantly earn the lowest salary. It is worth-noting that the Catholics, animists and the Pentecostals have a conflicting relation with the native.

Those who significantly have conflicting relationship among the Pentecostals, are younger people between 15 and 24 year. Just like the Catholics, they practice

more solidarity when they become old. The age and religion of a migrant play an important part in his or her social integration in a community. Generally, there is a very significant relationship between age, religion and relationship with ones neighbors.

The Protestants do significantly have progressive and regressive activities when they are about 15–24 years old. Although when they are about 25–34, their activities become either regressive and unstable, they put in an effort when they are about 35–44 and it becomes significantly either stable and instable. It is worth-noting that it progresses when they get older. The difference that the internally migrated Protestants made is that they do not give up their activities like the animists do, neither do their activities regress like for the Muslims who start up very well but relax as they get older and their activity regresses, neither are they like the Catholics who have stable activities rather theirs make progress. However, despite these differences, there is no correlation between age/Religion and socio-economic activities.

Muslims significantly make more money when they reach adulthood than the other religious denomination. They do not significantly earn low salary as compared to the other religious groupings. It is interesting to note that the Pentecostals and the animists stagnate while the Muslims make leaps ahead of them. We equally noticed a high income gap between the Muslims, Catholics and Protestants. A major change takes place among the youth when they are 45–54 years old, the income of the internally migrated Muslims and Catholics drastically significantly decline while that of the Pentecostals and Protestants increased. Older Muslims and Catholics earn basically very low income unlike the Protestants who earn very high salary.

Generally internally migrated women decide not to have any contacts with the natives who are their neighbors and this is significantly so with the Catholic women, Pentecostal women and women who are animists. Generally, men have a conflictual relationship with their neighbors significantly men who are Pentecostals and animists. Muslims generally practice solidarity whether men or women. Women seem to diversify their relationship with their native neighbours than men significantly Catholic and Pentecostals women. While Catholic women significantly have good relation with the natives, Pentecostals women significantly practice solidarity with them. It is worth noting that all although Catholic women significantly have good relationship with the natives, they also significantly have a very difficult relation with them because they significantly are in conflict with them or may significantly decide not to contact the natives. There is a very significant relationship between the gender of a religious person and their social relationship with their neighbors.

Contrarily to the Muslims, animists and Protestants where the female Muslims economic activities strive better than that of the male, it is instead the economic activities of the male Pentecostals that are doing better because their activities are significantly progressing and instable while that of female Pentecostals are regressing and unstable. Therefore the economic activities of Pentecostal males are better than Pentecostal female. They are also somehow significantly regressing when the males are singled out from the females while the female Muslims seem to significantly have flourishing socio-economic activities. This is not so with the Catholics where both male and female Catholics significantly have regressing and unstable economic activities.

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Age at First Marriage of Women in Bangladesh: Levels, Trends and Determinants

Mohammad Salim Zahangir and Mosammat Zamilun Nahar

Abstract

Age at first marriage is an important demographic event affecting births, deaths, and women's and children's health. This study aims to explore the levels, trends and determinants of age at first marriage of women in Bangladesh. This study utilized data from the 2014 Bangladesh Demographic and Health Survey. The univariate (some basic statistics), bivariate (simple cross-tabulation and χ^2 -test) and multivariate (analysis of covariance, multiple classification analysis and binary logistic regression) techniques were adopted to analyze the data. Age of women at first marriage in Bangladesh has been increasing over time, while the pace is sluggish. Respondent's education has a strong positive effect on age at marriage. Women with a higher level of education are more likely to get delayed marriage. Current age, religion, region, place of residence and husband's education are also influential factors affecting age at marriage. Wealth index is partially significant, that is, women from households with economically poor status are significantly more likely to marry early than those from affluent households. The change in age at marriage is associated with major social structural changes such as women's educational attainment and urbanization process.

Keywords: age at first marriage, Bangladesh, statistical methods

1. Introduction

Marriage is an important social institution, especially in a society like Bangladesh, where without marrying men and women cannot engage in sex and maintain their intimate sexual and familial relations [1–6]. This indicates that age at marriage is the prime issue to grow the marital relationship. Age at marriage symbols the transition to adulthood in many societies. It is the point at which certain options in education, employment, and contribution to society are prohibited and the initiation of regular exposure to the risks of pregnancy and childbearing [7]. Girls who marry early achieve lower education, have lower social status in their husbands' families, report less reproductive control, suffer higher rates of maternal mortality and morbidity, and experience domestic violence [8–14]. Early marriage is associated with poor sexual and reproductive health. Child brides are often inept to negotiate safe sex with their husbands, making them more vulnerable to sexually transmitted infections, including HIV, and putting them at higher risk of early pregnancy [15, 16]. Moreover, early married women have, on average, a longer

reproductive span leading to higher completed fertility and rapid population growth [9, 17, 18].

Conversely, women marrying after the age of 18 (called late marriage: authors' definition in the contexts of Bangladesh) can achieve a higher level of schooling, develop career interests and participate more in the workforce as skilled personnel. These achievements and interests may, in turn, stimulate women to limit family size or expand the spacing of birth [19, 20]. Late marriage reduces the period of childbearing, resulting in lower completed fertility. Several studies noticed that age at marriage associated with major structural changes in society [21–25]. For example, late marriage emerges in new roles for teenagers. Moreover, late married women experience relatively lower rates of malnutrition, isolation, and depression [26, 27] than women who marry early, in part due to intimate partner violence [28, 29].

Marriage is almost universal in Bangladesh. The country has one of the world's highest rates of early marriage [30]. Field [17] reported that more than 70% of first marriages occur within 2 years of menarche in Bangladesh. According to UNICEF [31], 52% of Bangladesh girls get married before their 18th birthday. The number is remarkably high yet. However, a significant decrease is perceived since 2000, when the amount was 65%. This indicates that Bangladesh has made some progress in reducing early marriage. The problem is, in the early 2017s, the government of Bangladesh passed a law that would allow for child marriage to occur in “special circumstances”. That is, with parental consent and with permission from the courts “the best interested of the underage female or male” can be married, while the minimum age at marriage (18 for women and 21 for men) did not change. This new child marriage law in Bangladesh may swing in the wrong direction.

The existing literature on marriage in Bangladesh focuses mainly on early/child marriage or on similar specific topics (see, [30, 32–45]). An overall discussion on age at first marriage in Bangladesh is available in [37]. Due to major social structural changes in Bangladesh, the current situation raises a question comprising a complete idea about the practice of marriage. This study aims to explore the levels, trends and determinants of age at first marriage of women in Bangladesh.

2. Levels and trends of age at marriage: BDHS 1993/94–2014

The Demographic and Health Survey (DHS) is a nationwide household survey in developing countries offering data for a wide range of monitoring and impact assessment indicators in the areas of population, health, and nutrition. Bangladesh is under the global DHS program. By 2014, the DHS has conducted seven surveys in Bangladesh, in 1993/94, 1996/97, 1999/2000, 2004, 2007, 2011, and 2014. In this section, all seven datasets are used to estimate the mean age at first marriage of women in Bangladesh. **Figure 1** represents the mean age at first marriage of women aged 15–49 years based on survey years from 1993/94 to 2014.

According to the first survey conducted in 1993/94, the mean age of women at first marriage was about 14.25 years; it was narrowly decreased in 1996/97 (about 14.16 years). Researchers claimed that 95% of girls' menarche happens at an average of 13.5 ± 1.0 years of age [53, 54]. That is, until 1997, women got married around the age of puberty. The mean age at marriage was significantly increased, nearly 0.75 years, in 1999/2000. It was almost the same from 1999/2000 to 2004 (about 15 years). Later, it was increased about a half-year in 2007. This increasing trend has been continued and reached 15.86 years in 2014.

Table 1 represents the percentage of never-married women by age groups, obtained from different (BDHS) surveys from 1993/94 to 2014. The proportion of

women who get late marriage will increase if the proportion of never-married women increases in consecutive surveys. It shows an increasing trend in the proportion of never-married women aged 15–19 in 1993/94–2014. With some fluctuations, this proportion has also been increased among women aged 20–24, 25–29 and 30–34 years. Overall, the proportion of never-married women has been increased over the years, while the amount of increase is not too high. Both **Figure 1** and **Table 1** designate that age at first marriage of Bangladeshi women has been slowly but steadily increasing.

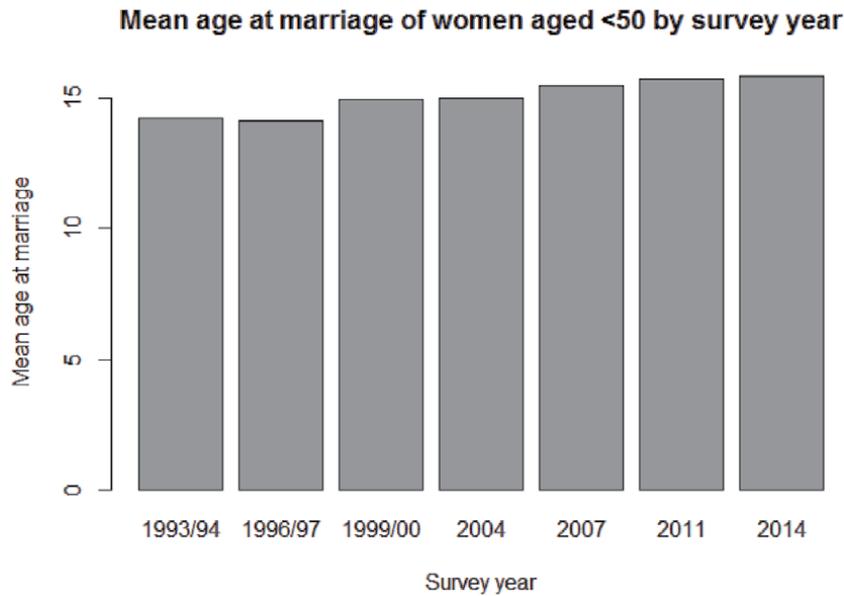


Figure 1. Mean age at first marriage of women aged <50 by survey years, BDHS 1993/94–2014. Sources: 1993–1994 Bangladesh demographic and health survey (BDHS) [46]; 1996–1997 BDHS [47]; 1999–2000 BDHS [48]; 2004 BDHS [49]; 2007 BDHS [50]; 2011 BDHS [51]; 2014 BDHS [52].

Age	BDHS 1993–1994	BDHS 1996–1997	BDHS 2000	BDHS 2004	BDHS 2007	BDHS 2011	BDHS 2014
10–14	95.2	95.2	92.7	88.6	—	—	—
15–19	50.5	49.8	51.9	52.1	52.8	54.3	54.8
20–24	12.4	17.2	18.5	15.2	14.3	13.4	15.5
25–29	2.2	3.4	4.2	4.2	4.3	3.0	4.1
30–34	0.3	0.5	0.1	1.2	0.6	1.2	1.2
35–39	0.3	0.0	0.2	0.4	0.6	0.8	0.8
40–44	0.7	0.0	0.0	0.3	0.2	0.3	0.6
45–49	0.2	0.0	0.0	0.0	0.8	0.2	0.2

Sources: 1993–1994 Bangladesh Demographic and Health Survey (BDHS) ([46]:72); 1996–1997 BDHS ([47]:82); 1999–2000 BDHS ([48]:78); 2004 BDHS ([49]:93); 2007 BDHS ([50]:77); 2011 BDHS ([51]:49); 2014 BDHS ([52]:40).

Table 1. Percentage of never married women in Bangladesh by current age, BDHS 1993–2014.

3. Data, variables and methods

3.1 Source of data

This study uses the data from the Bangladesh Demography and Health Survey (BDHS) conducted in 2014. BDHS is a nationally representative and retrospective survey, collected information on marriage, fertility, family planning, maternal and child health, and information about HIV/AIDS. A total of 17,863 ever-married women aged 15–49 were successfully interviewed. Of those, this study engaged women who are 20 or higher ages. That is, this study considered a sample of size 15,840. A detailed description of the survey is available in the report book, prepared by the Ministry of Health and Family Welfare's National Institute of Population Research and Training [52].

3.2 Variables and methods

“Age at first marriage” is the dependent variable in this study. It is reported by ever-married women during the survey and measured in terms of completed years. In **Table 1**, over 50% of women aged 15–19 had never married. Thus, women aged 15–19 are not included in this study as they may give a bias result. The explanatory variables (covariates) are chosen based on existing literature on age at marriage of women in Bangladesh and other developing countries and the availability of data. The covariates are current age (20–29, 30–39 and 40–49), religion (Muslim and non-Muslim), place of residence (urban and rural), region of residence (Barisal, Chittagong, Dhaka, Khulna, Rajshahi, Rangpur and Sylhet), respondent's and husband's education (illiterate, primary, secondary and higher secondary), wealth index (poor, middle and rich) and access to mass media (no access and has access). It should be noticed that access to mass media is the combination of three factors such as frequency of reading newspaper, listening to radio and watching TV.

This paper reviews the use of descriptive statistics to describe the age at first marriage of women aged 20 or more. The chi-square test for independence of attributes is applied to observe the association between age at marriage and each of selected covariates. To identify the determinants of age at marriage and to assess the effects of determinants more splendidly, the analysis of covariance (ANCOVA) and multiple classification analysis (MCA) techniques are sequentially employed to the data. Finally, a binary logistic regression technique is applied to inspect the accountability of covariates to early/late marriage. This technique is repeated three times. Model 1 includes the current age only. Model 2 is used to obtain the net effect of current age on age at marriage after controlling all other covariates. Model 3 is used to examine the effect of education on age at marriage over time.

4. Results

4.1 Trends in age at marriage of women aged 20–49: Univariate analysis

Table 2 represents some descriptive statistics of age at first marriage of women ages 20–29, 30–39 and 40–49 years. The modal value (Mo) exposes that the prevalence of marriage among women aged 30 or more is the highest at age 13 and that of women aged 20–29 is 16. Besides, the values of mean (\bar{X}), median (Me), first quartile (Q_1) and third quartile (Q_3) indicate that women aged 20–29 are rather delayed married than women aged 30 or more.

Age at survey (in years)	\bar{X}	Me	Mo	Q_1	Q_3	SD	β_1	β_2	N
20–29	16.25	16	16	14	18	2.80	0.80	1.01	6504
30–39	15.91	15	13	14	17	3.24	1.66	4.94	5352
40–49	15.46	15	13	13	17	3.24	2.12	10.27	3984

Table 2.
 Descriptive statistics of age at first marriage of women by current age, BDHS 2014.

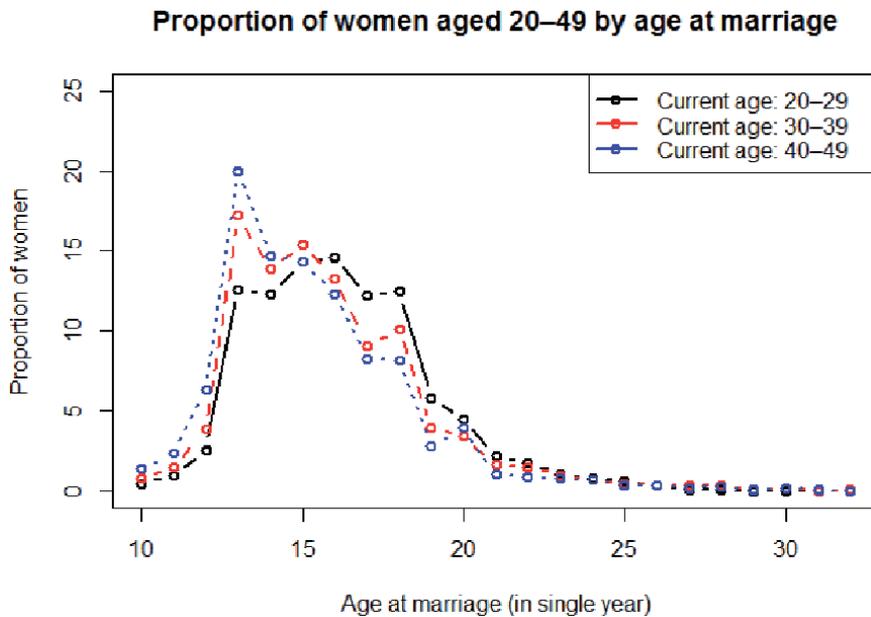


Figure 2.
 Proportion of women aged 20–49 based on age at marriage, BDHS 2014.

The values of β_1 and β_2 in **Table 2** and the curves in **Figure 2** assign that the frequency distribution of age at first marriage of women for all three age groups/cohorts is positively skewed, while the curve obtained by the younger cohort (women aged 20–29) is less skewed than that of older cohorts (women aged 30–39 and 40–49). That means the practice of early marriage among the younger cohort is not as frequent as in older cohorts.

4.2 Differentials of age at marriage of women aged 20–49: Bivariate analysis

The legal age of women at first marriage is 18 years in Bangladesh, while the parliament of government has approved a new law called ‘Child Marriage Restraint Act 2017’, which allows girls under 18 to marry through parental consent and with permission from the courts. Hence, women marrying at age 18 or later is called the mature or late marriage. The response variable ‘age at first marriage’ is classified as <18 and ≥ 18 years to observe the prevalence of late/early marriage among women aged 20–29, 30–39 and 40–49 by some selected covariates. The χ^2 -test for independent of attributes (results are not shown) suggests that the covariates are significantly associated with age at marriage. **Table 3** represents the percentage and the mean difference of nuptial age among women aged 20–29, 30–39 and 40–49 years.

Covariates	Percentage at marriage of women age				Mean age at marriage of women age				Increase in mean age
	20-29 (2)	30-39 (3)	40-49 (4)	40-49 (7)	20-29 (5)	30-39 (6)	40-49 (7)	(8) = (5)-(6)	
<i>Religion</i>									
Muslim	29.2	23.6	18.7	15.31	16.18	15.80	15.31	0.38	0.49
Non-Muslim	36.4	35.2	33.8	16.65	16.93	16.84	16.65	0.09	0.19
<i>Region of residence</i>									
Barisal	28.4	21.4	18.3	15.42	16.19	15.73	15.42	0.46	0.31
Chittagong	35.6	29.2	24.2	15.77	16.74	16.11	15.77	0.63	0.34
Dhaka	32.5	28.9	22.4	15.61	16.38	16.15	15.61	0.23	0.54
Khulna	22.8	18.7	15.9	15.00	15.77	15.49	15.00	0.28	0.49
Rajshahi	21.3	20.9	14.1	14.95	15.72	15.60	14.95	0.12	0.65
Rangpur	21.6	17.8	15.3	15.01	15.56	15.44	15.01	0.12	0.43
Sylhet	44.9	36.5	36.7	16.86	17.29	16.87	16.86	0.42	0.01
<i>Type of place of residence</i>									
Rural	26.3	20.6	16.4	15.08	16.00	15.56	15.08	0.44	0.48
Urban	36.6	33.0	27.5	16.14	16.72	16.57	16.14	0.15	0.43
<i>Respondent's education</i>									
Illiterate	19.6	13.0	13.6	14.75	15.27	14.83	14.75	0.44	0.08
Primary	19.1	16.4	16.4	15.04	15.42	15.10	15.04	0.32	0.06
Secondary	29.2	30.4	29.1	16.45	16.30	16.45	16.45	-0.15	0.00
Higher secondary	75.5	80.4	77.6	21.22	19.55	21.00	21.22	-1.45	-0.22
<i>Husband's education</i>									

Covariates	Percentage at marriage of women age			Mean age at marriage of women age			Increase in mean age
	20-29	30-39	40-49	20-29	30-39	40-49	
Illiterate	18.2	14.0	13.6	15.35	14.96	14.75	0.39
Primary	22.2	18.4	15.7	15.72	15.28	15.02	0.44
Secondary	31.9	28.7	21.6	16.38	16.18	15.61	0.20
Higher secondary	58.4	55.6	47.5	18.44	18.84	18.18	-0.40
<i>Access to mass media</i>							
No	20.7	16.9	13.8	15.60	15.22	14.85	0.38
Yes	34.3	29.7	25.3	16.57	16.34	15.92	0.23
<i>Wealth index</i>							
Poor	18.8	15.9	13.9	15.50	15.18	14.80	0.32
Middle	30.5	22.5	17.6	16.23	15.66	15.16	0.57
Rich	47.4	43.1	35.8	17.58	17.50	17.06	0.08
Total	29.8	24.8	20.4	16.25	15.91	15.46	0.34

Table 3.
 Percentage and mean age at first marriage of women aged 20-49 years by socio-cultural factors, BDHS 2014.

Considering few exceptions, the practice of delayed marriage by each covariate is more prevalent among women aged 20–29 than those who are aged 40–49 and 30–39 as well. Overall, the prevalence of marriage at 18 or later ages is about 30%, 25% and 20% among women aged 20–29, 30–39 and 40–49, respectively.

When age at first marriage of women is assessed by religion, it shows that non-Muslims delays 0.75 years or more to get married than their Muslim counterparts. In Muslims, the mean age at marriage is highest for women aged 20–29 (16.18 years), followed by women aged 30–39 (15.80 years) and 40–49 (15.38 years), respectively. The corresponding mean values for non-Muslim women aged 20–29, 30–39, and 40–49 are closed to each other.

Age at marriage varies across regions (divisions) in Bangladesh. In any region, the mean age at marriage is highest for women aged 20–29, followed by women aged 30–39 and 40–49, respectively. The difference in mean nuptial age between women in the first two age groups is substantially high in Chittagong (0.63 years) and Barisal (0.46 years) divisions. The corresponding difference between women in the last two age groups is also high in Rajshahi (0.65 years), Khulna (0.54 years) and Dhaka (0.49 years) divisions. In all three cases, the mean age at marriage is highest in Sylhet, which is 1.43 years or more higher than that of Rangpur division. The second-largest mean age at marriage is found in Chittagong, subsequently in Dhaka and Barisal divisions.

A notable variation in the mean nuptial age is shown when women are classified by place of residence. In rural areas, mean ages of marriage among women aged 20–29, 30–39 and 40–49 are 16.00, 15.56 and 15.08 years, respectively. In urban areas, the mean age at marriage among women aged 20–29 is 16.72 years, which is slightly higher than that of women aged 30–39 (16.57 years) and notably higher than women aged 40–49 (16.14 years).

Respondent's educational attainments have a significant positive relation to age at first marriage. The average age at marriage among women aged 20 or more with higher secondary education is much higher than the legal age at marriage. It shows that higher secondary school graduates marry, on average, three or more years later than those who are secondary school graduates and four or more years later than those who have no education. The average age at marriage among women with primary education is not too distinct from women with no education. Of all three age groups, women aged 20–29 with no or primary education have the highest mean age at marriage (15.27 and 15.42 years, respectively), while they with secondary or higher secondary education have the lowest mean age at marriage (16.30 and 19.55 years). The opposite is true for women aged 40–49.

The impact of husband's education on age at marriage is not as strong as female education. With an exception (e.g., women aged 20–29 marrying to the men with higher secondary education), the highest mean age at marriage is found among women aged 20–29, followed by women aged 30–39 and 40–49, marrying to the men having no or have any education. Women marrying to the men with higher secondary education marry, on average, three or more years later than those marrying to the men with no education.

Access to mass media seems to play some role in increasing the age at marriage. Mass media exposures marry, on average, about one or more years later than their non-exposure counterparts. Among non-exposures, the highest mean age at marriage is found among women aged 20–29 (15.60 years), followed by the women aged 30–39 (15.22 years) and 40–49 (14.85 years), respectively. A similar pattern is seen among exposure groups.

Wealth index may have an impact on age at marriage. Women from poor households marry, on average, two or more years earlier than those from rich households.

Source of variation	Sum of squares	df	Mean square	F-test	p-value	Partial $R^2 \times 100$
<i>Covariates</i>	1885.59	2	942.79	145.56	0.000	—
Age	274.30	1	274.30	42.35	0.000	1.05
Age squared	1611.28	1	1611.28	248.77	0.000	0.89
<i>Factors</i>	39353.49	17	2314.91	357.41	0.000	—
Religion	968.63	1	968.63	149.55	0.000	0.69
Region of residence	6218.19	6	1036.37	160.01	0.000	0.24
Place of residence	116.40	1	116.40	17.97	0.000	0.12
Respondent's education	30716.64	3	10238.88	1581	0.000	4.32
Husband's education	1246.33	3	415.44	64.14	0.000	0.67
Access to mass media	11.26	1	11.26	1.74	0.187	0.05
Wealth index	76.05	2	38.03	5.87	0.003	0.27
Model	41239.08	19	2170.48	335.11	0.000	
Residual	115568.19	17843	6.48			
Total	156807.27	17862	8.78			

Note: $\beta(\text{age}) = -0.013$, $\beta(\text{age-squared}) = -0.004$. df means degrees of freedom.

Table 4. Hierarchical analysis of covariance of age at first marriage and selected variables, BDHS 2014.

In poor communities, women aged 20–29 marry on average 0.32 years later than the women aged 30–39 (15.18 years) and 0.70 years later than women aged 40–49 (14.80 years). It is also true for women belonging to the middle and rich class.

4.3 Determinants of age at marriage

Differentials in age at marriage across levels of explanatory variables have been presented using simple cross-tabulations. To the point of determinants of age at marriage, these simple tabulations represent only part of the results [36]. Indeed, an assessment of the effect of a variable on age at marriage endures difficulties arising from the impact of other variables that might be correlated. The multivariate treatment of the data can suitably be used to extract the effect of each of inter-correlated variables on the dependent variable. Hence, an ANCOVA technique is employed to examine the effect of explanatory variables on age at marriage. All selected covariates produce a total of 21 two-way interaction terms. Only two of them are found to be significant at 1% level of significance but they contribute negligibly (below 0.005) to the squared multiple correlation coefficients. Hence, the interaction terms are avoided from the final model.

The variables involved in the model are introduced into the ANCOVA hierarchically. Age and age-squared—a function of age, are treated as covariates since age is a continuous variable. The variable age-squared is accessed into the model owing to possible curvilinearity of age at marriage by the respondent's current age. The beta (β) coefficient of age-squared, computed from the ANCOVA technique, is negative (-0.004), which is a symptom of convexity in the relationship. The sequence of the variables in the model is the same as is shown in **Table 4**. Following the ANCOVA, MCA is carried out to examine the effect of independent variables on age at marriage and to briefly interpret them.

Table 4 represents the results of the hierarchical analysis. The analysis indicates a total of 8.30% variation for all the variables under consideration. Only the age variable explains 1.05% of the variation. The regression coefficient of age (-0.013) exhibits an inverse relationship between age at marriage and current age. That is, women of higher ages marry earlier in life than younger women, indicating a successive increase in age at marriage. The negative beta coefficient of age-squared confirms a curvilinear negative relationship with age at marriage. The value of partial $R^2 = 0.89$ signifies that the variable is relatively less powerful than the current age. After controlling for age and age-squared, religion explains a considerably large proportion of variation (0.69). Region of residence demonstrates a significant relationship with age at marriage. It explains only 0.24% of total variation after controlling for age, age-squared and religion. Place of residence explains the smallest amount of variation (0.12), when controlled for region of residence with the preceding three variables. Respondent's education has the largest net effect on age at marriage of all independent variables. It contributes 4.32% of total variation even after controlling for five variables such as age, age-squared, religion, region of residence and place of residence. The variation explained by husband's education is 0.67%. Husband's education as a predictor of age at marriage is weaker than female education. The amount of variation explained by access to mass media is almost negligible (0.05%). The influence of wealth index is significant, contributing 0.27% of variation to the total, when controlled for age, age-squared, religion, region of residence, place of residence, access to mass media, female and husband's education.

The results obtained by MCA are shown in **Table 5**. The unadjusted mean age at marriage for Muslims and non-Muslims indicates the expected pattern. It is higher for non-Muslims. However, the difference in mean age at marriage between

Covariates	No. of respondents	Unadjusted	Adjusted
<i>Religion ($\eta = 0.095, \beta = 0.080$)</i>			
Muslims	16135	15.77	15.78
Others	1728	16.72	16.58
<i>Region of residence ($\eta = 0.173, \beta = 0.197$)</i>			
Barisal	2142	15.75	15.65
Chittagong	2865	16.23	16.22
Dhaka	3093	16.02	15.95
Khulna	2581	15.42	15.38
Rajshahi	2512	15.40	15.41
Rangpur	2531	15.32	15.31
Sylhet	2139	16.92	17.18
<i>Type of place of residence ($\eta = 0.133, \beta = 0.021$)</i>			
Rural	11696	15.57	15.81
Urban	6167	16.40	15.95
<i>Respondent's education ($\eta = 0.446, \beta = 0.378$)</i>			
Illiterate	4206	14.88	14.99
Primary	5495	15.19	15.32
Secondary	6778	16.15	16.12
Higher secondary	1384	20.04	19.38
<i>Husband's education ($\eta = 0.351, \beta = 0.110$)</i>			
Illiterate	5153	14.99	15.57
Primary	4894	15.37	15.69
Secondary	5379	16.04	15.96
Higher secondary	2437	18.26	16.57
<i>Access to mass media ($\eta = 0.161, \beta = 0.012$)</i>			
No	6593	15.23	15.81
Yes	11270	16.22	15.88
<i>Wealth index ($\eta = 0.264, \beta = 0.024$)</i>			
Poor	6611	15.19	15.87
Middle	7390	15.71	15.78
Rich	3862	17.28	15.97

Table 5. Results of multiple classification analysis (MCA) of age at first marriage of ever married women, BDHS 2014.

Muslims and non-Muslims narrows to 0.88 years obtained by adjusted from 0.95 years by unadjusted. This is also true for the remaining variables, except for region of residence. That means the multivariate adjustment of data reduces the difference in mean age at marriage among categories of each covariate. The difference between eta (η) and beta (β) values corresponding to religion is 0.015. That is, there is no inter-correlation between religion and other predictors. The difference in mean age at marriage across regions is found to be the maximum of 1.6 years when it is computed from Sylhet (16.92 years) to Rangpur (15.32 years)

Covariates	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Constant	0.26 ^a	—	0.07 ^a	—	0.08 ^a	—
<i>Religion</i>						
Muslim (RC)			1.00	—	1.00	—
Non-Muslim			1.71 ^a	1.51–1.94	1.77 ^a	1.56–2.00
<i>Region of residence</i>						
Barisal			1.36 ^a	1.15–1.61	1.38 ^a	1.17–1.64
Chittagong			2.26 ^a	1.94–2.64	2.13 ^a	1.83–2.48
Dhaka			1.95 ^a	1.67–2.28	1.86 ^a	1.59–2.16
Khulna			1.09	0.93–1.29	1.08	0.92–1.27
Rajshahi			1.09	0.92–1.30	1.08	0.91–1.27
Rangpur (RC)			1.00	—	1.00	—
Sylhet			4.46 ^a	3.81–5.23	4.20 ^a	3.60–4.91
<i>Place of residence</i>						
Rural (RC)			1.00	—	1.00	—
Urban			1.14 ^a	1.04–1.25	1.15 ^b	1.05–1.26
<i>Respondent's age</i>						
20–29	1.66 ^a	1.51–1.82	1.16 ^b	1.04–1.29		
30–39	1.29 ^a	1.17–1.42	1.07	0.96–1.20		
40–49 (RC)	1.00	—	1.00	—		
<i>Access to mass media</i>						
No (RC)			1.00	—		
Yes			1.10 ^c	0.99–1.22	1.15 ^b	1.04–1.28
<i>Wealth index</i>						
Poor (RC)			1.00	—	1.00	—
Middle			1.06	0.95–1.18	1.08	0.97–1.20
Rich			1.06	0.92–1.23	1.19 ^c	1.03–1.37
<i>Respondent's education</i>						
No education (RC)			1.00	—		
Primary			1.18 ^a	1.04–1.33		
Secondary			1.92 ^a	1.67–2.20		
Higher secondary			13.36 ^a	10.83–16.49		
<i>Husband's education</i>						
No education (RC)			1.00	—	1.00	—
Primary			1.10	0.97–1.23	1.17 ^b	1.04–1.32
Secondary			1.41 ^a	1.25–1.61	1.62 ^a	1.44–1.83
Higher secondary			1.91 ^a	1.62–2.25	2.82 ^a	2.42–3.28
<i>Interaction terms</i>						
Primary × 20–29					1.11	0.97–1.28
Secondary × 20–29					1.52 ^a	1.36–1.70

Covariates	Model 1		Model 2		Model 3	
	OR	95% CI	OR	95% CI	OR	95% CI
Higher secondary× 20–29					7.84 ^a	6.37–9.65
Primary× 30–39					0.94	0.81–1.10
Secondary× 30–39					1.45 ^a	1.26–1.65
Higher secondary× 30–39					9.37 ^a	7.17–12.24
–2log likelihood	17957.6		15242.9		15452.7	
Chi-square	120.2		2834.9		2625.1	
Degrees of freedom	2		19		20	
R ²	0.008		0.164		0.153	
Adjusted R ²	0.011		0.241		0.224	

Notes: RC stands for reference category, OR indicates odds ratio and CI means confidence interval.

^a*p* < 0.001.

^b*p* < 0.01.

^c*p* < 0.05.

Table 6.

Binary logistic regression modeling on age at first marriage of women aged 20–49 years by socio-economic factors, BDHS 2014.

regions. The statistical adjustment increases this difference, which is 1.87 years. As before, the values of $\eta = 0.173$ and $\beta = 0.197$ are close to each other, meaning no inter-correlation of region of residence with other predictors. Usually, urban women have a higher mean age at marriage than their rural counterparts. However, the adjustment largely reduces the difference of 0.14 from 0.83. A larger gap between $\eta = 0.133$ and $\beta = 0.021$ indicates an inter-correlation of place of residence with other predictors.

Respondent's education remains the highest predictive capacity even when adjusted for other variables ($\eta = 0.446$ and $\beta = 0.378$). The adjustment holds the expected patterns: women with secondary or higher levels of education have a higher mean age at marriage than those who are illiterate. The effect of husband's education is not as pronounced as respondent's education. The beta value ($\beta = 0.110$) reduces to more than one-third of the eta value ($\eta = 0.351$), demonstrating an inter-correlation of this variable with other predictors. In the case of mass media and wealth index, the adjusted with respect to the unadjusted mean age at marriage differences are extremely small. Poor women and the women who have no contact with mass media have a lower mean age at marriage. A larger difference between eta and beta values indicates that mass media and wealth index are inter-correlated with other predictors.

4.4 The prevalence of legal age at marriage

According to the report in Section 2, the mean age at marriage of Bangladeshi women is far below the legal age for marriage. Hence, along with determining the determinants of age at marriage, it is crucial to review their accountability for early/late marriage. In case of that, the response variable 'age at first marriage' is considered as a categorical variable say *Y*, which takes two values 0 and 1. A value of '0' includes women marrying before 18, and '1' includes those marrying 18 or later ages. Based on the composition of *Y*, a binary logistic regression method can suitably be used to examine the effect of factors associated with a higher age at

marriage. The results obtained by the logistic regression method are shown in **Table 6**. The odds ratio (OR) is a relative measure of a specific category of a factor relative to the reference category of that factor. Model 1 includes only the current age of women; it estimates the amount of change in the chance of marrying 18 or later ages over time. Before carrying out the logistic regression method for Model 2, the Variance Inflation Factor (VIF) is used for checking multicollinearity among the independent variables. If the VIF value lies in 1–10, then there is no multicollinearity and if the $VIF < 1$ or $VIF > 10$, then there is multicollinearity. The independent variables in this study do not suffer from multicollinearity problems as the values of VIF lie between 1 and 2 (results are not shown). All selected factors used in MCA are included in Model 2. The inclusion of other factors weakens the predicting power of current age on delayed marriage. Model 3 represents the interaction effect between respondent's education and current age and the main effect of the rest of the factors.

In **Table 6**, the values of log-likelihood and the associated χ^2 indicate that all three models are statistically significant. With respect to Model 1, Model 3 is better fitted due to the inclusion of interaction terms. Model 1 shows that the chance of marrying 18 or later ages significantly decreases with the increase of age. For example, the OR of the reference category (women aged 40–49) is 1.00, which gradually goes up to 1.66 for women aged 20–29, while after controlling all selected factors, it becomes 1.16 (see Model 2). Compared with Muslim, non-Muslim women are significantly more likely to marry 18 or later ages (OR = 1.71 in Model 2 and 1.77 in Model 3).

Among regions, the OR is highest in Sylhet (4.46 in Model 2 and 4.20 in Model 3), followed by Chittagong (2.26 and 2.13), Dhaka (1.95 and 1.86) and Barisal (1.36 and 1.38) respectively. In both models, urban women have a significantly higher OR than rural women. The OR is somewhat higher for women who have any contact (1.10 in Model 2 and 1.15 in Model 3) than those who have no contact with mass media. According to Model 3, wealth index affects partially the age at marriage. For instance, women from rich households are 1.19 times more likely to marry 18 or later ages than women from poor households.

Respondent's education is one of the most important factors affecting the age at marriage. In Model 2, women with higher secondary education obtain an incredibly higher OR, which is 13.36 times higher than that of women with no education. Moreover, the OR for women with secondary education is about two times of reference category.

Husband's education has also a significant impact on age at marriage. The OR obtained by Model 2 is substantially higher for women who marry to the men with a higher level of education. For instance, women marrying to the men with secondary education or with higher secondary education are 1.41 and 1.91 times more likely to marry 18 or later ages than those belonging to the reference category. Model 3 provides a similar trend with relatively larger ORs.

Most of interaction terms between current age and respondent's education are significant. The effect of education on age at marriage varies from one to another age group. The OR increases with increasing the level of education. The OR for women aged 20–29 with secondary education is 1.52 and with higher secondary education is 7.84. The corresponding ORs for women aged 30–39 are 1.45 and 9.37 respectively.

5. Discussions

According to survey years, age at first marriage of women in Bangladesh has been increased between 1993 and 2014. Additionally, the analyses by respondent's current age demonstrate that women are in transition regarding age at marriage.

For instance, younger women (aged 20–29 years) were more likely to get delayed marriage than those who are higher ages (e.g., women 30–39 and 40–49 years). It may be partly accredited to younger women with higher educational attainment compared with their older counterparts. These findings are consistent with those of earlier studies conducted on Bangladeshi women [37, 38, 55] and the women of Nepal and sub-Saharan Africa [56, 57].

The association between education and age at marriage is evident from almost all demographic research. Several studies [9, 17, 44, 45, 58] claimed that illiteracy is the prime cause in explaining the high frequency of early marriage in Bangladesh. A study on Nepali women has shown that each additional level of education beyond primary schooling substantially reduces the likelihood of early marriage [59]. The current study also finds similar results. Usually, women with a higher level of education spend a longer span of life in education, have a higher occupational aspiration and want to have a prestigious job. All these attainments delay the nuptial age [40]. It is also noteworthy to mention that women with a higher level of education get importance in taking decision on family matters. Thus, they have better bargaining power in getting delayed marriage and selecting their groom. Husband's education is also influencing age at marriage. Women who marry to the men with a higher level of education are higher likely to delayed marriage.

Religious beliefs and attitudes have a fixed and wide-reaching force in human culture. However, such values are distinctive between religious traditions. The higher prevalence of early marriage among Muslims reflects their traditional beliefs and practices. Previous studies conducted in Bangladesh or somewhere else [30, 55, 60, 61] also noticed that Muslim women marry earlier than their non-Muslim counterparts.

Distinct culture across regions possibly has an impact on age at marriage. In general, women in the north-west places of Bangladesh (Rangpur, Rajshahi, and Khulna) marry early. It may be because people in these regions are mostly poor, illiterate and adherent of traditional culture [30]. Women from other regions, especially in Sylhet and Chittagong, are more submissive to follow the marriage law in Bangladesh. One possible reason is that there are various tribal communities in Sylhet and Chittagong regions and the mean age at marriage of tribal women is four years higher than other Bangladeshis [62]. Moreover, as a port city, people in Chittagong are in an advantageous position to engage in business and service professions, resulting in getting delayed marriage. Also, for better earnings, many young people from Sylhet migrate to the Middle East and Europe, especially in the UK [63], which propels them to get delayed marriage.

Not likely the region of residence, but place of residence also partakes in explaining the socialization process. It shows that people in rural areas are under-privileged in terms of their educational attainment, economic status, social and cultural norms. Hence, age at marriage differs in rural–urban settings. In harmony with previous studies on Bangladeshi women and women in other developing countries, this study observed that women in rural areas are inclined to reflect the more conventional behavior of early marriage [30, 38, 40, 55, 60].

Mass media, a very different form of socialization than any other, affects individuals' thoughts, attitudes, and behavior. In line with an earlier study in Bangladesh [30], this study has found a positive relationship between age at marriage and exposure to mass media. Women who have any exposure to mass media are less likely to marry early than their non-exposure group.

Wealth Index is a composite measure of cumulative living standard of the household. Consistent with a previous study on 35 countries in Sub-Saharan Africa [64], this study has found a relationship between wealth index and age at marriage. For instance, economically poor women are significantly more likely to marry early

than those who are rich. However, there is no significant difference in the likelihood to get early/late marriage between women in poor class and women belonging to the middle class of economy.

6. Conclusion

The mean age at marriage by survey years as well as by women's in three age groups indicate that the prevalence of early marriage among women in Bangladesh has been decreasing with time. However, the pace is too slow or even slower than other South Asian countries like Bhutan (22.8 years), India (22.2 years), Maldives (21.6 years), Nepal (17.9 years), Pakistan (20.3 years) and Sri Lanka (23.8 years). From a recent document, Bangladesh ranks 1st in Asia and 4th in the world in terms of child marriage. While the Child Marriage Restraint Act 1929 has been abolished by the act of 2017 preserving article 2 of the previous statute: the legal age for marriage for a girl 18 and for a boy 21, scholars and social scientists deem that the special provision added in the article 19 of 2017 child marriage restraint act will not encourage to decrease child marriage in Bangladesh. In fact, no laws or acts against child marriage will effectively works until people are cognizant about the devastating impacts of child marriage at individual, family and social levels. Awareness among mass people basically grows from the improvement of socio-economic and cultural factors.

This study shows that an increase in age at marriage is associated with major structural changes in society. Female education performs as a leading factor in this changing pattern. A strong positive relationship between respondent's education and age at marriage recommends increasing both the rate and level of female education. It could be the most effective way to advance the nation and women at the individual level. It is noteworthy to mention here that there are various government projects to promote the education of children in Bangladesh. Of those, free education for girls up to grade 10 and stipends for female students are two important projects that should be continued until confirming that no girl in Bangladesh will be married before achieving a minimum secondary school education, resulting in rapidly declining early marriage.

7. Strengths and limitations

This study has several strengths. Firstly, it is based on a nation-wide survey dataset and also a general discussion on age at first marriage of women in Bangladesh. Secondly, an increasing trend in age at marriage has been observed in several ways. Lastly, various advanced as well as sophisticated statistical tools are used to identify the factors associated with and their effects on age at marriage. It is therefore deemed that the findings are more accurate.

Conversely, this study has some limitations. It is based on secondary data that contain no or few information on the respondent's family background. As girls marry early, all antecedents relate to their family of origin (parents decide). Moreover, it is assumed that the number of women at the time of interview is the same as that of women at the time of first marriage. However, some of covariates, especially place of residence may somewhat deviate from this assumption as people tend to migrate from rural to urban areas for better livelihood. Hence, the results corresponding to place of residence may be biased to some extent. Better data collection may expose all potential factors relating to early marriage and provide accurate findings on age at marriage in Bangladesh.

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Section 3

Demographic Analysis in
Institutions, Organizations,
and Public Policy

The City of L'Aquila after the 2009 Earthquake: Review of Connections between Depopulation, Identity and Continuity

Stefano Gizzi

Abstract

The chapter wants to take into consideration the progressive loss of identity and authenticity of the city of L'Aquila, located in the Abruzzi region of central Italy about a hundred kilometers east of Rome, after the earthquake of 2009. Described as “a small Florence of the Italian Renaissance”, L'Aquila is nestled in a basin surrounded by mountains, with what was a fully recognizable identity until the devastating earthquake which took place on April 6, 2009, the night after Palm Sunday. After those violent seismic shocks, repeated in 2016 and 2017, there was a progressive demographic depopulation, since the historic center of the capital and that of the hamlets have been closed and declared a “red zone”. The population, especially the younger ones, no longer recognizes themselves in their place of origin, and many people have preferred to leave. Authenticity, both material and formal (of the urban form) is also increasingly diminishing. Today the image of the city, which had been handed down over centuries, is lost. Immediately after the 2009 earthquake the city was closed and barred, preventing residents from remaining in their homes, even in the less damaged ones. The historic center was isolated and emptied, occupied by the military forces and the Fire Brigade. Contrary to any common sense, instead of immediately carrying out consolidation and restoration work (especially with regards to the more characteristic minor structures), it was decided to begin with long and expensive shoring and scaffolding installations. A forest of props and tie rods that secure the walls and draw imaginative and imposing patterns, thus postponing sine die urgent works. With the forced expulsion of the inhabitants which has now lasted for nearly seven years, the younger generation particularly, is showing (perhaps unconsciously) more and more indifference and detachment from their roots in the historic center. As time passes social and economic interest (as well as those of identity) in returning to their past houses fade. They prefer to pass time elsewhere, either in the suburbs where anonymous shopping centers have mushroomed, or in other cities (in some aspects this has been favored by the possibility of obtaining funds for the purchase of houses outside the municipality). This is why one can speak of a double loss of identity and continuity. The topic should, therefore, be approached from a twofold point of view: identity and continuity. Identity meaning that which transmits the original model and characteristic of place and the inhabitants; and continuity meaning that which allows you to remain permanently in the same place with a stable dwelling. We also find a dual meaning in

lasting continuity; the people (inhabitants), and the space and form of architecture. Identity and continuity are also reflected in lifestyle, as well as in details, materials, colors and common feelings. A 'sentimental heritage' as well as a material one, which is now lost. There is, therefore, a twin theme: that of the continuation of archetypes, and that of housing models in which the population recognizes itself. Today in L'Aquila, identity has disappeared. The inhabitants no longer appear as protagonists, but are reduced to extras, to mute actors against the backdrop of an incomprehensible scene. Even if the search for a lost identity and continuity may now seem an unreal or utopian goal, it should have been the opposite; they should have been the priority and gone hand in hand with the reconstruction. At the end, the various restoration and reconstruction criteria for the survival of what remains of the city will also be examined.

Keywords: Identity, Continuity, Demographic Depopulation, Earthquake, Restoration, Image of The City

1. Introduction

1.1 Abstract

The article takes into consideration the relationships between loss of identity, depopulation and discontinuity in the city of L'Aquila, in central Italy, after the devastating earthquake of 2009, also examining the various aspects related to the theme of reconstruction and restoration, material and immaterial, and the possibility of a hopeful permanence of the inhabitants in the historic center and in the relevant territory. The causes of the progressive depopulation and the change in the urban and territorial image of the city are examined. The errors made after the earthquake with the forced closure of the historic center to the inhabitants and the slowness of the reconstruction and restoration processes are also evaluated.

1.2 Background of the study

L'Aquila, located in the Abruzzi region of central Italy about a hundred kilometers east of Rome, is a city emblematic of a lost identity (both material and symbolic), and a discontinuity of the population and their local traditions. Described as "a small Florence of the Italian Renaissance", L'Aquila is nestled in a basin surrounded by mountains, with what was a fully recognizable identity until the devastating earthquake which took place on April 6, 2009, the night after Palm Sunday.

According to tradition, the city was founded by Frederick II of Swabia [1-4] - vir inquisitor et sapientiae ama - as he describes himself in his treatise on hunting,¹ (even if the constitutive Act is now considered apocryphal). It was planned, at least intentionally, between 1241 and 1245 in order to strengthen the border territories as a bulwark against the power of the papacy. Construction was completed by his son Corrado IV [5], and consolidated after the victory of Charles I of Anjou over the Swabians at the Battle of Benevenuto in 1266.

L'Aquila, therefore, has a double ancestry (Swabian and Angioinian), which was still clearly visible at the time of the earthquake. On a plaque, set in the walls of Montefalco in Umbria, is an engraved emblem of the imperial eagle of Frederick, geometrically marked with two opposing triangles. This symbol, according to some

¹ FEDERICO II, *De arte venandi cum avibus*, Biblioteca Apostolica Vaticana, ms. cod. Pal. Lat. 1071 (orig. Written before 1248), P. I. 5: "Auctor est. vir inquisitor sapientiae et amator Divus Augustus Fr(i)dericus secundus Romanorum imperator, Jerusalem et Sicilie rex".

architectural historians, may have inspired the first configuration [6] - which was part of Frederick's program - "extreme organizational innovation and geometric precision, plus clarity of institutions and structures." [7]

Under Manfredi, the Emperor's natural son, L'Aquila was elevated to a bishopric [8] with a bull issued by Pope Alexander IV in 1256 (1257 according to other sources), passing from the role of *pagus* to that of *civitas*.

During the Swabian period natural and planned development was encouraged: based on the construction of artisan type housing along the winding uphill roads, starting from a small pre-existing village rich in water sources (Acculae or Aquili) at the monastery of Santa Maria ad Fontes. While the Angioinians employed a standard cardo-decumanus plan, using a system of city blocks as a whole and no longer the single sectors as before (see **Figures 1** and **2**).

L'Aquila was a compact city whose identity was linked to the origins of the population from the neighboring hamlets, and the possibility of replicating these settlements within the city, thus avoiding any conflicts of recognition, (also by means of a shrewd fiscal policy initiated by the Swabia's, and continued by the Angioinians). Each nucleus differentiated itself from the each other politically and religiously (according to the saint they worshipped), as well by the origins of the inhabitants [9]. Under Charles of Anjou each family was permitted to build a single house, "lunga otto canne e larga quattro" ["eight rods long and four wide"] by paying "dodici boni carlini per uno fiorino contato"² ["twelve boni carlini for one counted florin"]. Enlarging the city to 1200 "fuochi" [fires (families)] (see **Figures 3-5**).



Figure 1. Remains pre-existing the presumed foundation of L'Aquila under Frederick of Swabia (drawing by S. Gizzi, 1976).

² V. DI BARTHOLOMAEIS (Ed.), *Cronaca Aquilana rimata di Buccio di Ranallo di Popplito di Aquila*, Bottega d'Erasmus, Torino 1970, p. 16: "Et uno casalino a foco si vadano assenando, / Lo casalino degia essere quatro canne per lato / E sette canne et meza per longo mesurato, E de omne casalino allo re sia dato / Dodici bon carlini per uno fiorino contado". See also G. BUDELLI - C. CAMPONESCHI - F. FIORENTINO - M.C. MAROLDA, *L'Aquila. Nota del rapporto tra "castelli" e "locali" nella fondazione di una capitale territoriale*, in E. GUIDONI (Ed.), *Città contado e feudi nell'urbanistica medievale*, Multigrafica, Roma 1974, pp. 182-195.



Figure 2. L'Aquila. Convents, military area, accesses from the valley floor as poles of attraction for the first urban organization in the Swabian period (drawing S. Gizzi, 1976).

Identity recognition was also reinforced by the revival, in every 'locale' (under the Swabians) and in every 'quarto' (under the Angioinian), of the 'mother-church' and the most important stately home of the county (see **Figures 6** and **7**).

A strong connection was established between the 'locali' and the territory of origin, facilitated by a law which established that those who built at the new site did not lose the right of citizenship of their place of origin ('castello'), and remained owners in the countryside. As a result each settlement in the city, while still remaining a unitary body, seemed to be split into two ('locale' in the city and 'castllo' in the countryside) (see **Figure 8**).

The subsequent subdivision into 'quarti' was an even more noteworthy event. It marked a process of centralization of political and administrative power, and a greater distributive and figurative clarity to othe city, overcoming the fragmentation of the 'locali. This facilitated not only a one to one relationship between the 'locali' and 'castello' of origin, but a broader link between the urban settlement and the countryside as a whole, including the scattered farms.

It was a bond that would be strengthened in the following two centuries thanks to the flourishing of trade (especially of the Wool Merchants Guild) [10], with the road from Rome to Florence (with a branch from the 'Via del Sale' - the Salaria) on one side, and the route between L'Aquila and Puglia on the other.

Today this image, which had been handed down over centuries, is lost. Immediately after the 2009 earthquake the city was closed and barred, preventing residents from remaining in their homes, even in the less damaged ones. The historic center was isolated and emptied, occupied by the military forces and the Fire Brigade.

Contrary to any common sense, instead of immediately carrying out consolidation and restoration work (especially with regards to the more characteristic minor structures), it was decided to begin with long and expensive shoring and scaffolding

installations [11]. “A forest of props and tie rods that secure the walls and draw imaginative and imposing patterns” [12], thus postponing *sine die* urgent works (see Figures 9–18).

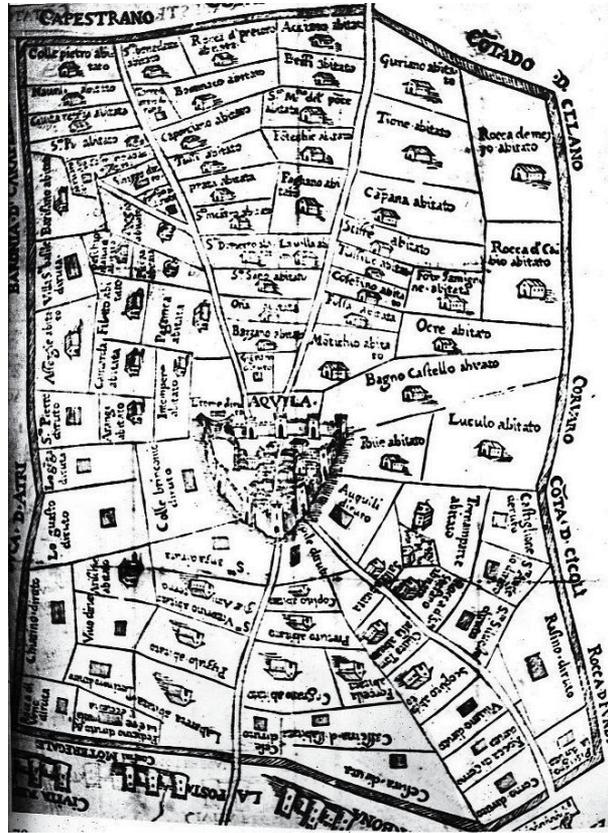


Figure 3.
L'Aquila and the countryside (L'Aquila, Salvatore Tommasi Provincial Library).



Figure 4.
L'Aquila and countryside in an image from 1620 (L'Aquila, Salvatore Tommasi Provincial Library).

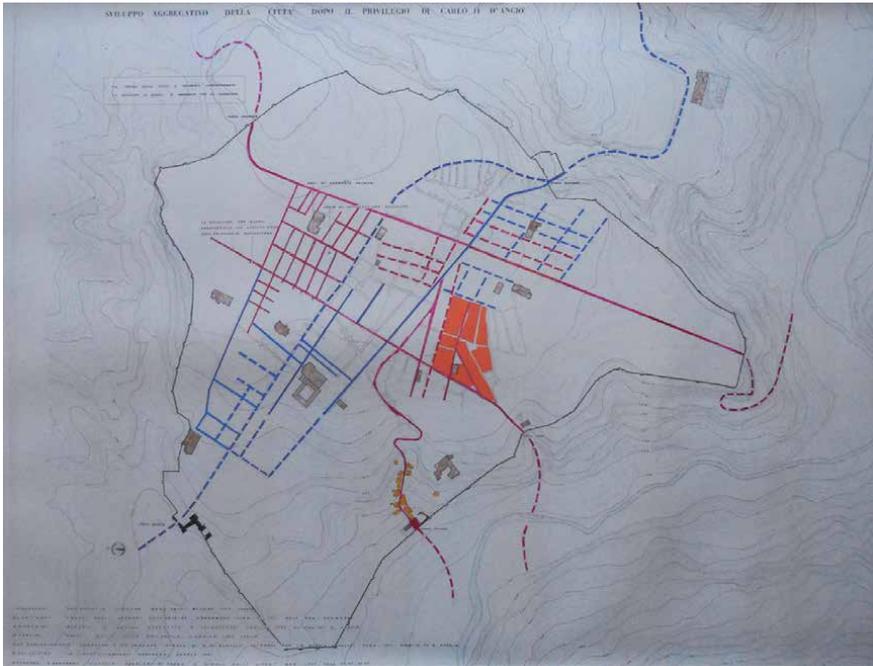


Figure 5.
Aggregative development of the city after the privilege of Charles of Anjou (drawing S. Gizzi, 1977).



Figure 6.
New urban and fiscal division of L'Aquila into "quarti" (quarters) (drawing by S. Gizzi, 1976).

With the forced expulsion of the inhabitants which has now lasted for nearly seven years, the younger generation particularly, is showing (perhaps unconsciously) more and more indifference and detachment from their roots in the historic center. As time passes social and economic interest (as well as those of identity) in returning to their past houses fade. They prefer to pass time elsewhere, either in the suburbs where anonymous shopping centers have mushroomed, or in



Figure 7.
Further expansion of the religious nuclei and new directions with respect to the already structured city (drawing by S. Gizzi, 1976).

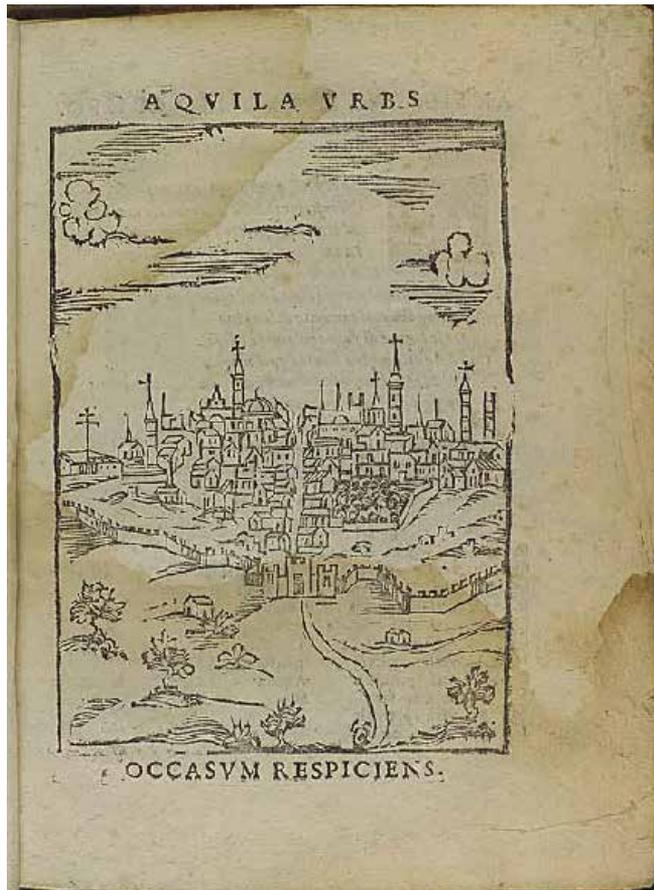


Figure 8.
“Aquila Urbs Occasum Respiens” (drawing Salvatore Massonio, XVI Century).



Figure 9.
Dense scaffoldings near the basilica of San Bernardino (photo S. Gizzi, 2011).



Figure 10.
Props of different types along via di San Bernardino (photo S. Gizzi, 2011).

other cities (in some aspects this has been favored by the possibility of obtaining funds for the purchase of houses outside the municipality). This is why one can speak of a double loss of identity and continuity.

Indeed it is feared that many owners, tired of waiting, could sell their damaged properties to groups of speculators, ready to demolish and rebuild them with considerable financial gain. In fact, due to the extension of the stop on reconstruction work, companies have begun to acquire real estate to resell, thus increasing the expulsion of the residents [13].

The topic should, therefore, be approached from a twofold point of view: identity and continuity. Identity meaning that which transmits the original model and



Figure 11.
Shoring of the church of the Convent of Santa Chiara (photo S. Gizzi, 2011).

characteristic of place and the inhabitants; and continuity meaning that which allows you to remain permanently in the same place with a stable dwelling. We also find a dual meaning in lasting continuity; the people (inhabitants), and the space and form of architecture. Identity and continuity are also reflected in lifestyle, as well as in details, materials, colors and common feelings. A 'sentimental heritage' as well as a material one, which is now lost.

There is, therefore, a twin theme: that of the continuation of archetypes, and that of housing models in which the population recognizes itself.

Today in L'Aquila, identity has disappeared. The inhabitants no longer appear as protagonists, but are reduced to extras, to mute actors against the backdrop of an incomprehensible scene. Even if the search for a lost identity and continuity may now seem an unreal or utopian goal, it should have been the opposite; they should have been the priority and gone hand in hand with the reconstruction.

The degree of consultation with the inhabitant concerning measures and solutions to be taken was also markedly different to previous earthquakes in Italy, where the residents were kept informed of the decision-making processes. In the case of L'Aquila a feeling of resignation immediately seemed to prevail [14]. The bitter words of Walter Siti, winner of the 2013 Premio Strega, summarize the mood well; "L'Aquila does not want to rise again, the city has committed suicide. Looking at it closely in the evening, it seems like Los Angeles; the artificial suburbs have greatly expanded it, the lights are lights and they make no difference" [15].

If it is true that the reoccurring earthquakes, that have taken place in every age, have often contributed to the changing the face of the city, it is equally true that the city still remained recognizable after the various reconstruction and restoration. This is because the restoration works carried out followed the stratifications and confirmed the existing structures.

Already in the middle Ages there were statutory regulations established in the city; such as those of Charles of Anjou in 1315, which declared that churches



Figure 12.

“Works in wood provisional in a small church outside the city walls” (photo S. Gizzi, 2011).

destroyed by earthquakes or other disasters (natural, war, human made) should be restored!³

Another unresolved problem that has contributed to the de-population of the city is the fragmentation and overlapping of responsibilities. From those of the Dipartimento della Protezione Civile (Civil Protection Department) to those of the Commissario Straordinario, of the “Direzione Regionale per i Beni e le Attività Culturali”, of the “Soprintendenze architettonica storico-artistica ed archeologica” (Extraordinary Commissioner, the Regional Directorate for Cultural Heritage and Activities, the Historical-Artistic and Archaeological Architectural

³ A. CLEMENTI, *Statuti del 1315*, in G. SPAGNESI – P. PROPERZI, *L'Aquila. Problemi di forma e di storia della città, cit.*, p. 129, Statuto del 1315 n. 6: “We have established that the men or congregations of any local of the said city of Aquila and its district shall build or have built, taking care of the repair of those in ruins, a church in the city of Aquila within the circle of the city walls and start it within one year from the publication of this notice”. Cf. also M. PIACENTINO, *La vita in Abruzzo nel Trecento desunta dagli Statuti della Città dell'Aquila concessi da Roberto d'Angiò nell'anno 1315*, A. Polla, Cerchio 1993.



Figure 13.
“Provisional works in one of the alleys in the quarter of San Pietro di Coppito in L'Aquila” (photo S. Gizzi, 2011).



Figure 14.
Emergency provisional works in wood in the church of Paganica (photo S. Gizzi, 2011).



Figure 15.
Provisional works in San Martino d'Ocre (Photo S. Gizzi, 2011).



Figure 16.
Provisional wooden work and props in the Medici center of Santo Stefano di Sessanio, near L'Aquila (Photo S. Gizzi, 2011).

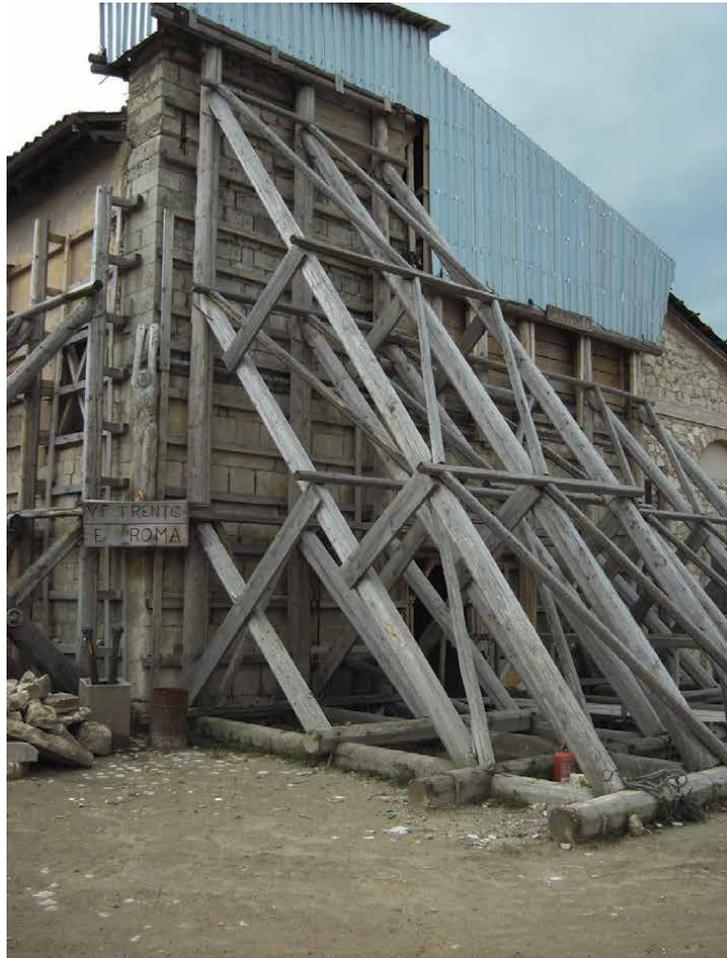


Figure 17.
Shoring of the church of Onna (photo S. Gizzi, 2011).



Figure 18.
Props, temporary coverings and temporary works of various kinds in the square of San Pietro di Coppito in L'Aquila (photo S. Gizzi, 2010).

Superintendence), the Region, the Municipality and the Diocese. All these institutional-bodies often had conflicting ideas and a reluctance to engage in dialogue.

The Diocese, in particular, has the role of overseeing the restoration of the buildings of worship it owns. The Metropolitan Archbishop of L'Aquila, Monsignor Giuseppe Molinari, used very touching words on the occasion of the first post-earthquake Christmas. "Dear Baby Jesus [...] we, the survivors of the great tragedy, will bring you this year our tears, fears and hopes. [...] For those who judge everything with a human yardstick, we are poor earthquake victims with neither present nor future certainties [...] we no longer have our beautiful city, its monuments, its churches, its workshops, its poetry and its culture. But one day you also said: 'Seek the kingdom of God and all the rest will be given to you'. We believe this promise of yours" [16].

He also spoke out against the excessive division of responsibilities, "Six months after the catastrophe, the Curia of L'Aquila had already prepared a plan for the possible reconstruction of the historic center. We had immediately organized a Master with three hundred architects, engineers and technicians from all over the world. Since last November we were ready, but here nothing has happened yet. The reason is the bureaucracy. Regional laws, Italian laws, European laws..." [17].

While in response to a question from a journalist, "Monsignor, won't the command deck be too crowded between commissioners, sub commissioners and deputies?" he replied, "The number is not a problem, if they all row in the same direction." And to another question, "Will the Curia's lead bother anyone?" he responded, "And why should it? The Church owns a third of the entire heritage of the historic center and behaves like any other owner. It defends its rights and does so through its Bishop, there is no need for substitutes. The Church has owned this patrimony for a millennium" [18].

The Auxiliary Bishop, Monsignor Giovanni D'Ercole, sent by the Vatican to assist Molinari in the restoration of the churches was even more outspoken. "With the wheelbarrow initiative, people expressed their desire to participate and tried to draw attention to the great expectations of the city, still on its knees from the wounds of the earthquake. The population wants to rebuild and clear the historic center of rubble as the first important step. [...] The people want their city as it was before, but it seems like a dream that is dying day after day. [...] In truth, a lot was done for the emergency, but almost nothing for the reconstruction. Indeed, it seems that everything has stopped. People have been rehoused in 21 prefabricated new towns, but no one talks about the houses to be rebuilt. Of course there are no longer any tents, but neither are there houses. The population lives uprooted in peripheral areas without services, families are divided and are far from the warmth of their original residential clusters. While 20 thousand people still live in hotels. There is so much suffering and fear that, after the emergency, everything will be completely forgotten" [19].

2. The Government's Decision to Propose L'Aquila as the Seat of the G8 Meeting

Three weeks after the earthquake the Head of Government, Silvio Berlusconi, after consulting with the Consiglio dei Ministri (Council of Ministers) and U.S. President Barack Obama announced, on April 24, 2009, that the meeting of the G8 (Canada, France, Germany, Italy, Japan, Russia, United Kingdom, U.S.A.) would take place in the barracks of the Guardia di Finanza in L'Aquila, instead of La Maddalena in Sardinia where it was initially planned, and where the associated works had almost been completed. "The priority is now L'Aquila, La Maddalena can wait" [20].

The presence of the major heads of state (from Obama, Merkel to Sarkozy) in the city, was seen as an opportunity to raise the awareness of the international community and encourage them to donate funds for the much needed restoration and reconstruction works.

In particular, Nicolas Sarkozy, promised funds for the restoration of the church of the Anime Sante del Purgatorio (del Suffragio) located in Piazza del Mercato (see **Figures 19–21**). While Angela Merkel committed to financing restoration work for the hamlet of Onna. This was one of the centers worst hit - almost totally razed to the ground- and where in World War I the German troops had shot seventeen people on June 11, 1944. Four years on from this promise, the article “Eine Kirche für Onna” [21] appeared in the “Süddeutsche Zeitung” of May 8, 2013, giving an account of the almost complete repair of the town.

The images of the collapsed dome of the Anime Sante (which travelled around the world), as well as those of the first provisional shoring with special steel structure being lowered from a helicopter, made the gesture of the French President particularly symbolic.

This was about saving a vaulted roof of significant importance. Designed by Giuseppe Valadier (known for the restoration of the Colosseum and the Arch of Titus in Rome), albeit with not univocal proof, given that the Roman architect was only named by the priest and scholar Angelo Signorini, according to which “the dome was designed by Giuseppe Valadier [sic] a Roman” [22] and by Teodoro dei Baroni Bonanni, who states “the dome was made by Giuseppe Valadier of Rome, and the two large marble chapels by Pietro Pedetti, and Bernardino Ferradini of Como” [23], in a more recent and sounder study.⁴

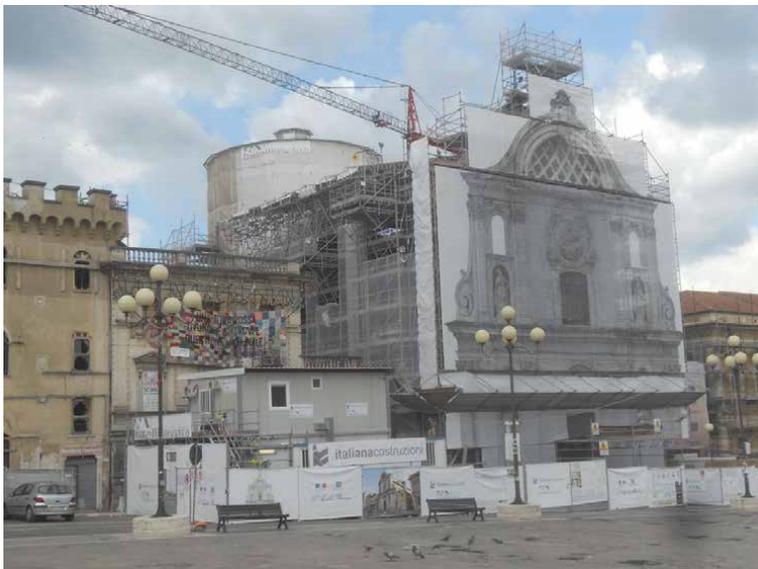


Figure 19.
The church of the Holy Souls (Santa Maria del Suffragio) in Piazza Duomo in L'Aquila in August 2014 (photo S. Gizzi, 2014).

⁴ Among the latest studies, we draw attention to that of M. G. PEZONE, *Carlo Buratti. Architettura tardo barocca tra Roma e Napoli*, Alinea, Firenze 2008, p. 156, who reaffirms that the dome was “built many years later according to the project of Giuseppe Valadier.”



Figure 20. News of the move of the G8 from Sardinia to L'Aquila (from "Il Corriere della Sera", July 9, 2009).

Both the move of the G8 summit from Sardinia to L'Aquila, and the idea of holding one of the Councils of Ministers in L'Aquila were met with much criticism. One of the most vocal opponents of the Summit was Vittorio Emiliani - President of the 'Comitato Italiano per la Bellezza' (Committee for Beauty), who in an article published in "L'Unità" declared: "The desire to restart again is blocked by the great monster, especially after the spectacle of the G8 grand parade snatched from La Maddalena, and the solemn promises of adoption of this or that monument by foreigners. A hallucinatory delirium that many people in Italy also applauded. It was a grim nightmare for those of us who had been involved, in a variety of ways, in the tragedies of Tuscania, Friuli, Umbria and the Marche, where historic centers were struck dead, churches razed or in ruins, starting with the Basilica in Assisi, symbol of St. Francis, which returned to its former self in only two years; an Italian 'cure' which was applauded around the world" [24].

In fact the G8 event risked becoming a summit show among rubble [25]. It is indicative that one of the strongest criticism of the second event was expressed by the current Minister of Cultural Heritage, Dario Franceschini (at the time Secretary of the PD), who in an interview declared that "the ministers gathered in L'Aquila will only walk the red carpet" [26].



Figure 21. "The first lady in tears in the rubble" (From "Il Corriere della Sera", 10 July 2009).

3. The previous earthquakes

"L'Aquila the city that was, is not; the houses are united in piles of stones; the buildings that were not fallen were falling down." These words, which might appear extremely current, are actually referring to another devastating earthquake that struck the capital of Abruzzo in 1703, and are found in a report prepared on April 17, 1703, by Marco Garofalo, Marquis della Rocca, for the Viceroy Marquis of Villena.⁵ Garofalo had been appointed years before, "Preside" and "Vicario" of the

⁵ Archivio di Stato di Napoli, Segreteria dei Viceré n. 1120, Carte diverse del Governo del Viceré di Napoli da gennaio a tutto dicembre del 1703, lettera datata Aquila li 13 aprile 1703, partially reported in R. COLAPIETRA, *Spiritualità coscienza civile e mentalità collettiva nella storia dell'Aquila*, Deputazione abruzzese di storia patria, L'Aquila 1984, p. 508, reported also in R. COLAPIETRA, *L'Aquila dell'Antinoria. Strutture sociali ed urbane della città nel Sei e Settecento*, in *Antinoriana* III, vol II, Il Settecento, Deputazione Abruzzese di Storia Patria, L'Aquila 1978, p. 511. See also, *Relatione ovvero itinerario fatto dall'auditore D. Alfonso Auria de Llanos per riconoscere li danni causati dalli passati terremoti seguiti li 14 gennaio e 2 febbraio MDCCIII con il numero de' morti e feriti nella Provincia dell'Abruzzo Citra e luoghi circonvicini per darne di essi distinta notizia al Signor Viceré di Napoli*, Roma, Gaetano Zenobi, 1703. Also noteworthy, L. A. CHRACAS, *Racconto storico de terremoti sentiti in Roma, e in parte dello Stato Ecclesiastico, e in altri luoghi la sera de' 14 di gennajo, e la mattina de' 2 di febrajo dell'anno 1703: nel quale si narrano i danni fatti dal medesimo, le sacre missioni, il giubbileo, le processioni, e tutte le altre divozioni, funzioni, e opere pie ordinate, e fatte dalla Santità di Nostro Signore Papa Clemente XI e da tutto il popolo*, per Giuseppe de Martijs, nella stamperia di Gio. Francesco Chracas, Roma 1704.

Province of L'Aquila, and just fifteen days after the earthquake he gathered together the highest authorities of the city, appointing them to public office with the aim of reconstructing the city [27]. Another report was drawn up a few weeks after the event by the "auditore", Alfonso Uria de Llanos [28], on the request of the "Preside" Garofalo to carry out a thorough inspection. He described the city as "all destroyed, without any building remaining".⁶ That L'Aquila suffered is also evident in another letter to the Marquis della Rocca, "the plague of earthquakes" [29], indeed of "a horrible earthquake" [30].

Nevertheless the tremors of 1703, even though violent, did not cause significant urban destruction [31] (except, perhaps for the 'quarto' of San Giovanni), and certainly not more damage than the traumatic construction of the Spanish castle, which demolished the ancient residences *ad reprimendam audaciam aquilanorum*,⁷ who had rebelled against the hegemony of the Viceroy Filiberto d'Orange.

Yet, at that time, the reconstruction was almost immediate. The supervisor, Matteo Castrati, and the Marquis Alessandro Quinzi, Chamberlain, in a "briefing" on May 10 of the same year [32], just a few months after the earthquake "gave orders to the citizens to build their homes as best they could, in order to resurrect this city" [33]. There was, therefore, the passion and will to restore almost resurrect the city, also in a spiritual sense! [34]

Another account published in Naples in 1703 describes the terrifying conditions, also in Ref. to the territorial and emotional aspects. "It is incredible the number of cities and lands that have been completely destroyed or badly damaged in this last movement [...]. That noble City of L'Aquila has been almost entirely razed [sic] to the ground, with the few houses and walls that remained standing being threaten with imminent collapse" [35].

As has been scrupulously stressed the interest in the earthquake is evident [36], also by the language used to describe the degree of damage: "damaged (very much)", "damaged (seriously)", "uninhabitable", "flattened (almost)", "ruined", "destroyed", "*diruta*", "completely destroyed", "*offesa*", "rubble", "overturned from foundations" ([36], p. 58).

Furthermore, the opposing views and partiality of the reports of the 1703 earthquake originating from Rome and Naples are noteworthy [37]. The former tends to exaggerate the damage done in order to pressure the Viceroy of Naples into giving more funds, while the latter appear more realistic.

At the time, some of the reconstruction took on a symbolic meaning, as it was linked to the renewal of the most important religious and civil monuments, the more "identifiable". This was the case of the Cathedral of San Massimo e Giorgio, with the aim of revitalizing "and upgrading the christianization of the traditionally popular neighborhood" [38], as it was around the Cathedral. A neighborhood "very

⁶ On the report of the "auditore" Alfonso Uria de Llanos, cf. R. CAMASSI – V. CASTELLI, *I terremoti del 1703 nelle fonti giornalistiche coeve*, in R. COLAPIETRA – G. MARINANGELI – P. MUZI (Ed.), *Settecento abruzzese. Eventi sismici, mutamenti economico-sociali e ricerca storiografica*, Deputazione Abruzzese di Storia Patria, Libreria Colacchi (Ed.), L'Aquila 2007, pp. 43–67, especially pp. 59–60: "In the category of printed reports [...] those of the Neapolitans must first of all mention [...] the Itinerary, by Alfonso Uria de Llanos [...] which describes the effects of the earthquake in about twenty localities in the area of L'Aquila, with [...] attention to economic considerations and observations on the geological effects".

⁷ According to many historians *ad reprimendam audaciam aquilanorum* is the epigraph placed on the lintel of the portal of the Spanish Castle of L'Aquila that Charles V, through the viceroy Pedro de Toledo, had built on a project by Pedro Luis Escrivà, started in 1534; but today no trace of this plaque remains. cf. S. MANTINI, *L'Aquila spagnola. Percorsi di identità, conflitti, convivenze (secc. XVI–XVII)*, Aracne, Roma 2009, pp. 307–308.

desolate, whose remains had already had a troubled history in the fifteenth century” ([38], p. 512). So much so that in 1709 the residents agreed to tax themselves to raise funds to begin the restoration ([38], p. 513). Other minor churches linked to the single “locali” were also rebuilt but in reduced dimensions, such as San Marciano, originally with three apses was rebuilt with a single nave and only one apse.

More than actual “restorations,” these works were referred to as “architectural modernizations” ([38], p. 517). Many noble civil buildings were also “renovated” or “modernized”, among the most important were: Palazzo Antonelli (already “half restored” in 1712) ([38], vol. I, Il Seicento, p. 921), Palazzo Quinzi (which still appeared “half damaged”) ([38], vol. II, Il Settecento, p. 587), and Palazzo Ardinghelli in Piazza Santa Maria Paganica, (“renovated” from 1732 to 1742 in baroque style [39]).

When comparing the earthquake of 1703 to the most recent one two main points stand out: the immediacy of the reconstruction, and the fact that no Aquilan left their city. There were however, some buildings that had not completely collapsed and were deliberately destroyed, with the aim of restructuring some churches [40].

The reconstruction after the 1703 earthquake certainly gave new shape to the city [41] (see **Figure 22**). It was rebuilt “on a plan consolidated during the Spanish Viceroyalty” ([41], p. 496). According to a new “*barocchizzazione*”, and the resulting architectural works were carried out “to recover from natural disasters, in the logic of the political alternations of the eighteenth century” ([41], p. 498). A period where the baroque style [42] prevailed, particularly among the Roman architects (such as Sebastiano Cipriani,⁸ who “restored” both the Cathedral and some of the city gates).

But now what shape should the city, still needing a clear plan of action, take?

It is well noted that “after the earthquake of 1703 in L’Aquila there was a race between Neapolitan and Roman workers to rebuild the city, retrieving from the



Figure 22.
Buying and real estate purchases after the 1703 earthquake (drawing S. Gizzi, 1976).

⁸ On Cipriani and other Roman architects in L’Aquila after the 1703 earthquake, see above all the updated volume of M. G. PEZONE, *Carlo Buratti. Architettura tardo barocca tra Roma e Napoli*, cit.

foundations some particularly complex buildings in order to rebuild them *ex-novo* maintaining their outline in the ground, and as we have also observed the conservation of some of the lower floors well built in the Middle-Ages, and the addition of some floors, as well as consolidating them with ingenious devices such as wooden chains” [43]. Yet, as it was written with a hint of regret, “after the earthquake, L’Aquila was rebuilt but no longer possessed its ancient beauty” [44].

Even more immediate (and symbolic), compared to the eighteenth-century reconstructions, was the restoration of the city walls immediately after the first major earthquake in 1315. The defensive wall were refortified without delay thanks to the decree of Robert of Anjou, who urged the inhabitants to rebuild them⁹ in the same outstanding and “sumptuous” [45] way as the Cathedral of SS. Massimo e Giorgio had been rebuilt.

In regard to the “first” earthquake of 1315, in a poetic description (*Cronaca Rimata*) attributed to Buccio di Ranallo, not only is the collapse and material damage described, but also the beliefs and popular traditions to remedy it ([45], CCL – CCLIV).

4. City–Countryside relationship

4.1 Problems caused by depopulation

As in other areas hit by the earthquake, the problems associated with depopulation are particularly serious [46].

As already mentioned, the 2009 earthquake affected not only L’Aquila, the capital, but all the historic centers of the surrounding area, already affected by a progressive demographic and also economic abandonment. A highly effective social policy would therefore be needed, which should respond not only to the contingent problem, but also to address the problem of intense depopulation that is tearing apart the system of interrelationships of those villages. As in other areas of central Italy, the abandonment of those territories is unfortunately favored by the deterioration of the relationship between man and the environment in fragile contexts. Therefore, effective action should be taken that must make use of the contribution of different disciplines, not only geographical, architectural and urban planning, but also historical and economic, involving physical, social and political factors.

Regarding L’Aquila, the capital, about depopulation, a few days after the earthquake, the intervention of professor Salvatore Settis (Director of the *Scuola Superiore Normale of Pisa*) was very effective, explaining the contrast between “synecism” and “exoitism”, Words of Greek origin. At the time of its foundation, the first phenomenon (συνοικισμός) occurred, with a contemporary movement of many people who have chosen a single destination, as a place for meetings and exchanges. And L’Aquila is the only medieval city that had this origin. The opposite (exoikismós), that is, the *diaspora*, dispersion, depopulation, the emptying of the historic center of its inhabitants, is a defeat due to the ignorance of citizens and institutions [47].

Therefore, the validity of a reconstruction action must be based not only on the ability to respond to an improvement in the static and safety conditions of the monuments and houses, but also on the ability to counteract the seemingly inevitable decline of the area.

⁹ The walls of Aquila had been fortified in 1315. Cfr. also G. SPAGNESI – P. L. PROPERZI, *L’Aquila. Problemi di forma e storia della città*, cit.

4.2 Recent errors made in countering phenomena resulting from the earthquake and depopulation

One of the most evident phenomena of the current post-earthquake has been the upheaval of the relationship between the city and the countryside, which until then had remained balanced and defined. Previously, construction had never filled the space within the fourteenth-century surrounding wall, and green areas - such as gardens and vegetable gardens - still existed.

Likewise, the relationship between the farming communities and the settlements of the ancient "Comitatus" (a political-military arrangement present in the L'Aquila area) was of great importance, above all because of the mutual trust [48]. Until the 1960s, urban construction had not saturated the space within the surrounding walls. The areas towards Porta Napoli, Via XX Settembre and, in general, the southern area of the town had remained green. For centuries this had been a peculiar feature of L'Aquila: the enclosing walls included a much larger area than just the built up space.

For this reason it was a serious mistake to have planned and, partly created, a belt of temporary housing (some unfortunately definitive) of a completely extraneous construction types, such as wooden houses or buildings which have nothing in common with the characteristics of the area [49]. Even though these were constructed on an innovative anti-seismic and movable bases, such as those designed by the former Dean of Engineering of the Naples University, Edoardo Cosenza, (who argued that "the use of seismic isolation, possibly accompanied by dissipation devices was essential"),¹⁰ they ran a real risk of threatening the city country relationship, which up to the seventeenth or eighteenth centuries (but also until after the World War II) was balanced, defined and legible.

Today it appears important to maintain this separateness, this suggestion of the countryside that envelops and separates, almost protecting the city from the rest, and revealing it rich in "the most beautiful vegetables and foliage in Italy" [50].

For all this, it seems essential that the boundaries between the built-up city and countryside remain separate and well defined. Since the foundation of L'Aquila the countryside has never ceased to keep up a new physiognomy, despite having merged together "in new urban settlements dozens and dozens of small rural centers [...] passing through a difficult process of planning and programming of modes and phases of settlement" [51]. Today it is precisely those distinctive features that, by the creation of satellite centers and the new temporary wooden buildings settlements, are in danger of disappearing.

It is, therefore, unthinkable that L'Aquila could be part of an undifferentiated union with the belt of new-towns (a term and form that refers to the English model of Sir Ebenezer Howard [52], and which is completely out of context in the Abruzzo region), on which there has been much said [53]. Or, for that matter, joined with the hamlets (Tempera, Pettino, Poggio di Roio, Bagno, etc.), each with their own very specific identity and local history! (see **Figures 23 and 24**) [54].

¹⁰ Cfr. *Interview of Edoardo Cosenza. Cosenza: ricostruire con innovative concezioni strutturali. Particolare attenzione alla progettazione antisismica e grande rigore nella realizzazione degli edifici*, in "L'Ingegnere italiano", n. 348, giugno 2009, p. 6: "Q. Would the new techniques so much talked about, have reduced the damage if introduced earlier? R. Without a doubt. For example, the use of seismic isolation to protect strategic structures, which must remain operational immediately after an earthquake, would have been decisive. [...] There is no best type [...] The important thing is careful planning and implementation. [...] If then you want to eliminate the possibility of non-structural damage and equipment, then the use of seismic isolation, perhaps accompanied by dissipation equipment, is necessary."



Figure 23.
Temporary residences built around L’Aquila under the government of Silvio Berlusconi (photo S. Gizzi, 2013).



Figure 24.
Temporary residences built around L’Aquila under the government of Silvio Berlusconi. Note the ground insulators (photo S. Gizzi, 2013).

This precarious situation¹¹ means that the new houses, campers and shacks represent a sort of “new nomadic configuration of modernity, of officialdom” [55]. The government’s choice of an easy and out of context model for the new towns was

¹¹ In the same way as new-towns and other prefabricated buildings, it is necessary to avoid what Riccardo Dalisi defined, thirty years ago, as the “preconstruction syndrome”, that is, the use of prefabricated buildings and temporary housing of various kinds. R. DALISI, *Intervento*, in AA.VV., *Proposte per la ricostruzione*, cit., p. 216: “Everyone talks about prefabricated buildings; and they are invoked from all sides; that is, a kind of ‘preconstruction syndrome’ that occurs”.

essentially a political one, not supported by urban planners, restorers and even less by the citizens.

In the country, the government launched a very short-sighted project called 'C. A.S.E. Piano' - Comparti Antisismici Sostenibili Ecocompatibili (Ecocompatibili Sustainable Anti-seismic Complexes) a building model without any coherent thought of urban distribution or typological characteristics, but based on standardized canons indifferently applied in Abruzzo, Switzerland or Central Europe, in the same way as M.A.P. - Moduli Abitativi Provvisori (Temporary Housing Modules) and M.E.P. - Moduli Ecclesiastici Provvisori (Provisional Ecclesiastical Modules). Interesting typologies if considered per se, (placed on slabs isolated from the ground by last generation anti-seismic insulators), but as a whole they constitute an out of scale and out of context building model. Meanwhile small and random buildings, made possible by a municipal resolution, have sprung up in areas which until recently were green.

But, returning to what was mentioned earlier. A reconstruction that has not yet taken place seven years after the earthquake means that, particularly the younger generations, will no longer find reasons, roots or interest to return to live or work in the historical center.

Thus the new settlements, rather than being temporary (as in the case of Friuli and Umbria), have become permanent, leading to the creation of a new contemporary and 'impromptu' city¹² and totally bypassing the restoration of the existing one [56].

What is more serious however is that the identity appears to be lost, even in new architecture. Until a few years ago the buildings just outside the historic center blended in, while today one feels a sense of bewilderment. Also the recent construction (especially in the areas around the Celestine Basilica of Santa Maria di Collemaggio, and along the axis of the valley floor of Via Strinella), is out of context, post-modern and decidedly kitsch.

In the aftermath of the earthquake, it was hoped to avoid the dispersion and relocation of the essential services, even if it was obvious that reconstruction in the historic center would have taken longer than that of the suburbs [57]. The most serious damage however was inflicted by the imposition of the so-called 'red zone': a completely isolated area where only the authorities and technicians could enter, while the resident population was expelled (see **Figure 25**).

Despite everything, the strength and dignity of the population is evident (accustomed as they are to suffering and, to an extent, isolation) and it has been demonstrated on many occasions. Typical is the night of the "wheelbarrow people" [58], that is, those who after waiting in vain for the historic center and the surrounding streets to be cleared of rubble took the initiative and - using hundreds of wheelbarrows - did it themselves and deposited the waste in front of the headquarters of the Regional Council in protest.

The main thoroughfare, Corso Federico II, has also become a type of notice board where the residents can express their dissent. Everyone hangs protest notes, the keys to their apartments yet to be restored, and declarations of love for L'Aquila [59] along the nets that prohibit access to the arcades (see **Figures 26–29**).

¹² R. DE MARCO, *La ricostruzione post-terremoto. Alcuni punti di attenzione sul tema*, Ufficio Speciale per la Ricostruzione del Centro Storico dell'Aquila, Struttura Speciale di Alta Consulenza, documento 9.3, febbraio 2011: "At the occurrence of a situation such as the one described, which seems to be characterized by extemporaneousness and poor transparency, at least three categories can be identified as being particularly penalized: the citizen who should have guaranteed rights rather than being subject to extemporaneous concessions, the administration and local authorities of direct reference".



Figure 25.
L'Aquila, the "red zone" of via Costa Masciarelli, in the historic center (photo S. Gizzi, 2011).



Figure 26.
"We have a dream: L'Aquila", written along Corso Vittorio Emanuele II (photo S. Gizzi, 2010).



Figure 27.
L'Aquila, the keys to the houses declared uninhabitable hung by the inhabitants, as a sign of protest, along Corso Vittorio Emanuele II (photo S. Gizzi, 2010).



Figure 28.
L'Aquila, the keys to the houses declared uninhabitable hung by the inhabitants along Corso Vittorio Emanuele II, together with the words "We have a dream: L'Aquila" (photo S. Gizzi, 2010).



Figure 29.
"The protest of the thousand keys": "removing the rubble from L'Aquila", from "Il Corriere della Sera", Monday 22 February 2010.

This testifies to the existence of a particular form of emergency psychology [60], which also manifests itself as a communion of punishment among the entire population.

5. Possible Prospects for L'Aquila

Immediately after the earthquake several initiatives were organized by Italian architects, restorers and planners. These included numerous conferences, seminars and some operational 'laboratories', organized by the Istituto Nazionale di Urbanistica e dell'Associazione Nazionale dei Centri Storici (National Institute of Urban Planning and the National Association of Historic Centers). A series of nine workshops on the theme of the recovery of L'Aquila were also organized by the architects, Pierluigi Properzi, professor at the local Faculty of Engineering, and,

Carlo Gasparrini from the Federico II University of Naples, and a member of the group which drew up of the Regulatory Plan of Rome.

Many points of interest emerged from the first meetings and, since they are still very topical, it seems appropriate to recall them briefly.

At the meetings it became clear that a cultural project, aimed at the reconstruction of the city, did not yet exist. The inaugural workshop was introduced by Pierluigi Properzi and Marco Romano. Piero Properzi, emphasized both the need for a plan of reconstruction and the importance of avoiding any strong differences of opinion; confirming a categorical no to the opposition *historic center-periphery*. Marco Romano, former member of the Consiglio Nazionale per i Beni Culturali (National Council for Cultural Heritage), emphasized the opportunity of developing an aesthetic vision, or 'aestheticizing' the city by establishing, as a priority, the restoration of the major thoroughfares - the Corso, with its arcades and adjacent squares.

Raffaele Colapietra - professor of modern history at the University of Salerno, author of numerous texts on the history of L'Aquila, and interviewed in the internationally successful film, *Draquila*, by Sabina Guzzanti - strongly disagreed with Romano. He was the only resident of L'Aquila who has not left his home in the center [61], despite the ordinances, and he stressed the importance of the urban and social history of the city. Pointing out how the appearance of the present city was a result of the rebuilding after the 1703 earthquake, and that the principle colonnaded axis (the colonnades are from the early twentieth century) were not at any time of primary importance. Likewise, Piazza del Mercato, which was strictly commercial in nature and had never been home to any monuments of importance.

The urgent need to recover the identity of the urban fabric (as opposed to the belt of new towns that were already appearing) was evident from the first meeting. Attention was also drawn to the delicate task of entrusting the reconstruction work to competent companies, experts in restoration (and consequently tenders), as well as the (few) advantages and (many) disadvantages of the European tenders, which risked - with the possibility of numerous appeals - to lengthen the time of "reconstruction."

The Mayor of L'Aquila, Massimo Cialente, was in agreement with this, and also with the need to immediately identify the first five most important areas within the walls to begin the works, starting with those on the edge of the oldest sectors, so as to experiment with the first 'reconstruction' sites.

There was criticism for the lack of reference in relation to technical and administrative aspects, compared to other experiences, where the results could already be assessed; such as the 1976 earthquake in Friuli (particularly at Venzone, where restoration and anastylosis of the main monuments and the historical fabric of the city was prompt) and also those of the Marche in 1979 and 1997, and Umbria in 1997.

The necessity for precise mapping of the damage, the need to immediately repair the underground infrastructure and the necessity to 'evaluate' the strategies were highlighted by the urban planners, Bruno Gabrielli, Pierluigi Properzi and Elio Piroddi (former professor in L'Aquila and now Professor of Urban Planning in Rome).

To these considerations, further indispensable issues needed to be added and addressed; such as the choice to prioritize and strengthen the continuity of identity through the enhancement of the various overlapping historical fabrics, partly still recognizable. Starting from those of the Swabian (a faint trace remains in the *Borgo di Rivera*), the Angioinian, and up to the Spanish city and that of Margaret of Austria, natural daughter of Charles V and governor of L'Aquila between 1572 and 1586 [62-64], (for whose entry into the city, the "Porta della Barete was restored,

where she had to enter, raising the walls and the two side towers, and decorated with fresco paintings by Giovampaolo Cardone”) [65].

While not forgetting the importance of the more recent periods, found particularly in the urban areas with a concentration of liberty architecture (Villa and Santa Maria di Farfa) and rationalists (already highlighted by the Italian section of the Do. Co.Mo.Mo.) [66]. Any substitution, even minimal, of these buildings would be serious and could become grim and compromising. Think also of particular road axes, with double curvature and stately and patrician buildings (Via S. Marciano, Via del Cembalo dei Colantuoni), where inappropriate building replacement could have a profound effect, like a foreign body in a fabric that has reached a centuries-old balance.

Of course, the question is always linked to the quality of the planning, and what is going to be rebuilt or integrated /replaced. But, it is necessary above all to avoid a 'façade' approach, that is, to preserve only the exterior at the expense of emptying the interior. It is essential to preserve the typologies as a whole, and particularly the minor fabric which characterizes the entire center. There is no doubt that it is easier to deal with the restoration or reintegration of 'monuments', and that it is much more difficult, but necessary, to preserve the identity of minor buildings, even the private ones (over which the Superintendence and the Ministry have, in fact, no competence or control).

Concerning the principle area of restoration, Marco Dezzi Bardeschi, in agreement with Mario Manieri Elia, Giovanni Dispoto and the author, reiterated the need to maintain the palimpsest of the stratifications (to which the recent one should be added, also as architectural language). This wiped clear any misunderstanding of "demolition – reconstruction". The priority must be that of conservation, both material and not, and at most consolidation (to be implemented with traditional non-invasive techniques, avoiding the cementing of historic masonry) [67].

Giovanni Dispoto, Director of the Dipartimento di Urbanistica (Department of Urban Planning) of the City of Naples, was asked to review (improve) the technical-administrative process with which the earthquake problem was tackled in Naples after November 1980. Among the mistakes to avoid, was that of preventing getting locked into 'rigid' and 'invasive' structural consolidation solutions (in Naples there was the voluntary help of the two Faculties of Engineering and Architecture).

On the regulatory front, it was hoped there would be a special law for L'Aquila. Recalling that the Italia Nostra association asked the Ministero per i Beni Culturali (Ministry for Cultural Heritage) to extend a restriction to the entire historic center, creating perplexity since it was not possible to declare the interest of pulverized or destroyed buildings. The former Superintendent Renzo Mancini had attempted the same thing in the eighties, but the Tribunale Amministrativo Regionale (Regional Administrative Court) ruled against him for lack of motivation.

It would have been possible to make a request to the Organo Centrale del Ministero (Central Body of the Ministry) to obtain a waiver or a variation to the *Codice dei Beni Culturali* (Cultural Heritage Code), or to provide some form of targeted protection, especially for private minor construction. In this regard, Bruno Gabrielli, was of the opinion that the Piano Regolatore (Master Plan) or the Piani Attuativi (Implementation Plans) should already contain guarantees (if conceived well) for an adequate degree of protection.

Gasparrini too, believed that it was not possible to define or decree by law the "beauty" of an historical center, even if it is particular, like that of L'Aquila ("a little Florence"). The matter needed to be presented on the basis of *civitas* rather than *urbs*, that is, to prioritize more the union of citizens than the formal organization of the city. In particular, as he wrote in a brief note to those present, "defining a national and/or regional legislative text that indicates and regulates the

reconstruction of the historic center and the use of public and private resources, but using different methods from the past.”

Among the various proposals made after the earthquake, that of the Prime Minister Silvio Berlusconi, appeared singular (even if it embodies the ideas of “non-experts”), regarding the kind of reconstruction or restoration for L’Aquila. In a television interview five months after the earthquake he said, “In front of each building the question will be: can we reconstruct it by repairing the damage? Is there any certainty that it can withstand other tremors with these works or will we have to demolish and rebuild it with modern anti-seismic techniques?”¹³

In this case, what we have suggested - but it’s also the logical solution - is that the frontals, sculptures, and all things of artistic or historical interest are removed and stored. The building is rebuilt according to the anti-seismic reinforced concrete technology, and then the same frontals, windows, sculptures and bas-reliefs are reinstalled. It is a very long work. For all of L’Aquila, and I don’t want to demoralize anyone, it will take from five to ten years.

But today, above all, it is necessary to bring back the small productive ‘stimuli’ or attractors to the characteristic points of the historical city of L’Aquila, without compromising the stages of an urban restoration that still appears long and difficult.

6. Possible models for reconstruction

6.1 Criteria for possible models of reconstruction

Currently, for a number of reasons, seven years after the earthquake of April 6, 2009, there is still a lot of confusion and uncertainty about the most appropriate criteria to be adopted.

It is necessary to consider that, as in other cases, it is not useless to recall some background perspectives relating to the multiple components of the quality of living, including safety, in living environments of historical and architectural value. As has rightly been written, the rediscovery of historical and cultural heritage makes sense precisely as it is the rediscovery of the factors of community cohesion and identity that attest to its roots, even as an alternative to the consolidation of global networks [68].

However, as regards L’Aquila, since no overall plan has yet been drawn up, work has proceeded “by feel”. There have also been numerous controversies about the slowness and delay of the current rebuilding, including journalistic ones [69], warning above all that “with single decrees [from the Municipality] instead of an overall plan, many buildings would remain rubble” [70].

Likewise was the plea - dating back to the earthquake in Irpinia, but still very current- by Palma Bucarelli (a famous critic and art historian) to avoid the rash and unconsidered use of self-propelled machines and earth loading shovels. “The intervention of the bulldozers is unjustified for the unsafe monuments, where in many cases it was possible to shore them up, and think of a rapid restoration” [71].

A call to which, Marcello Vittorini, a town planner from L’Aquila seconded. Recalling a forgotten earthquake in Abruzzo in the middle of the last century “In the earthquake of 1950, [...] less serious than the latter, [...] only the commonplace existed, there were no civil protection laws. [...] At that time the uncivilized

¹³ Speech by Silvio Berlusconi on the program “Porta a Porta”, Rai 1 TV, hosted by Bruno Vespa, dedicated to “L’Aquila e tutto il resto”, 15 settembre 2009.

bulldozer was not thought of at all, even the stones, the cornerstones were preserved” [72].

Now the city is abandoned it is transforming itself into a small Pompeii,¹⁴ into a large, “emptied mausoleum” [73]. As the former President of the Fondo Ambiente Italiano (National Trust of Italy) said “It is obvious that the danger to L'Aquila and the surrounding towns affected by the earthquake, is that it will give rise to a type of modern suburban chain,” which “could lead to the abandonment of those historic centers, that need to be restored and filled with the life that was there before”¹⁵

Ada Negri in the poem, “Nel paese di mia madre”, describes the memory of the smell of a living city, of a historical nucleus, albeit melancholic. “Power of death, power of life, in the smell of the ashlar: the earth enjoys it from the deep humus, under the August blaze that stands motionless” [74]. In reality, the authoritative voices of urban planners warn instead of “a ransom”, a total estrangement and detachment [75].

Instead it may be useful to reflect, even if it is lengthy, on the methods and criteria of restoration/reconstruction, given that that the historical center is of a fair size. The two extreme alternatives, renovation à l'identique (borrowed from many similar examples) and replacement/insertion of contemporary architecture, appear conceptually both possible and probably, yet it is still too early to make a decisive and final choice.

Concerning these two positions and limiting ourselves to what has been published in recent years, we note some significant writings.

The publisher-architect Mario Ferrari notes the correctness of the reference to “as it was and where it was,” but with different human, modernized nuances; “In the haste to ensure that the developments in reconstruction legislation - in the sacrosanct unity of the “Aquiliani “on the principle that everything must be redone as it was and where it was - an unusual hope grows within me. That is, even within the framework of a faithful reconstruction of the city, this piece of history [the void caused by the earthquake] will not be erased. I hope that [...] in the future urban layout there is planned a presence of small *mementi mortis*, opportunities for reflection on the transience of human destiny, on those 25 eternal seconds that have dissolved the city” [76].

Numerous authors have expressed themselves in favor of the second hypothesis, most recently Federica Di Vincenzo in “Mu6”. “Restoring the formal integrity of some buildings may make no sense [...]. It is also necessary to make a distinction between buildings of cultural interest [but here we don't take into account the minor buildings!] and those of simple civil construction [...].

We need to think carefully about the advisability of re-proposing, unconditionally, the same city to which we were accustomed and for that reason is familiar and comforting. One should not be afraid to open oneself up, the right amount, to the

¹⁴ B. BOLOGNA, *Crolli a Pompeii e L'Aquila sospira “che ne sarà di noi”*, in “Abruzzo 24 Ore”, 8 novembre 2010: “And to say that many have often thought ‘don't let L'Aquila become another Pompeii’, but what they would want to add is: ‘uninhabited and deserted like Pompeii after the eruption [...] L'Aquila like Pompeii screams: we need funds, protection, effective politics and not special effects. [...] We need to think about what tools are necessary to revitalize the entire national archaeological heritage”.

¹⁵ G. M. MOZZONI CRESPI, *Ibid.* But cf. also C. FIUMI, *Il volo difficile de L'Aquila. Tra bilanci e ricordi, fotografia collettiva di un popolo che non dimentica*, in “Sette”, 25 marzo 2010. Even the current Undersecretary for Cultural Heritage, Ilaria Borletti Buitoni, reiterated the same concept in an interview: “I believe that in five years, if the rubble remains rubble, the spirit and soul of the historic center of L'Aquila will remain those of Pompeii”; cf. I. BORLETTI BUITONI, “L'Aquila è morta, sembra Pompeii”, in “Corriere della Sera”, domenica 10 dicembre 2010, cronache, p. 23.

possibility of contemporary architectural works, sometimes aimed at remembering - why not - what has happened in the history of one's city" [77].

The problem is that in none of the Italian cases, in which building replacements or renovations were carried (either due to seismic events or war damage), was the result satisfactory. It was almost always a question of architecture "put in place", of poor quality. This is evident in the examples of Genoa, Treviso, Ravenna, Pistoia, Viterbo and the Florentine Arno River itself, in which the replacement works appear lacking in originality, banal and unsatisfactory.

Even in the most recent opinions in favor of complete restoration there are nuances, gradations and subtleties worthy of attention. Those who have often been supporters of the need for renovation/reconstruction according to the original lexicon of lost parts, ask themselves the following question. "In L'Aquila, before rushing into a reconstruction exactly the same as the pre-existing one, we should - in the name of a truly correct philology - ascertain whether the bourgeois buildings [...] have remained themselves, or have they not been too modified in height and not only, have variants been introduced either to make the buildings more habitable to the various families over time, or by the promotion from bourgeois to patrician".¹⁶

Basically, therefore, one asks to which historical phase of the building to refer to, so that "it would be advisable to return to heights from the ground of no more than two or three floors".¹⁷ According to this practice, much emphasis was placed on the advisability of a *philological reconstruction* (a study day was organized on this subject in Rome, "Il terremoto in Abruzzo. Per una ricostruzione filologica. Precedenti e prospettive"¹⁸), with a perspective different to that of restoration tout-court.

Among the authoritative voices in favor of a reconstruction 'as it was and where it was', that of Paolo Portoghesi stood out in affirming the rightness "of reconstructing the ancient buildings as they were," considering that "in the case of a vast and generalized destruction [...], the upheaval of places goes hand in hand with that of habits, feelings and inveterate customs, especially in people of a certain age, causing tremendous suffering. To the tragedy of destruction is added that of adaptation to a totally new reality" [78].

He did not, however, exclude the possibility offered by contemporary building, provided that it was outside the historical center. "The idea of constructing totally new buildings, perhaps in different areas could be correct, as long as one thinks of urbanized areas provided with all the services, arising as a replacement of the peripheral areas [78].

Along the same lines, but with different nuances, Franco Purini and Italo Insolera expressed themselves. Franco Purini in support of the need for a "philological method" for works in the historic center¹⁹; and Italo Insolera in support for

¹⁶ Cfr. P. MARCONI, *Cosa fare nelle città distrutte dalla guerra, dai terremoti o dall'uomo?*, in "Ricerche di storia dell'arte", 99, 2009, dedicated to "Com'era dov'era. Dopo il terremoto, o la guerra", pp. 77-101, specially p. 82.

¹⁷ *Ibid.*, p. 82.

¹⁸ As part of the *Master* in "Conservazione e Recupero dell'Edilizia Storica dell'Università degli Studi di Roma Tre", il 18 settembre 2009.

¹⁹ Cfr. The interview of F. ERBANI, *Terremoto e ricostruzione. Il dramma de L'Aquila e dei paesi abruzzesi interroga architetti e urbanisti*, in "La Repubblica", 9 aprile 2009, a Franco Purini e ad Italo Insolera. Purini argued that "the recovery of a destroyed historic center must be carried out with a philological method, but new neighborhoods [not new cities] are indispensable [...]. It is precisely the ancient that asks us this because the building heritage of the past may not suit the needs of sustainability and safety. New neighborhoods, that however create public spaces, and facilitate the formation of communities".

the theory that “cities cannot be thrown away and rebuilt, they are points where many activities converge [...] which can't be invented”).²⁰

6.2 Policies for the best reconstruction models

Of course now it no longer serves to regret the failure to implement a proper prevention plan, as it was opportunely pointed out by the Ministry; noting how “the approach should have been different”, without “waiting for the event (the seismic one or any other) to occur”, preventing “the catastrophic aspects [...] without considering in any way the possibility of exchanging restoration with prevention” [79].

Precisely on the basis of this experience, the same Ministry recently drafted the *Linee Guida per la valutazione e riduzione del rischio sismico del patrimonio culturale* (Guidelines for the assessment and reduction of the seismic risk of cultural heritage) [80, 81], in alignment with the new technical standards for buildings, in which there are many examples of applications relating to the Abruzzo capital.

In this regard, we recall the admonition of Roberto Pane as early as 1980. “The earthquake is a violent and merciless tester; it shakes every masonry structure, causing the crumbling parts to collapse; and for modern factories, the discovery of the unforgiving failure and fraud in the use of reinforced concrete” [82].

The subject, especially for civil construction, is complicated by the fact that many buildings have “imploded”; the risk now being that they will be completely emptied and their typology changed (see **Figures 30–36**).

Undeniably there is the possibility of recomposing by anastylosis, the stone blocks lying on the ground of the various ‘workshops’ (along the lines of the



Figure 30. *Porta Napoli, at the end of Corso Federico II, immediately after the partial collapse (photo S. Gizzi, 2009).*

²⁰ *Ibidem*. According to Insolera “a perfect solution does not exist. The best results came by examining everything with a fine toothed comb. Cities cannot be thrown away and redone; they are the point where many functions converge - homes, work, offices - which are not invented. More than the English new towns, I would look at the Ina-Casa neighborhoods, built in Italy from 1949 to 1963”.



Figure 31.
L'Aquila, collapses and props along the axis of Via Roma (photo S. Gizzi, 2010).

reintegration of the Cathedral of Sant'Andrea Apostolo in Venzone after the earthquake of 1976 [83–86], and which has recently been discussed regarding L'Aquila²¹). Proceeding first with the “presentation on the

ground” of the recovered ashlars, after identification and graphic restitution of the same²²; as in the case of the many numbered pieces belonging to the Basilica of Santa Maria di Collemaggio, arranged in the field behind and ready for a welcome reassembly.

In this regard, one of the most urgent anastyloses should, in our opinion, concern one of the most singular artifacts of architecture. Namely the evocative perspective canvas (painted dome) by Venanzio Mascitelli [87], dated 1827, in the Cathedral of SS. Massimo and Giorgio (created on the example of Andrea Pozzo's false dome of Sant'Ignazio in Roma –1685-), and now totally shattered: a work that always aroused the admiration of visitors and faithful.

The collapse was obviously favored by incorrect previous restorations. Now the restoration has begun, thanks to the help of the Fire Brigade, with the support of the Istituto Superiore per il Restauro e la Conservazione (High Institute for Conservation and Restoration), which has recovered the canvas cut in nine pieces [88].

Paradoxically, since the current earthquake, it has been possible to collect information of some interest: among the collapsed parts pre-existing architectural elements have been recovered (and exhibited in a special exhibition). Some are from the Angioinian age - which had been reused inside the new walls after the earthquake of 1703 [89] - components of which there were no memory. “Stone elements [...] of some of the most ancient monumental complexes of L'Aquila, of which any trace and memory had been lost” [90]. These were, in any case, works carried out in

²¹ See, for example, S. BUCCI, *I monumenti perduti tra restauro e clonazione. Esperti divisi. I casi di Venzone e di Pavia*, in “Corriere della Sera”, 9 aprile, 2009: “According to Roberto Cecchi [...] you can choose, after an earthquake, to reconstruct exactly the original, as was the case for the Cathedral of Venzone [...], or [...] as in Noto, where work was done by integrating the old and the new. Or, again, it is possible to act by mending, [...] healing the wounds”.

²² G. ZANDER, *Persepoli. Una testimonianza di come si lavora insieme*, in “Antiqua”, anno II, n. 5–6, settembre-dicembre 1984, pp. 123–132, especially p. 131: “L'anastilosi deve avvenire in due tempi: ricomposizione a terra [...] e ricollocazione in opera”.



Figure 32.
L'Aquila, collapses in the historic center: Tartari house, from the 15th century (photo S. Gizzi, 2010).

continuity with the pre-existing masonry, with the same or similar techniques and technologies (see **Figure 37**).

All this has been lost over the years, the memory. The criteria for restoration have increasingly turned towards the use of heavy, invasive and poorly thought-out technologies, aimed, above all, at the use of reinforced concrete. In this sense the incorrect restorations were not so much those, discussed at length by Superintendent Mario Moretti (in the 1970s), on the various churches in L'Aquila (*in primis* Santa Maria di Collemaggio²³), but the previous ones with the insertion of reinforced concrete. For example, the intervention of Ignazio Carlo Gavini, in the wake of Gustavo

²³ On Mario Moretti, in addition to the well-known literature, I also reference the thesis, supervised by me, of Sara D'Aurelio "La figura di Mario Moretti, soprintendente e restauratore in Abruzzo", a.a. 2003, Facoltà di Conservazione dei Beni Culturali dell'Università degli Studi della Tuscia di Viterbo.



Figure 33.
Onna, near L'Aquila. Collapses and rubble (photo M. M. Segarra Lagunes, 2011).



Figure 34.
Onna, near L'Aquila, detail (photo M. M. Segarra Lagunes, 2010).



Figure 35.
Collapses in Paganica, a hamlet of L'Aquila (photo S. Gizzi, 2011).



Figure 36.
Fire brigade in Onna, after the collapses (photo S. Gizzi, 2010).

Giovannoni and Gino Chierici, as well as those carried out by the Civil Engineers and then by the Provveditorato alle Opere Pubbliche (Superintendency Public Works), from post Second World War to 1962 [91]. However, it was the use of reinforced curbs which Moretti used for raising the roof of the central nave of Santa Maria di Collemaggio and San Pietro di Coppito, as well as similar interventions in Santa Maria Paganica, that were one of the causes for the current disaster.

Yet, just think, that even after the Irpinia earthquake, widespread use of cementing historic masonry and the insertion of materials incompatible with the ancient structures continued. It seems significant that, in 1982 (two years after that earthquake), the conference “Terremoto e centri storici” (Earthquake and historic



Figure 37. L'Aquila, church of Santa Maria Paganica. Reused stone elements that came to light inside the eighteenth-century walls after the collapse (photo S. Gizzi, 2010).

centers) was held in Pescara, the capital of Abruzzo, as if foreseeing what would happen in 2009.

“Why was this initiative held in Abruzzo? As Abruzzo is one of the regions with greatest seismic risk in Italy, and because the conditions of abandonment of almost all the historic centers put the Region in conditions very similar to those of Irpinia before 1980”, wrote the former President of the Abruzzo Regional Council of “Italia Nostra” in the introduction to the Conference [92].

At that forum in 1982, over thirty years ago, Superintendent Renzo Mancini noted that “the Abruzzo records have been enriched by the knowledge of some of the typical consequences of earthquakes” [93], it was still valued that “where possible in principle, we intervene with reinforced concrete curbs” [93], citing a series of examples such as: the churches of San Pietro ad Oratorium in Capestrano, San Filippo in L'Aquila, Santa Maria delle Grazie in Civitaretenga. Precisely those

that in the current earthquake would have suffered the most structural damage even if, “in the theory of restoration, the walls were left with their original bulge denouncing the historical phenomenon of collapse and its causes” ([93], p. 55). But Giulio Pane had already observed the risk, “These interventions, like a hat, are nothing but a greater risk! [94]”.

6.3 Practice. Possible procedures for reconstruction

Now, the fundamental problem is that of understanding the specific traditional techniques of L'Aquila, of the ancient masonry structures, of the mortars, on which considerable progress has been made (thanks to the research carried out by the Universities of Aquila [95] and Chieti²⁴). Overcoming the idea - due to the history of restoration in L'Aquila - which until now was only concerned with the major buildings [96–98], such as the Palazzo and the municipal tower (already restored after the 1703 earthquake [99]). And for civil construction, the dismantling and reassembling of the “Cancelle” [100], and of a small building used as shops in the Renaissance period (overlooking the Piazza del Mercato, and moved early in the twentieth to a back alley), today seriously damaged by the earthquake.

Some consolidation techniques used after the 1703 earthquake did prevent the total collapse of the structures, but were rendered partially ineffective by subsequent



Figure 38.
The words “L'Aquila is reborn” on a restoration site scaffolding (photo S. Gizzi, 2014).

²⁴ Cfr., for example, C. VARAGNOLI, *Tecniche costruttive tradizionali e terremoto*, in “Ricerche di storia dell'arte”, 99, 2009, *cit.*, pp. 65–76; of the same A., *La costruzione tradizionale in Molise e l'esperienza del terremoto*, in A. ANTINORI (Ed.), *Città e architettura in Molise nell'Ottocento preunitario*, Gangemi, Roma 2006, pp. 81–102, e ID. (Ed.), *La costruzione tradizionale in Abruzzo. Fonti materiali e tecniche costruttive dalla fine del Medioevo all'Ottocento*, Gangemi, Roma 2008. Cf., also, S. RANELLUCCI, *Manuale del recupero della regione Abruzzo*, DEI Tipografia del Genio Civile, Roma s/data. See also L. ZORDAN, *Tecniche costruttive dell'edilizia aquilana. Tipi edilizi e apparecchiatura costruttiva*, in M. CENTOFANTI – R. COLAPIETRA – C. CONFORTI – P. PROPERZI – L. ZORDAN, *L'Aquila città di piazze. Spazi urbani e tecniche costruttive*, Carsa, Pescara 1992, pp. 80–111, e L. ZORDAN, *Gli elementi costruttivi e le maestranze*, *ibidem*, pp. 112–159.



Figure 39.
L'Aquila, panels with the figures of the reconstruction sites located under the arcades of Corso Vittorio Emanuele II (photo S. Gizzi, 2014).

restoration with extensive use of reinforced concrete. For example: the wall spurs (frequently inserted in churches) [101], and the wooden chains used by Giuseppe Valadier in the dome of the Suffragio, along the lines expressed in *Architettura Pratica* [102].

Finally we are now moving towards the union and bonding of industrial and traditional techniques, as is being experimented in Collemaggio (for the first consolidation work after the collapse [103]) as well as at Santa Maria Paganica and the church of the Suffragio. Overcoming the long-standing and sterile diatribe between the supporters of pre-modern consolidation systems and those of innovative contemporary ones, and moving forward in a balanced search for technologies compatible with the historic heritage, which also represents a hope for the future of L'Aquila (see **Figures 38 and 39**).

7. Conclusions

The need to revive everyday life and put a stop to depopulation should have led to widespread reconstruction, but in most cases the lack of a culture of conservation and restoration became evident. Modern solutions, alien to the context, were chosen which ignored both the problem of protection and those of the compatibility of contemporary building in historical centers.

After the emergency works government action should be indispensable and a priority; proposing also development and promotion goals for the areas affected by such a devastating earthquake.

Similar issues to these had already been addressed in a book by Salvatore Boscarino relating to other earthquakes in the 1980s, coining the term “restoration of necessity” [104].

A new culture must play an important role in affirming a different relationship between man and the environment. The tragic event in the L'Aquila area highlights a balance that must be achieved through eco-sustainable choices.

Of course, the study presented here does not claim to be exhaustive. But it can certainly be useful as a reflection and a starting point for other types of analysis to be carried out on the relationship between both natural and man-made disasters and the problems related to the permanence of the population in the areas affected by them, including how to curb the phenomenon of depopulation.

The strength of the work, however, is the new approach to restoration and conservation. That is, restoration and conservation that must be understood not only as safeguarding values and material content, but also those of memory and intangible worth. It is not, therefore, only a question of merging restoration into town and architectural planning (which remain autonomous or separate disciplines), but also of proposing possible interventions linked to the memory of places and the inhabitants which are affordable to the Municipal administration and the various communities and Institutions.

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Health Seeking Behaviors among Displaced Populations/Refugees

Chika Ejike

Abstract

The United States resettles refugees every year. Their population in south-central Kentucky (KY) is diverse and fitting to research into culture-dependent healthcare utilization patterns. A mixed study was conducted with one hundred and ten semi-structured questionnaires and three individual interviews. Significant differences were observed between the use of healthcare services and refugees' nationality ($F(5, 98) = 4.29, p < 0.001$), acculturation ($t = -2.03, p < 0.04$), and interpreters ($t = 1.92, p < 0.05$). Beliefs affect use through the level of cultural competency of the healthcare provider. These findings contribute to the health policy debates surrounding this culturally diverse population.

Keywords: refugees, cultural competency, health delivery, acculturation, utilization, immigrants

1. Introduction

The immigrant population in the United States (U.S.) is on the rise; refugees and resident aliens are not excluded. Southcentral Kentucky, with its substantial refugee population is an exemplar of an idealized community that the world is a global village. The process of migration involves varying degrees of economic, social, and environmental dislocation, all of which affect the health and well-being of migrants in the period following migration [1]. Refugee migration, access to healthcare, and physical health are related in complex ways that work to the disadvantage of these immigrants [1]. Once in the host country, refugees more likely live-in poverty and face substantial economic barriers relative to access and utilization of medical care.

Differences in healthcare utilization among refugees from developing countries occur due to the strong impact of culture on health. Hence, immigrant culture poses a challenge in seeking help [2]. To understand cultural underpinnings of health and the use of health services among immigrants especially refugees, it is essential to note that decisions relating to healthcare use are bound by a social context [2]. The use of formal healthcare is constrained by the lack of knowledge, limited resources, and access to care, as well as cultural differences in illness and help-seeking behavior [2]. Despite the increased interest in refugees' use of welfare and social services, and in the future of the American healthcare system, surprisingly little is known, especially on a national level, about the healthcare utilization patterns of migrants or their participation in government funded insurance programs [2]. Some researchers are aware that statistics may mask differences in health service use and reasons people seek professional care; therefore, it is important to combine qualitative and quantitative approaches to broaden our understanding of the study.

2. Background

The 1965 amendments to the Immigration and Nationality Act, which changed the pace and composition of immigration to the United States, will have continuing ramifications for many years. Refugees are individuals who have been forced to flee their country of origin due to fear of persecution caused by racial, religious, or social group identification and those who have refugee status in the U.S. [3]. Unlike other immigrants, for example, foreign workers, tourists and students, refugees do not leave their home country by choice and cannot or will not return to that country.

The United States is a melting pot, one that retains cultural richness from various populations [4]. Considering the extent of ethnic diversity in the American society, surprisingly few empirical investigations exist on health service use among refugees. Researchers also know little about the extent to which the healthcare system addresses the needs of these individuals. However, as the U.S. immigration quotas increase, more research is needed on specific immigrant populations to learn about their unique cultural patterns of healthcare utilization. The importance of understanding the concept is evident by the less than sufficient scholarly work about this group [2]. Various studies have shown that limited information exists on refugees' knowledge of healthy behaviors, how much they engage in such behaviors, or whether they have the desire to learn healthier habits when needed. Researchers have identified a growing body of knowledge surrounding the influence of culture on health behavior and healthcare utilization practices [4]. Obvious reasons exist to expect differences in healthcare utilization among refugees' due to the impact of culture on health [5].

This study helps to better understand the role of culture in health service use. In addition, it provides insight and data about the refugee community in south-central, Kentucky, and similar rural areas [2]. The study examines useful information about the expectations or needs of refugees as being consumers in the healthcare system of the U.S. and highlights cultural patterns in their knowledge of preventive health and health-seeking behaviors [2]. Furthermore, to serve more appropriately this category of immigrants i.e., refugees, it is essential to understand the unique cultural beliefs and values that influence their utilization of healthcare services, their health status and health outcomes [2]. Recognizing the dynamics between culture and health is essential, thus, culture guides and influences various aspects of life, including health [2].

To address the healthcare needs of these refugees', this study reports on the culturally associated patterns in healthcare service use. Hence, the influence of culture was viewed as refugee cultural characteristics, perceived barriers, and perceptions on health status with regards to utilization of healthcare services. The research questions were as follows [6]:

1. What is the extent of relationship between Frequency of Use of Healthcare Services and the refugee cultural markers?
2. What is the extent of relationship between Frequency of Use of Healthcare Services and barriers as identified by refugees?
3. What is the extent of relationship between Frequency of Use of Healthcare Services and refugees' perceived needs?
4. To what extent does a relationship exist between services available at a healthcare facility and the Frequency of Use of Healthcare Services, i.e., Cultural Competency of Services?

3. Method

3.1 Study design

This study was conducted in 2016 and employed a mixed-study research design. Statistics alone may mask differences in actual health service use and the reason people seek professional care; therefore, it is important to combine both qualitative and quantitative approaches. This approach not only allowed the researcher to collect thoughts on culturally diverse health-seeking behaviors via questionnaires, but helped to integrate further in-depth understanding, feelings, reflections, and clarity on the research questions and the topic during interviews.

3.2 Study population and sample

The target population was identified as refugees who reside in the city of Bowling Green, Kentucky (in the United States), from 2012 to 2016, are registered with the International Center, and fit one or more of the following criteria [2]: (a). Have been forcibly displaced outside their native countries with a history of hardship, including war, famine, and violence, (b). Have spent a part of their lives in refugee camps, (c). Have resettled in Bowling Green over the past 5 years (i.e., 2012 to 2016), (d). Have used a healthcare facility (urgent care clinic, ER, hospital, health department) at least once. Based on these criteria the actual target population was 3,371 refugees. As identified in **Table 1**, refugees meeting this criterion include: Afghans, Burmese, Burundians, Congolese, Cubans, Iraqis, Nepalese (Bhutanese), and Somalians. A convenience sample of 110 refugees was gathered from the target population because of the non-static nature of the refugee population and challenges in assembling individuals within each refugee group [2]. Nations represented in the study sample as exemplified by **Table 1** below were, Burma (which are one of the largest refugee group in Bowling Green), Burundi, Democratic Republic of Congo, Cuba, Iraq, Nepal (Bhutan), Somalia and Others (Bosnia, Pakistan, and Saudi Arabia). A purposeful sample of four individuals fluent in English were selected for the individual audio-recorded interviews. They included one Burmese, two Congolese and one Iraqi who had given prior consent. See **Table 1** (*here*).

Country	Target Population	Study (n)	Sample (%)	% of Target Population
Afghanistan	62	—	—	—
Burma	2122	38	(34.50)	1.79
Burundi	37	3	(2.70)	8.10
DRC	141	19	(17.20)	4.63
Cuba	170	12	(11.00)	1.71
Iraq	362	9	(8.20)	2.48
Nepal	155	8	(7.30)	5.16
Somalia	322	7	(6.40)	2.17
Others	—	14	(12.70)	—
Total	3371	110	110	3.26

Note. DRC – Democratic Republic of Congo.

Table 1.
 Population and sample percentages per refugee group, 2010–2015.

3.3 Study instrument

A questionnaire was developed after an extensive literature search. The questionnaire was based on the Andersen-Newman theoretical framework and centered on factors that influence health service utilization. Participants completed informed consent forms. The final instrument consisted of 27 Likert-type questions, five open ended, 10 yes or no, and 15 demographic or background questions.

A pilot study was conducted to test the validity and reliability of the survey instrument. The participants for the pilot study were non-targeted refugees from two main refugee groups in southcentral Kentucky: the Burmese and Congolese populations. The participants in the pilot study were precise in their feedback of the instrument [2]. The researcher then reviewed the information provided, conducted an exploratory factor analysis to validate the instrument.

Factor analysis was conducted on the pilot data. Data checks confirmed that the distribution closely met assumptions relevant to factor analysis, i.e., the sample size ($N = 158$) was sufficient to support the maximum number of items (27 items). Cronbach's alpha for each scale demonstrated adequate to strong reliability. Seven factors emerged with two to five items, which produced a high Cronbach's alpha with values ranging from 0.742 to 0.913. Four items on the initial draft of the survey instrument overlapped other items during factor loading: I live near (within 3 miles/5 km) to a healthcare facility (loading as 0.578); I understand all the instructions given by the medical professional (loading as 0.469); I feel frustrated going to a healthcare facility because nobody understands my language (loading as 0.547); There are interpreters in my language at the healthcare facility (loading as 0.460). As these items were deleted from the final questionnaire, the number of items on the final survey instrument was reduced from an initial 31 to 27 [2]. Descriptive statistics for individual items are provided in **Table 2**.

The questionnaire was translated to various immigrant languages for example, Arabic, French, Spanish and Swahili for those who did not understand English. Questionnaires and informed consent forms were distributed at the International Center, the Community Action of Bowling Green, the Neighborhood Community Services, and the Bowling Green Housing Authority.

3.4 Variables

The rationale for including four independent variables (Predisposing Factors, Enabling Factors, Need-Related Factors, and Cultural Competency of Services) and the dependent variable (Frequency of Use of Healthcare Services scale) was grounded in theoretical and conceptual considerations derived from the Andersen-Newman framework. Three of the four sets of items under the Predisposing Factors were chosen because of their relevance to the cultural identity of refugees: Native Language, Nationality, and Religion are fundamental to any group [2]. The items within Enabling Factors (Number of Years in the U.S., Have Health Insurance, Educational Level, Available Transportation, Make an Appointment, and Friendly Environment) can be expected to influence refugees' attitudes about using available healthcare services. Need-Related Factors (Gender and Age) affect refugees' health status or their individual perceptions on health. Finally, the level of Cultural Competency of Services (Interpreters and Health professionals understand patient's condition) items are related to whether a given healthcare facility was tailored toward meeting refugee health needs [2].

The dependent variable for this study was the Frequency of Use of Healthcare Services scale as defined by the number of times in the past year participants used available healthcare services, such as the emergency room, family planning

services, visiting friends and family that were hospitalized, and urgent care centers [2]. The Frequency of Use of Healthcare Services scale consists of 5 items: (a). In the past year, I have visited the emergency room for a life-threatening medical condition “x” number of times, (b). In the past year, I have received family planning services at a healthcare facility (e.g., Contraceptives) “x” number of times, (c). In the past year when sick, I have visited/scheduled an appointment at a healthcare facility “x” number of times, (d). In the past year, I have visited a sick family member or friend at a healthcare facility “x” number of times and (e). In the past year, I have been sick or injured “x” number of times [2].

3.5 Data collection—interview

Individual interviews were conducted with a subset of the participants who opted to participate in this format of the study. The informal interview involved the researcher recruiting refugees who were fluent in English to prevent translation errors that could introduce study bias and issues with response delays [2]. Four participants one Burmese, two Congolese and one Iraqi consented to be interviewed via audio recordings lasting on average 50 minutes using a set of 13 semi-structured, open-ended questions to explore the various perspectives on culture and health-seeking behaviors among refugees. These questions were developed to explore the cultural characteristics, barriers, need-related health issues, and level of Cultural Competency of Services used with the aid of the Andersen-Newman conceptual model on healthcare service utilization. Although all participants were asked about general community issues, some participants were asked to describe their personal experiences as follow-up.

3.5.1 Data quality control

The information culled from the questionnaires were reviewed and checked for completeness. The questionnaire was initially prepared in English and later translated into four different languages. It was also pre-tested prior to the actual data collection. Changes to the interview questions included (1) modification of words and sentences used, and (2) reduction in the number of questions asked to avoid redundancy.

3.5.2 Ethics—institutional review board

Formal letter of approval was obtained from Western Kentucky University Institutional Review Board committee. The respondents were informed about the objective and purpose of the study. Verbal and written consent were obtained from each respondent during data collection.

3.5.3 Data analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS) 23 software. Variables which found to be statistically significant at $p < 0.05$ were identified as independent cultural predictors of health care service use. Audio-recordings and notes taken during the interviews were transcribed. After listening to the interviews many times, the transcripts were reduced, coded, and categorized into themes, and finally triangulated with the quantitative results.

4. Results—quantitative findings

The study participants were predominantly female (65%) and identified as Burmese (34.8%). All of them spoke their native language because none identified

English as their spoken language. Majority identified with Christianity (71%) as their form of religion [6]. An average of two years in the U.S. indicated that most of the participants were new arrivals to the U.S. Almost all participants (80.2%) identified as having received some form of health insurance policy on arrival to the U.S. See **Table 2**. In addition, a little over a third (36.7%) reported having at least an elementary school education from their home country. A smaller proportion (31.2%) identified as either fully employed or working part-time. Most respondents were married (70%) with at least one child living in the home (53.6%). A large majority used Medicaid (83.87%), which is provided a few months after arrival in the U.S. The results also show that most respondents (55.4%) receive some form of assistance, e.g., Supplemental Nutrition Assistance Program (SNAP) from the U.S. government until they find sustainable jobs [6].

Regarding frequency of use of healthcare services, most of the refugees (83%) indicated that they had not visited the emergency room (ER) for a life-threatening illness; 11% had visited the ER once in the past year [2]. Nearly all refugees surveyed (96%) indicated they had never received family planning services or contraceptives from their health department. This could indicate that some aspect of the respondents' culture (e.g., belief or religion) does not advocate the use of contraceptives or that respondents were reluctant to disclose this information. Nearly half (42%) had visited or scheduled an appointment with a healthcare facility during the past year. Of these, some (17%) had done so at least twice and a few (5%) at least five times. Concerning visiting sick friends or family members at the hospital in the past year, the majority (74%) of those surveyed indicated they had not done so. For those who claimed to have been sick or injured in the past year (32%), some (2%) had been sick six times and one person (1%) indicated being sick at least 20 times [2]. See **Table 2** (*here*).

Item	Frequency (N)	Percent (%)
Gender		
Female	69	65.09
Male	37	34.91
Age		
17–28 yrs.	35	32.71
29–38 yrs.	30	28.04
> 39 yrs.	42	39.25
Nationality		
Burmese	38	34.86
Congolese	19	17.43
Cuban	12	11.01
Iraqi	9	8.26
Nepalese/Bhutanese	8	7.34
Others	23	21.10
Language		
Arabic	10	9.80
Burmese	18	17.65
Karen/Karenni	12	11.75
Somali	3	2.94
Spanish	10	9.80
Swahili	18	17.65

Item	Frequency (N)	Percent (%)
Others	31	30.39
Religion		
Buddhism	9	9.00
Christianity	71	71.00
Islam	17	17.00
Other	3	3.00
Number of Years in U.S.		
< 2+ years	67	60.91
> 3+ years	43	39.09
Educational Level		
< High School	51	52.04
> High School	47	47.96
Have Health Insurance		
Yes	81	80.20
No	20	19.80
<i>N</i> = 110.		

Table 2.
 Summary descriptive statistics for predisposing, enabling, and needs-related factors.

Student t-test, ANOVA, and correlation analyses were used to assess the association between the predisposing factors and frequency of healthcare services use. **Table 3** further explains these results. An $F(5, 98) = 4.29, p < 0.001$ finding indicates that nationality/ethnicity plays a role in the use of healthcare services within the refugee population in southcentral Kentucky. Religion was not found to significantly influence the use of healthcare services.

The extent of relationship between Frequency of Use of Healthcare Services and identified barriers were assessed. Number of years in the U.S. were categorized into two distinct groups: those living in the U.S. for two years or less and those living in the U.S. three years or more. A significant association was found between those that have lived in the U.S. for over three years and a visiting or scheduling an appointment with a healthcare facility during the past year: and $t = -2.03, p < 0.04$, meaning that acculturation plays an important role in service use [6]. More so, a significant association was also observed between the number of years in the U.S. and visiting a friend or family member at a healthcare facility in the past year: $t = -2.43, p < 0.01$. There is a measure of familiarity with the units/services of a health facility because of one's level of acculturation [6]. The number of years in the U.S. was also found to be significantly associated with respondents' health status in the past year (whether they have been sick or injured) $t = -2.22, p < 0.03$. This result indicate that the longer refugees acculturate with their host country, the more likely they become aware of acceptable ill or health seeking behaviors. Thus, demonstrating an increase in service use, literacy, and awareness of available services due to duration of stay [6].

Health insurance coverage and the use of available healthcare services was examined among refugees. A significant association was observed between health insurance coverage and visits to the emergency room in the past year $t = -3.35, p < 0.001$. Also, a significant relation was found between health insurance coverage and visiting a sick family member or friend at the hospital within the last year

$t = -3.00, p < 0.003$. From these findings it can be deduced that possessing a health insurance card to an extent determines access to a health facility [6].

Student t-test was used to assess the cultural competency of services. A significant relationship was found between interpreters and the frequency of use of healthcare services (visited the emergency room in the past 1 year), $t = 1.92, p < 0.05$. This means that refugees were more likely to visit a healthcare facility where interpreters were available. Many respondents indicated the presence of interpreters at their local health facility, hence the frequent visits to the emergency room [6]. See **Table 3** (*here*).

Frequency of Use of Services	<i>p</i> value	<i>t</i>	Factors
In the past year when sick, I have visited/scheduled an appointment at a healthcare facility	0.04	-2.03	Number of years in the U.S.
In the past year, I have visited a sick family member or friend at a healthcare facility	0.01	-2.43	Number of years in the U.S.
In the past year, I have been sick or injured "x" number of times	0.03	-2.22	Number of years in the U.S.
In the past year, I have visited the emergency room for a life-threatening medical condition	0.001	3.35	Health Insurance
In the past year, I have visited a sick family member or friend at a healthcare facility	0.003	3.00	Health Insurance
In the past year, I have visited the emergency room for a life-threatening medical condition	0.05	-1.92	Interpreters

* $p < 0.05$ – significant level, *NOYUS – number of years in the U.S.

Table 3. Associations between dependent variables (frequency of use of health care services) and independent variables: number of years in the US, health insurance, and interpreters.

4.1 Results—interview findings

Demographically, the four interview participants included one Burmese, two Congolese and one Iraqi, ranging in age from 38 to 75 years with an average age of 56.5. This group did not provide an exact representation of refugees in Bowling Green. Educational attainment on the average was at least a high school degree from their respective countries, and all four subjects were married [2]. Three of the four were gainfully employed; the 75-year-old Burmese immigrant was retired. The sample consisted of three Christians and one Muslim. The study research questions constituted the framework for exploring the existence of cultural influence on the use of healthcare services through the lens of the four interviews [2]. Central themes identified include: (a) Importance of taking care of one’s health, (b) Refugees’ barriers to use of available healthcare services, (c) Perceptions on physical and psychological state of health, and (d) Issues of cultural competency of the healthcare system regarding knowledge about foreign disease conditions or ailments.

4.1.1 Importance of taking care of one’s health

All the respondents believed that good health was important for working effectively and contributing one’s quota to the American society (being a taxpayer) and

the local community, and for paying domestic bills. Besides, good health provides peace of mind and this, in turn, is necessary to maintain their daily activities [2].

4.1.2 Refugees' barriers to use of available healthcare services

The Burmese point of view (on barriers to use of health services) was that refugees not only have challenges with transportation, but also with inadequate health insurance coverage. It is safe to say that most Burmese refugees favored proximity in the use of healthcare services.

"Most refugee [according to my experience/observation] do like to go to the doctor nearest to them"

He also added that language could be a barrier [2]:

"The greatest problem of most refugees from Burma arriving in Bowling Green, is language. Most of them have not gotten the chance to learn English. A person without a sound knowledge of English surely would face many difficulties in communication. Therefore, the first important thing is education. The necessary organization should provide opportunities or programs so that refugees could learn English until they can speak and write English, so that what they say could be easily understood by an American listener or speaker".

Views expressed by the two Congolese refugees on barriers were that not only was transportation a challenge, but also the affordability of public transportation.

"We need transportation, it's really a big problem in our community because most of us don't have transportation, we've (refugees) missed so many doctor appointments. Therefore, we decided to start the association ARIKY (Association of Rescue and Intervention of Kentucky), because of this kind of issues"

They also added,

"I think we still have more challenges as refugees. One is transportation, even if we call 911, some people cannot afford the ride. Another is getting a driver's license because of the language barrier. So current challenges include transportation, interpretation, and translation.

Similarly, the Iraqi interviewee identified transportation and language barriers as the two main limiting factors to accessing available healthcare services [2],

"The first thing I would talk about is the transportation – it is very important to the patient. S/he is ready to stay at home and stay sick [without transportation], plus it is linked with the language barrier. So, if s/he cannot speak English and has no means of transport that is a big problem, just like it happened for one of the refugees"

Another reason he gave was the feeling of camaraderie with the healthcare professional,

"For example, most of the Iraqis go to Morgantown city because there is a doctor there that speaks Arabic. They feel that they can communicate and understand the doctor well".

4.1.3 Perceptions on physical and psychological state of health

Through the interview questions, the refugees provided insight about perceptions of their physical and psychological state of health. The 78-year-old Burmese immigrant presented age-related diseases such as cataracts, hypertension, and a case of hyperuricemia as his main health concerns. However, the Congolese viewed their health concerns in a different manner. According to them, before arriving in the U.S., they passed through screening and health checks and were cleared of all forms of chronic or infectious disease. Thus, they came into the U.S. with a clean bill of health. However, having lived for a few years in the U.S. and beginning to work in different factories, they began to develop some health concerns, such as eye infections, ear-aches, or headaches. The Iraqi refugee, as a certified medical interpreter, noticed that most refugees have high cholesterol levels and complain of joint and back pains [2].

Regarding the difference in men and women experiences with healthcare providers, the Burmese immigrant remarked that there is a clear difference:

“Men prefer men doctors, and the ladies prefer lady doctors in Burmese culture”. He added that religion played a role... “It’s also a concern with the religion Buddhism. Even among Burmese Christians, women should be treated by women doctors only, men likewise”

The Iraqi claimed it was about culture:

“In our culture, it is not acceptable that a female, if pregnant or with other medical concerns sees a male doctor” He continued: “She needs to see a female doctor [like a gynecologist]. They prefer that because it is part of our culture”

The Congolese participants indicated a different perspective, and thought religion was based on the individual, whether male or female. Both genders may have personal preferences and religion may not play a significant role in their choice of healthcare provider.

4.1.4 Issues of cultural competency of the healthcare system regarding knowledge about foreign disease conditions, presentations, or ailments

This theme sought to examine the issue of cultural competency of the healthcare system regarding knowledge about foreign disease conditions or ailments presented by immigrants, such as the case of Ebola in the U.S. or the current outbreak of the Zika virus. Also noted was the availability of services such as interpreters toward which refugees would naturally gravitate [2].

The Burmese interviewee said...

“The health departments should provide basic health education pamphlets and occasional health education talks translated in Burmese language on certain topics that are important to refugee health”.

The same views were shared by both Congolese refugees, with practical examples [2]:

“An example of language barrier - there was a pregnant lady, we took her to the hospital, and the health professional said, “No you’re not ready to deliver now, you can go home”. She could not argue, and she went home. After 2 hours, she delivered at home. I think the problem was an existing language barrier, so we need interpreters”

The Iraqi believed interpreters are needed; however, effective interpreters must fully understand the culture of that patient:

“An interpreter that understands the patient and can communicate the same to their health care provider bridges an important gap, due to differences in culture and beliefs. The interpreter should be an expert in the patient’s culture and can aid to avoid many points of misunderstanding between the health professional and patient”

Generally, the interviews ended on a note of admonition, motivating refugees to learn the English language, obtain a job, encourage others in the community to do the same and make an appeal to the health care system to improve its quality of service to accommodate the increasing influx of refugees.

5. Discussions

The study provides a better understanding of the role culture plays in health service use. In addition, the study gives useful information about the expectations or needs of these refugees as consumers in the healthcare system of the U.S. and highlights cultural patterns in their knowledge of preventive health and health-seeking behaviors [2]. The results of the study relate to the literature on behavioral patterns in the use of healthcare services by refugees.

The study results revealed a significant relationship between nationality and the number of times refugees have visited a healthcare facility to visit a friend or family member. The frequency of healthcare service use is essentially independent of refugees’ native language and religion with an exception to refugees’ nationality which was significant. This influence is like other research findings [7]. Findings on language and religion can be viewed from the perspective that ethno-medical approaches, such as the use of spiritual folk healers and folk remedies, affect the health outcomes of refugees [8]. In addition, some immigrants and refugees prefer spiritual healers rather than physicians to treat culture-bound syndromes because it is their belief that the physicians do not possess the knowledge or the understanding to treat foreign disease syndromes. Therefore, a need exists to create more awareness through interpreters, communication experts, and translated health bulletins about the effectiveness of evidence-based clinical practice [2].

The length of stay in the host country influence refugees’ use of healthcare services including visiting/scheduling appointments. Besides, possession of health insurance is related to ER visits. This is another similar finding which suggests that trust in Western medicine also appears to be influenced by acculturation level (Number of Years in the U.S.), indicating that greater levels of acculturation are related to greater trust in modern medicine [9]. It has been observed that in the U.S, access often is synonymous with health insurance and to some degree equality in the utilization of healthcare services [10].

Although no age or gender differences were observed in the use of health services, one would expect there to be a significant difference, i.e., more vulnerable populations (women, children, the elderly) would be expected to use services more than others (men, teenagers) in each community [2]. Demographic indicators of health status (i.e., age, gender) are among the strongest predictors of those who use healthcare [11].

Regarding cultural competency of services from the refugees’ perspective, the *t*-test for presence of interpreters at a health facility was only significant ($p = 0.05$) for *D1 – I have visited the emergency room for a life-threatening medical condition.*

However, from the healthcare providers view, identified barriers were reported as, lack of funding, and supports to meet the language and cultural needs of refugee patients, uncertainty about refugees' entitlements to healthcare, uncertainty about continuity of care, and difficulties with making appropriate referrals [12].

The results from the interviews depict what has been echoed that lack of language supports, difficulties with accessing specialty care, unfamiliarity with referral procedures, limited information on finding services, confusion about the roles of different health professionals, and overall challenges with navigating the healthcare system are all reported healthcare barriers from the perspectives of refugees [12]. Language barriers can reduce the quality of care, while the use of trained interpreters can improve access, quality, and patient satisfaction [13]. Moreover, to date, published research has indicated that immigrants face significant challenges regarding healthcare access [14]. It has been suggested that such challenges include lack of health insurance, lack of interpreters, discrimination based on race or accent, and lack of understanding on the part of doctors regarding immigrant or cultural perspectives on illness [14].

6. Strengths

The use of a mixed study design helped in gaining an in-depth understanding of health seeking behaviors among refugees. For example, these participants openly shared and expressed their feelings about each interview question. At times, there were laughs, sighs, and long thoughtful pause, before reasonable responses or perspectives were given. Even though some of their thoughts and feelings mirrored responses received from participants who completed items on questionnaires, other opinions or suggestions represented new insights or ideas [2].

7. Limitations

Despite the information provided, the study was not without limitations. The sample of refugees is only representative of the general refugee population in south-central Kentucky. Hence, there is inadequate generalization and transferability with the study. Also, an inability to compare the use of Western healthcare services to informal alternatives to medical care i.e. a case of whether informal alternatives affected the numeric strength that used available services (because they had local alternatives at home). More so, researchers have suggested that refugees use local or herbal remedies (Complementary, Alternative and Integrative Therapies - CAI). Some studies have portrayed the substantial effect of legal status, service use, and interactions with service providers by refugees. This study overlooks the issue of legal status (e.g., refugee versus asylum-seeker; refugee versus resident alien) which could be used to identify to what extent one's duration of stay is due to legal status and how much of this status helps in reducing fear encountered in contacting a physician or utilizing services at their local health facilities [2]. Response bias was also a limitation to the study due to the tendency of a respondent to answer questions on a survey untruthfully or misleadingly.

8. Recommendations

a). Refugees are less likely to access healthcare than citizens, regardless of insurance status; therefore, studies comparing uninsured citizens and uninsured

refugees are needed to further understand differences. b). Healthcare cost is a growing concern within the U.S, the presence of free community clinics is both cost- and resource-saving. Studies are needed to accurately determine the cost-saving benefit of free community clinics or county health departments in the setting of a literacy center, e.g., the International Center. Such studies may help address the pressing issues of health cost and language barriers in healthcare delivery [2]. c). Providing potential access to the healthcare system, however, does not guarantee utilization. Therefore, the relationship between a regular source of healthcare and utilization of healthcare services varies and should be further studied

9. Conclusion

Immigrants and refugees are a growing component of the U.S. population, and their ability to access and utilize healthcare is an increasing public health concern. Healthcare disparities and problems with healthcare access exist among immigrants and refugees [15]. This mixed study explored the relationship between refugee culture and the actual frequency of use of available healthcare services. Demographic factors directly impacted access through nationality and indirectly through language and religion, while social factors and beliefs impacted access through acculturation, health insurance and the level of cultural competency of a health care facility or provider. Despite accessibility of services, without perceived or realized need for services among immigrants, utilization may not occur [16]. Hence, the continued need for awareness and preventive health education.

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Researching into Commitments for Sustainable Development Goals and Healthy Aging

Santosh Kumar Mishra

Abstract

Implementing the Programme of Action (PoA), for the purpose of attaining Sustainable Development Goals (SDGs, also known as the “*Global Goals*”, adopted by UN Member States in the year 2015) requires, among other contributing factors, specific strategies on: (a) *aging*, and (b) *health*. The PoA was adopted at the International Conference on Population and Development (ICPD) that took place at Cairo, Egypt, in the year 1994. In view of these facts, the author of this paper makes two research statements: (a) “*SDGs and healthy ageing (HA) are connected*”, and (b) “*international community, across the regions of the globe, needs to make advocacy efforts for HA*”. These considerations gain increased significance if one looks at demographic trends: significant portion of the world population are older (also known as “*older people*”, “*older adults*”, and “*older citizens*”), with projections that share of older people (over the age of 65 years) will double by the end of 2050. The “UN Decade of Healthy Ageing (2021-2030)”, is, thus, a significant development. The author, in the present work, *primarily* attempts to discuss and debate specific initiatives (in terms of strategic interventions) that stakeholders need to undertake for the purpose of ensuring HA. It has been concluded on several platforms that “*attainments of SDGs are closely linked with HA*”. This research note also presents quick highlights on how SDGs and HA are inter-linked. In terms of research mythology employed here, the author has collected secondary data (largely ‘*qualitative*’ in nature) from various sources (*quoted under references*). Method of data analysis is ‘*descriptive*’. To sum up, key for HA aging lies in enlarging opportunities for positive health at all stages of life.

Keywords: Healthy Aging, Sustainable Development Goals (SDGs), Elderly Population, Millennium Development Goals (MDGs), Aging, Older People, Initiatives, Strategic Interventions, and Programme of Action (PoA)

1. Introduction

It has been increasingly recognized that all persons (of both sexes: males and females), in all parts of the planet, should be accorded with an opportunity that will facilitate them to live both “*long and healthy life*”. As against this commitment to long and healthy life, several international research institutes [including the office of the World Health Organization (WHO)], however, is of the opinion that the environments in which people live can (a) either favor health, or (b) be harmful to it [1]. The author of this paper makes a specific point here that the term

'environments' refer to situation which is multi-dimensional in nature. Environmental situations, from this point of view, are influenced together by four broad sets of contributing factors, namely,

- a. peoples' behavior;
- b. exposure to health risks (for instance, air pollution, violence, etc.);
- c. peoples' access to quality health (including social care); and
- d. the opportunities that aging brings in for people [1].

The term "healthy *aging*" (HA) refers to a situation wherein the policy makers and other involved stakeholders definitely resort to a process that ensures '*developing*' and '*maintaining*' the functional ability of older population. HA is, therefore, about creating the opportunities and environments that enable people to be (and to do) what they value throughout their live span. Under favorable situations, everybody can, therefore experience HA. However, it is pertinent to note here that merely being free of disease (or infirmity) is not a requirement for HA. This is because of the fact that since many older adults have one or more health conditions that, when well controlled, have little influence on their "*general well-being*" and overall "*better quality of life*" [1].

In the context of Sustainable Development Goals (SDGs) and HA, the conceptual framework of "*functional ability*" gains increased significance. The author of this policy paper briefly discusses here the modality of inter-connections between functional ability and HA (which, according to the WHO, can be defined as "*the process of developing and maintaining the functional ability that enables wellbeing among older age population*"). The WHO, *further*, states that the term "functional ability" is indicative of having the capabilities that enable people to be (and do what) they have reason to attach values in day-to-day life. *Furthermore*, in a more generalized sense, the relevant aspects of functional ability include a person's ability to make achievements in five matters, namely:

- a. *meet their basic needs;*
- b. *learn, grow and make decisions;*
- c. *be mobile;*
- d. *build and maintain relationships; and*
- e. *contribute to society* [1].

Most importantly, in addition to what have been stated above, the concept of functional ability envisages the intrinsic capacity of the individual, relevant environmental characteristics, and the interaction between them. The author makes a point here that "intrinsic capacity", the context of HA, comprises all '*mental*' and '*physical*' capacities that an individual can draw on in his/her life. In addition, these capacities (both "*physical and mental*") include peoples' ability in five key aspects, as outlined below:

- a. *to walk,*
- b. *to think,*

- c. *to see,*
- d. *to hear, and*
- e. *to remember* [1].

In the context of discussion on developing capacities in the five areas, as indicated above, it is important to note that the level of intrinsic capacity is shaped and influenced by several factors, such as (a) the presence of diseases, (b) injuries, and (c) age-related changes occurring in the individual human being. Apart from this, the author, in this introductory part of the paper (which primarily aims to give an insight into commitments for SDGs and HA), states that environments include:

- a. *the home;*
- b. *community and broader society; and*
- c. *all the factors within them* [1].

Notably, the factors within them, as outlined above, are comprised of aspects such as, (a) the built environment, (b) people and their relationships, (c) attitudes and values, (d) health and social policies, (e) the systems that support them, and (f) the services that they implement. The author of this research note makes a specific point here that being able to live in enabling environments that support and maintain peoples' intrinsic capacity and functional ability is key to HA [1].

HA is, therefore, one of the demographic indicators that all nations and societies strive to achieve, as mandated under the UN Decade of Healthy Aging (2021–2030). The functional ability, *in turn*, enables well-being in older age. *Further*, HA and functional ability (which, in broader sense, indicates: “*having the capabilities that enable all people to be and do what they have reason to value*”) of an individual are closely inter-connected. *Furthermore*, demographers, policy makers and other stakeholders are of the view that implementing the global strategy and action plan on two significant aspects will contribute to the realization of the SDGs: (a) *aging*, and (b) *health well-being* [2].

2. Materials and methods

2.1 Rationale and context

The SDGs (which are reflection of: “*universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030*”) were developed in order to secure the future for present and future generations. The 17 universally and unanimously accepted SDGs are integrated: they recognize that: (a) action in one area will affect outcomes in others, and (b) development must balance social, economic and environmental sustainability [3]. The author does not find it appropriate to highlight more about conceptual framework and scope of SDGs, as it is beyond the objectives of this research work. Findings of several research studies are indicative of the fact that many people from across the regions of the globe are, today, in a position to live longer. Also, it has been discovered that sizeable portion of the world's population are in the age that reflects “*older population*” (aged 65 years and above). There are projections (based on data published by the WHO) that the world's population of people over the age of 65, by the year 2050, will

double. Demographic change and/or indicator of this type has implications for sustainable development (SD). The SD is a concept that signifies economic development linked with non-depletion of natural resources. It has been found (in findings of several longitudinal studies conducted by national and inter-governmental agencies, including the WHO) that “*as people grow older, their health outcomes, needs and what they value can change*”. This scenario (connected with old age population) mandates that these changes must be researched into and tackled in appropriate and scientific manners. This will require envisaging “*multi-sectoral actions on ageing and health*”. This aspect, therefore, is critical. It requires support from researchers, academicians, university/higher education administrators, and other stakeholders [2]. The facts presented above signifies relevance of this work. The objectives and other details about methodology employed are outlined in subsequent sections.

2.2 Objectives

The author has divided objectives of this research paper into (a) general objectives, and (b) specific objectives. They are outlined in the following sections. Detailed description on objectives is presented below:

2.2.1 General objectives

In terms of general objectives, this policy paper outlines the concrete actions that are required if the current decade (or twenty-first century) is to be a success in terms of HA for all. Relevant discussion on policy matters pertaining to HA for all are presented by the author at appropriate sections of the work.

2.2.2 Specific objectives

With regard to specific objectives, this work primarily attempts to discuss and debate initiatives that stakeholders need to undertake for the purpose of ensuring HA for all on the globe. Specific initiatives, suggested by the author, are in the form of “*strategic interventions*”: both at macro and micro levels. *Most importantly*, the author has outlined actual initiatives (outcome/s of projects) undertaken in various parts of the globe in support of each suggested strategic intervention. Further, in view of the fact that attainment of SDGs is closely linked with HA, this research note also presents quick highlights on how SDGs and HA are inter-linked. In addition, in view of global COVID-19 pandemic (considered as one of the hardest medical and health emergency the mankind has ever encountered), the author has attempted to make quick presentation, in this work, on how national governments are addressing “*healthy lives and well-being for all at all ages*” (which come under the category of SDG-3). Since this does not come within direct purview of the objectives of this paper, brief discussion on COVID-19 response has been incorporated.

2.3 Type, nature and sources of data

In this section, attempt has been made to highlights the type of data used in this paper. Also, it discusses the nature of data and source (s) from where they (required for analysis purpose, in view of defined objectives) have been obtained. With regards to type of data, secondary data haven been used by the author. Data used are largely ‘*qualitative*’ in nature. Required data have been collected by the author from the secondary sources, largely published on internet platforms. They (data

sources) have been quoted under reference section of the work, as per standards research ethics. At this juncture, the author makes two specific points:

- a. *First*, only data published by reliable sources have been used by the author. Some of such sources include: (a) World Health Organization (WHO), (b) European Commission (EU), (c) United Nations Development Programme (UNDP), (d) Pan American Health Organization (PAHO), (e) WHO Regional Office for Europe, (f) European Research Area in Aging (ERA-AGE 2) (2020), (g) Australian Unity (2018), and (h) Economic Research Institute for ASEAN and East Asia (ERIA).
- b. *Secondly*, while quoting data sources (under references), the author has, wherever required (in case of copyright issues), obtained prior permission from the publisher. However, in some cases, email requests, sent for obtaining necessary permission for use of data (information), remained unanswered (for the reasons unknown to the author of this paper).

2.4 Processing and analysis of data

As outlined in the previous sections, the author has used data which are largely '*qualitative*' in nature, in view of objectives and scope of the paper. Thus, an attempt has been made to analyze the collected data (from secondary sources, quoted under references) in descriptive manner that ensures to meet objectives of this work; both general and specific objectives. No sophisticated statistical techniques have been used in this work. Nevertheless, the author makes a specific point in this section of the work that: "non-use of statistical or mathematical tools" (for the purpose of data analysis) does not defeat, in any manner, the purpose of "*qualitative research work method*" (which has been used in this paper to investigate into strategies needed to improve HA for all).

2.5 Methodology of data analysis

In this section of the paper, tool of data analysis has been discussed. As outlined above, the author has collected secondary data (largely '*qualitative*' in nature) from various sources (*quoted under references*) like books, book chapters, government publications, and publications of inter-governmental agencies (like WHO, EU, etc.). In terms of mythology of research employed here, method of data analysis is '*descriptive*'. Since this paper envisages secondary data collected from various sources, it involves "*desk-based research*". In addition, brief description of some of the key terms used in this research has been presented in the subsequent section. Conceptual framework of the frequented used terms has been briefly outlined.

Most importantly, in terms of plagiarism (which means "*the practice of taking someone else's work or ideas and passing them off as one's own*"), these issues are not prevalent in this research work. *However*, the author makes a specific point here that the readers of this work might find plagiarism (in terms of copying previous work) in some parts of this paper, although very limited in nature. This has resulted from the fact that while quoting examples of actual initiatives on HA on outcome/s of projects, undertaken in various parts of the globe (as outlined above, under sub-heading: General and Specific Objectives), not much changes the author of this work could make in presentation of the facts (data analysis). The author was, thus, inclined to make not much changes in text derived from various secondary sources

(indicated under reference section), failing which, the intended meaning (including the context) will be (or is likely to be) lost.

2.6 Scope and significance

This paper will give significant insight into strategic interventions that policy makers and stakeholders need to undertake for the purpose of ensuring HA all. This initiative will, *in turn*, facilitate achieve SDGs for all on a healthy planet by pre-defined time framework, i. e., the year 2030. Also, this work outlines selected actual initiatives (outcome/s of projects) undertaken in various parts of the globe in support of each strategic intervention suggested by the author in this work. Thus, based on findings and data analysis, lessons can be learnt. Some of the lessons (including programme innovations) can be replicated elsewhere in the area of HA. Importantly, the author has used three terms in this work: “older people,” “older adults,” and “older citizens”. They all carry the same meaning (people aged 65 years and above).

Additionally (and most significantly), the author categorically mentions herewith that, in this paper, these words have been used inter-changeably: (a) work, (b) research work, (c) research paper, (d) review paper, (e) manuscript, (f) research note, (g) *chapter*, and (h) policy paper. All these words, used in this manuscript, carry the same meaning.

2.7 Review of literature

Review of literature forms an integral part in research studies, especially in the field of social science research. It is for this reason that description on review of literature related to objectives of the research paper (and work done previously in the subject area, under study) needs to be presented. However, the author of this work did not find, despite several academic and research efforts (including consultation with experts in the field, located both in India and abroad), any relevant and meaningful research work that can be presented here as part of review of literature. This may be because of the fact that not much scientific work (that is available either in online or offline modes) has been done in the area of HA (for all). The author, thus, decided to not present any information under this section (review of literature) of this research work.

3. Description of key terms

In this section, the author briefly presents meaning and conceptual framework of some of key terms used in the present work. The idea behind this is that readers of this paper will understand the functioning framework within the context of which this research on strategies for HA for all has been authored. The key terms, arranged alphabetically, are defined below:

- a. *Active Aging* (AA): It is a concept recently coined mainly by two international development agencies, namely (a) the European Commission (EC), and (b) the WHO. The conceptual framework of AA evokes the idea of longer activity, with a higher retirement age and working practices. The concept of AA is based on three pillars, namely (1) participation, (2) health, and (3) security. The key aspects of AA are:

1. *autonomy* (which is the perceived ability to control, cope with, and make personal decisions about how one lives on a day-to-day basis, according to one's own rules and preferences);
 2. *independence* (which refers to the ability to perform functions related to daily living, that is, the capacity of living independently in the community with no and/or little help from others); and
 3. *quality of life* (that is an individual's perception of his or her position in life in the context of the culture and value system where they live, and in relation to their goals, expectations, standards, and concerns).
- b. *Aging*: The term '*aging*' (also sometimes written as '*aging*'), in the context of present work, and in its simplest form, implies "*the process of growing old or developing the appearance and characteristics of old age*". According to internationally accepted definitions (including definition accepted by the WHO), aged people (also known as "*older adults*", "*older citizens*", or "*older people*") are those aged 65 years and older. The projections made by the WHO are indicative of the fact that by the year 2050, 80% of all older people will live in low- and middle-income countries.
- c. *Elderly Population*: Elderly population (also sometimes termed as "*older people*" or "*older adults*") are those people who aged 65 and over. Other key descriptions and demographic characteristics of the elderly population are same, as outlined above (under Elderly Population).
- d. *Healthy Aging (HA)*: The concept of HA, in its simplest form, refers to "*the process of developing and maintaining the functional ability that enables well-being in older people*". Further, the functional ability refers to having the capabilities that enable people to (be and do what they have) reason to value. Furthermore, there are five key domains of functional ability [each of which can be enhanced (or constrained) by environmental factors]. These are the abilities to:
1. *meet basic needs*;
 2. *learn, grow and make decisions*;
 3. *be mobile*;
 4. *build and maintain relationships*; and
 5. *contribute to society*.

In the context of HA, policy makers and demographers opine that longer life brings with it opportunities, not only for older people and their families, but also for societies as a whole. It is advocated that additional years provide the chance to pursue new activities in several new areas (such as further education, a new career, or pursuing a long neglected passion). Today, in the 21st century, with emergence of Internet technology, many more avenues exist and await ahead for older people (who also contribute in many ways to their families and communities). The extent of these opportunities and contributions, however, depends mainly on one single factor: health. There is, however, not much research evidence to suggest that older people today are

experiencing their later years in better health and well-being than their parents. Improving HA for all, is, thus, need of the hour in the new millennium.

e. *Millennium Development Goals (MDGs)*: There are eight MDGs with measurable targets and clear deadlines for improving the lives of the world's poorest people. In order to meet these goals (MDGs), including universal goal of eradicating poverty, leaders of 189 countries signed the historic millennium declaration at the United Nations Millennium Summit that took place in the year 2000. At that time (that is the year 2000), there were eight MDGs (ranging from providing universal primary education to avoiding child and maternal mortality) that were set to be met, with a target achievement date of 2015. At this juncture, it is pertinent to note that the MDG-F contributed (in both direct and indirect manners) to the achievement of the MDGs, with the main driver behind its work being the “*eradication of extreme poverty*”.

f. *Programme of Action (PoA)*: It is also sometimes known as the International Conference on Population and Development (ICPD) Programme of Action (PoA). Alternatively, it is also termed as PoA of the ICPD. The ICPD was held in Cairo, Egypt in the year 1994. It is pertinent to note that Conference (the ICPD) adopted a 20-year Programme of Action (PoA). Most importantly, the PoA of the ICPD envisaged a bold and new vision of the relationships between population, development and individual well-being. Adopted by 179 governments, the ICPD PoA marked a fundamental shift in global thinking on population and developmental issues. Most importantly, it moved away from a focus on reaching specific demographic targets to a focus on the needs, aspirations and rights of individual women and men. Another significant aspect of the ICPD is that the PoA asserted that (a) everyone counts, and (b) the true focus of development policy must be the improvement of individual lives. The PoA also highlighted that the measure of progress should be the extent to which the international community addresses inequalities. In addition, it has, over the years:

1. provided a foundation for the Millennium Development Goals (MDGs); and
2. contributed to significant improvements in poverty reduction, health, education, and gender equality.

g. *Population Aging*: Population aging is considered as one of greatest demographic challenges of the modern era. With the international community already entering in the 21st century, it estimated that global aging is likely to add to increased demand for socio-economic amenities and other developmental infrastructure on economies of all countries in the regions of the globe. Although older people are precious (in terms of enriched knowledge and life experiences they possess), they are often ignored resource that has potential to make an important contribution to the fabric of the societies. Demographers, from across the regions of the globe, are of the considered opinion that national governments, international organizations and civil society need to join hands together to enact “*active ageing policies and programmes*” that favor enhancement of health, participation, and security of older citizens in all possible manners.

h. *Sustainable Development (SD)*: The theory of SD provides guiding principle for meeting human development goals, while sustaining, at the same time, the ability of natural systems to provide the resources and ecosystem services on which the survival of the economy and society depends, from long-term point of view. The desired outcome of SD initiatives is situation wherein resources are used to continue to meet human needs without undermining the integrity and stability of the natural system. In its simplest form, the conceptual framework of SD can be defined as “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*”. Sustainability goals [such as the UN-level Sustainable Development Goals (SDGs)], address the global challenges, including:

1. *poverty,*
2. *inequality,*
3. *climate change,*
4. *environmental degradation,*
5. *peace,* and
6. *justice.*

The definition of SD, as outlined above, was developed for the first time in the Brundtland Report in the year 1987. The author of this work makes a point here that “*Our Common Future*”, also known as the Brundtland Report, was published in October 1987 by the United Nations (UN). The UN is an inter-governmental organization which strives, in consultation and close coordination of its several specialized agencies (spread all over the globe), to (1) maintain global peace and security, (2) develop friendly relations among nations, and (3) achieve international cooperation. Also, it (the UN) serves as a center for harmonizing the actions of nations, across the continents.

Specifically, SD, today, is considered as a way of organizing society so that it can exist in the long-term. What it implies is that there is need to take into account both the imperatives of the present and those of the future (such as the preservation of the environment and natural resources, or social and economic equity).

i. *Sustainable Development Goals (SDGs)*: The SDGs are also sometimes known as the “*Global Goals*”. They were adopted by United Nations (UN) Member States in the year 2015. This development (of adoption of SDGs or Global Goals) took place in response to universal call for action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by the year 2030. In total, there are 17 SDGs. Most importantly, they are integrated, in the sense they recognize:

1. *that action in one area will necessarily affect outcomes in other areas, and*
2. *that development must balance social, economic and environmental sustainability in a balanced manner.*

j. *UN Decade of Healthy Aging (2021–2030)*: It is also termed as “*Decade of Healthy Ageing*”. The UN has designated 2021–2030 the Decade of Healthy Aging. Under this initiative, the WHO has proposed a series of actions aimed at improving the lives of older people, their families, and communities. The author of this chapter makes a point here that initiatives proposed to be undertaken as part of the Decade (i. e., Decade of Healthy Aging) will seek the participation of older people, who will be central to and fully engaged in this multi-stakeholder collaboration.

4. Healthy aging (HA) and active aging (AA)

Author, in this section of the work, finds it appropriate to present brief discussion on two inter-connected concepts: (a) HA, and (b) active aging (AA). The HA was the focal term used in the initiatives on aging undertaken by international developmental agencies, especially, the WHO between the periods: 2015–2030. Notably, HA replaces the WHO’s previous focus on AA. The AA was a policy framework developed in the year 2002. The HA, like AA, places increased emphasis on the need for action across multiple sectors. Such initiatives are expected to enable older sections of the population to remain a resource to their (a) families, (b) communities, and (c) economies [1].

The AA, in terms of conceptual framework, is defined as “*the process of taking appropriate measures for the purpose of optimizing opportunities needed for health, participation and security in order to enhance overall quality of life as people age*”. More specifically, it (AA) is a term used to indicate the maintenance (and continuity) of positive well-being. Considered from this point of view, well-being also essentially takes into account two significant aspects, namely: (a) good physical, social and mental health; and (b) continued involvement in one’s family, peer group, and community. These developments continue throughout the aging process. Everybody can experience HA. The AA and the HA together help reduce the pressure on (a) health care, and (b) social services. It has been found that aged population (or senior citizens) can make important contributions to:

- a. *their families,*
- b. *their communities,*
- c. *the economy, and*
- d. *their nation (s).*

It has also been found that sections of the older people who stay healthy, active and independent can continue to contribute their skills, knowledge, and experiences for betterment of the society [4]. It is important to remember that process of preparing for an aging population is vital to the achievement of the integrated 2030 Agenda, with aging cutting across the goals on:

- a. poverty eradication,
- b. good health,
- c. gender equality,

- d. economic growth (accompanied by decent work),
- e. reduced inequalities, and
- f. sustainable cities.

Therefore, it is imperative to address the exclusion and vulnerability of (and intersectional discrimination against) many older persons in the implementation of the new Agenda to ensure sustainability in health initiatives. At the same time, it is equally important to go extra miles: beyond treating older persons as a vulnerable group. Today, there is increased need for macro level policies that ensure that older people are treated and recognized as the active agents of societal development. This, in turn, will ensure achieving transformative, inclusive and sustainable development outcomes. The vision, mission and ultimate objective of all these initiatives is to ensure that older adults have HA in the later stages of life, as shown in the **Figure 1**.

It is in this context that the emergence of Decade of Healthy Aging (2021–2030), proposed by the UN, gains increased significance. Plan of action, to be implemented under the Decade, will seek active support and partnership of agencies, such as:

- a. the United Nations Department of Economic and Social Affairs (including its regional commissions);
- b. the United Nations Population Fund;
- c. the Office of the High Commissioner for Human Rights;
- d. the United Nations Development Programme;
- e. the UN-Habitat;
- f. the UN Women;



Figure 1.
“Enabling Environment among Older Adults at Later Stages of Life”.

- g. the World Bank; and
- h. other relevant national, international and regional organizations.

5. Key considerations for healthy aging

The author of this review paper has previously outlined the conceptual framework of HA. An attempt has been made in this part of the work to research into key considerations that the policy makers and experts need take into account while framing guidelines for policies aimed at improving HA for all, in general. The author makes a point here that two aspects need special attention: (a) diversity, and (b) inequality. Brief description of these two considerations follows:

- a. Diversity: Older persons belong to different ages (or age groups), with different levels of physical or mental capacity. Considered from this point of view, they are diverse in nature. Aging policy should, therefore, be framed to improve their functional ability, irrespective of whether they are robust, care dependent (or in between) [1].
- b. Inequity: Inequity is another dimension of aging process. It has been found that significant proportion, nearly 75%, of the diversity in capacity and circumstance observed in older age is the outcome of the cumulative impact of advantage and disadvantage across lives of people. Again, importantly, one finds that the relationships older people have (or develop) with the environments, over the life-span, are shaped and influenced by factors such as (1) the family they were born into, (2) sexual orientation, (3) ethnicity affiliation, (4) level of education, and (5) financial resources [1].

The description presented above makes it important to frame policies for older adults that take into account both diversity and inequity aspects. Such an initiative will ensure HA for all. Health has a central place in SDG-3, entitled “*Ensure healthy lives and promote well-being for all at all ages*”. Also, meeting the goal of HA for all will require (a) commitments on the part of national governments (including all other stakeholders), and (b) enabling environment (that will be a facilitator while implementing actual actions at micro or community levels, across various societies and continents of the globe).

6. Discussion

As outlined above, ensuring healthy lives and promoting well-being at all ages is essential to sustainable development (SD). In this section of the present work, the author presents discussion and analysis of data on HA in the light of specific and general objectives. The discussion follows:

6.1 Inter-linkages between HA and SDGs

Implementation of action plan for ensuring HA will definitely contribute to the realization of the SDGs. It can be seen from developments taking place across the regions of the globe that the 2030 Agenda for Sustainable Development (2030 ASD, commonly known as: “2030 Agenda”) is manifestation of the plan of action (POA) to achieve universal SD in a balanced manner [2]. The POA of this type seeks to realize the human rights for all. In addition, it (the POA) calls for a demographic

scenario wherein: (a) no one is left behind; and (b) SDGs are met for: (1) all segments of society, & (2) at all ages, with special focus on most vulnerable ones, including older persons [5].

Preparing the global community for an aging population is, therefore, crucial for achievement of the “integrated 2030 Agenda”. *Further*, at this juncture, it is pertinent to note that integrated 2030 ASD of this type requires policy makers to *emphasize* (and also *prioritize*, wherever necessary and possible) addressing concerns of aging population in the context of significant demographic considerations: (a) *poverty eradication*, (b) *good health*, (c) *gender equality*, (d) *economic growth*, (e) *decent work*, (f) *reduced inequalities*, and (g) *sustainable cities*. Interventions in these areas are key to achieving overall sustainable development (SD) [5].

It is in view of scenario outlined above that the policy makers and all concerned stakeholders need to address the issues older citizens are confronted with, especially the aspect of: treating aged population as: “*vulnerable group*”. *Furthermore*, the integrated 2030 Agenda requires that sections of the population that are aged are accepted & recognized as: “*the active and more meaningful agents of desired changes in the society*” (at micro levels). This, *in turn*, will result in a situation that is conducive to achieve “*transformative, inclusive and sustainable developmental outcomes*” [5].

6.2 Demographic transition and need for ensuring HA for all (In the context of new millennium)

The new millennium is experiencing demographic transition that makes it necessary for all involved stakeholders to maximize initiatives, within the “*framework of available resources*”, for the purpose of “*ensuring HA for all*”. *More specifically*, this aspect gains increased significance when one looks at unpredictable challenges for health care the international community is confronted with: “*the human populations around the globe are rapidly ageing*”. Notably, demographic transition of this type (in terms of significant swelling of aging population) will definitely impact almost all aspects of society [3]. The author of this work outlines below the very specific context in which need for ensuring HA for all can be justified in academic and research terms:

It is decade-old saying that health is: (a) wealth, *in general*, and (b) central to meaningful older age experiences, *in particular*. The author, herewith, makes specific point that although people today (in the new millennium), are living longer, there are not many research evidences which indicate that the extra years (read: “*years spent on old age*”) are spent in good (meaningful) health [4].

One very significant (and also practical) aspect of “old age” (or “*older age*”) is diversity of: (a) *health*, and (b) *functioning*. This aspect of diversity is (often) a consequence of the cumulative impacts of advantage or disadvantage across people’s lives. The policy responses, therefore, need to be designed in manners that overcome (and not reinforce) these inequities. It is for these reasons that the global community together joined hands, in the year 2015, to implement the “*2030 Agenda for Sustainable Development*” (2030 ASD) [3]. The 2030 ASD includes: (a) 17 Sustainable Development Goals (SDGs), and (b) 169 targets. Both these SDGs and 169 targets were adopted on 25 September, 2015 by Heads of State and Governments at a special UN Summit. The 2030 ASD necessarily envisaged the plan of action on “*commitment to eradicate poverty and achieve SD by the year 2030 world-wide*”. Notably, this Agenda (ASD) ultimately aimed at ensuring that no one is left behind. The adoption of the 2030 ASD (also known as: “*2030 Agenda*”) was a landmark achievement, providing for a shared global vision towards SD for all [6].

The document titled “*2030 Agenda*” urges: (a) that “*no one on the earth will be left behind*”, and (b) that “*every human being will have the opportunity to fulfil their potential in dignity and equality*”. The document titled “*Global strategy and action*

plan on ageing and health (the Strategy)”, published by the WHO, adopted by WHO’s Member States in the year 2016, provides a policy level framework. This policy framework calls the international community to make efforts that are aimed at ensuring that “the global response to population ageing is aligned with this ambitious development agenda”.

The Strategy (based on research by the WHO and other inter-governmental agencies) is based on new document titled “*WHO conceptualisation of Healthy Ageing outlined in the World report on ageing and health 2015*”. This document focus on the absence of disease. This consideration definitely envisages HA from the perspective of the functional ability that enables older people to be (and to do): “*what they have reason to value*” [4]. The Decade of Healthy Aging (2021–2030) will serve as important tool in ensuring HA for all (including in meeting SDGs for all countries).

6.3 Strategic interventions needed for ensuring HA

The author of this research paper suggests strategic interventions that are needed for ensuring HA for all on the planet. As outlined under specific objectives, each suggested strategic intervention is supported by evidences [actual initiatives (outcome/s of projects) undertaken in various parts of the globe]. The description given below is divided under two sections: (a) Section-1: Strategic Priority Areas, and (b) Section-2: Priority Interventions. The discussion follows:

7. Section-1: strategic priority areas

7.1 Strategic priority Area-1

7.1.1 Statement: healthy aging over the life-course

The aspect of good health needs to be considered by all (including developmental planners) for overall SD. This acquires increased significance for older citizens or older people, as it helps them ensure independence, security, and continued productivity in later years of the life span. But it has been found that the non-communicable diseases (NCDs) (especially diabetes, cancer, cardiovascular disease) have potentialities to (a) deteriorate (and diminish) quality of life of aged population, (b) increase costs incurred towards health-care, and (c) add to pressure on family members (and others around) responsible for their care [7].

Addressing the NCDs among senior citizens becomes challenging for the health care providers. This concern is considered to be one of the key factors (a) in furthering HA (health gains) at higher ages, and (b) for resigning policies aimed at attaining long-term health and social sustainable goals. It is pertinent to outline here that NCDs account for considerable loss of “*healthy life years*” among aging population [8]. An individual’s health, including the level of activity, during older age, therefore, depend on his/her living circumstances and actions (over a whole life span). Priority area in this matter will definitely (a) “*promote health*”, and (b) “*prevent diseases*”. Maintaining mental capacity (and overall) well-being, thus, deserves attention by policy makers and other stakeholders [8].

7.1.2 Evidence in support of statement

With regard to priority area titled “Healthy Ageing over the Life-Course”, several initiatives have been undertaken across the regions of the globe. The European Research Area in Aging (ERA-AGE), for instance, launched and implemented joint

research programme in aging by publishing a call for multidisciplinary research applications on the “Active and Healthy Ageing Across the Life Course” in Europe. Aspects to be considered under the “Active and Healthy Ageing Across the Life Course” are outlined in the **Figure 2**.

The call, in response to Active and Healthy Aging Across the Life Course approach is dedicated (a) to the achievement of enhanced and healthy aging and, (b) in particular, to address the major priority established by the Active and Healthy Aging Innovation Partnership (AHAIP). This project aimed at increasing healthy life expectancy by 2 years in the European Union (EU) by the year 2020. This is Europe’s first response for aging research. It also envisages second round of ERA-AGE’s post-doctoral fellowship programme, known as Future Leaders of Aging Research in Europe (FLARE) [9].

7.2 Strategic priority Area-2

7.2.1 Statement: health and long-term care systems fit for aging population

Attainment of long-term health care system that is appropriate for aging populations is another area of concern. This should form part of strategic priority area. In this context, the question needing answer is: what can be done in order to ensure that different levels of health (and social) care: (a) are better coordinated, and (b) provide services that are appropriate for sections of the aging population confronted with multiple chronic conditions and functional limitations? [8].

The above consideration becomes more important in view of increasing governmental spending on providing quality health care for older people (especially in the long-term) everywhere (and more in the context of countries in the European region. There are research evidences that suggest that several of the older people, today, look forward to enhanced access to high-quality healthcare services. Health care expectation of this type also includes informal health care that is provided by: (a) “family members”, (b) “network of friends”, and (c) “civil society members” at large [8]. The author (of this work) makes special mention here that contribution of these sections of the population makes difference, as they are health care providers who



Figure 2.

“Active and Ageing Across the Life Course” in Europe model. [Source: Sheffield University (year of publication not mentioned). “Futurage: A Road Map for European Ageing Research”. Sheffield, United Kingdom: Department of Sociological Studies, Sheffield University (Accessed on April 10, 2021 from: https://www.age-platform.eu/sites/default/files/Research-briefing_futurage.pdf)].

truly understand the health concerns due to their close connections (and prolonged interactions) with aged people in course of social living.

7.2.2 Evidence in support of statement

In support of programme undertaken in response to 2nd priority area named “Health and Long-Term Care Systems Fit for Ageing Population”, the author presents here the example of Approach to Geospatial Modeling (AGM) initiative which was undertaken in Australia. As a part of this project (AGM), an effort was made to select and ascertain health and aging demand (in terms of “*community needs*”) and supply (in terms of “*social infrastructure available*”) indicators. Further, these indicators have been mapped on the basis of publicly available data projected for the years 2025 and 2040. Furthermore, the programme implementers used trend data and current state data in order to determine assumptions about projected future: (a) ‘*demand*’, and (b) ‘*supply*’. It is interesting to note that the resulting maps enable to illustrate both the level of current and projected demand and supply. Most importantly, this exercise enabled find out the gaps that prevail in provisions of social infrastructure by local government area (LGA). The AGM initiative considered three focus areas, namely:

- a. Aging Well,
- b. Chronic Diseases, and
- c. Mental Health.

It is pertinent to note that these three focus areas were selected (and scoped) based on these three parameters: (a) scale and burden of disease, (b) level of publicly available information, and (c) potential need for reform. It was found that within each area of focus, there are a range of measures that can be used as indicators of demand (or need). It is important to note that this approach provides summary of key infrastructure for health and aging in Australia. This list, however, is not a comprehensive. This is because of the fact that in Australia, many state (and local community) initiatives exist that are beyond the scope of this project to map in their entirety. In terms of outcomes of the initiatives of the AGM, it has been observed, in broad terms, that there are also key programmes and services that the project managers might be aware of. But the fact remains is that they (programmes and services) have not been able to map the required indicators due to the lack of sufficient publicly available data (that needs to be made available by the LGA). Most importantly, in terms of lessons learnt, it has been noted that continuation of the current health and aging models (like LGA) would require significant investment. This aspect is significant in order to meet the projected demand for infrastructure in years 2025 and 2040 in view of the fact that most obvious gaps remain in “aged care social infrastructure” [10].

7.3 Strategic priority Area-3

7.3.1 Statement: supportive environments

This aspect (of environments that are conducive and supportive) is important priority area. The author makes points that initiatives aimed at building (and creating) *supportive environments* is promising development. This type of promising development is reflection of network of cities and communities that: (a) interact

with each other in meaningful way, and (b) cooperate among themselves. This working mechanism creates age-friendly (and supportive) environments [8].

7.3.2 Evidence in support of statement

In the context of strategic priority area-3 (named Supportive Environments) the author of this policy paper herewith makes mention of Senior Friendly Communities Project (SFCP). For the purpose of this work, description on SFCP initiative has been presented under following sub-headings, as outlined below:

A. Introduction to the SFCP Initiative: In order to improve the lives of people suffering from dementia and old-age depression, local authorities in parts of the WHO European Region have started undertaking initiatives aimed at combining public health and various social services. The ultimate outcome of the SFCP project is to: “*better support the active and healthy ageing of their senior communities*”. Also, there was emphasis on highlighting an initiative in the Meuse-Rhine Euroregion (EMR). It is important to note that the Senior Friendly Communities Project (SFWP) aims build upon the WHO global and European strategies and action plans on healthy aging and the Age-friendly environments in Europe (AFEE) framework. This framework attempts to (a) design policy tools; and (b) trains local policy-makers in strategy development, local public health interventions, cross-border collaborations, and people-centred approaches for the care and well-being of their elder populations [11].

It is important to note that the project (SFCP) is implemented by the EMR Foundation. The EMR Foundation supports cross-border cooperation between professionals and organizations engaged in maintaining, promoting and improving public health for residents of the EMR. The cooperation, as outlined above, is tailored to the needs of older people and utilizes an integrated approach that combines health and other municipal services (adapted to the specific needs of the local community). Notably, The EMR cross-border region includes parts of Belgium, Germany and the Netherlands [11].

Further, local authorities and the communities they serve have a key role to play in developing and implementing “*evidence-based interventions*” (in order to improve the well-being of people with dementia and old-age depression, and their informal caregivers). It has been found that as elsewhere in the European Region (EU), the EMR initiative has an aging population and an increasing prevalence of dementia (about 2%) and old-age depression (about 25%). Notably, with an overall population (of about 4 million people), Policy makers, local authorities and health professionals are working towards improve the lives of their elder communities [11].

B. Key Activities: It is pertinent to note the key activities municipalities can choose from include: (1) multiple strategy workshops for local policy-makers on how to develop a strategic plan focusing on local public health campaigns, inter-sectorial action and cross-border collaboration that contribute to the well-being of people with dementia and old-age depression; (b) training of well-being coaches who work closely with primary care physicians; (c) outreach activities offered by trained volunteers to socially isolated older people; (d) educational sessions on aging, positive health, communicating with people with dementia and on empowering family caregivers; (e) creation of local social networks of older people; (f) education in primary schools on

dementia and depression; (g) cultural activities that include the themes of dementia and depression; and (h) online support tools for informal caregivers [11].

In the Netherlands, e. g., family physicians in the city of Kerkrade are working to identify patients in need of social support. When such patients are identified, doctors offer services provided by well-being coaches. These coaches are volunteers who are trained to support people at risk of old-age depression. Social workers in the Netherlands are also tasked with coordinating teams of volunteers trained to provide telephone support to socially isolated people, who are then contacted every 3 days, or every week, to follow up on their needs and to prevent social isolation. Further, in Euskirchen, Germany, police officers, public transport personnel, fire fighters and shop owners are being trained to communicate with people who have early dementia. In Belgium, municipalities are developing neighborhood groups and networks of older people to improve their social inclusion [11].

C. *Project Assessments and Activities*: The project usually begins with a baseline capacity assessment, which is available in Dutch, English, French and German, and is carried out in each participating municipality. The local community then usually selects a number of activities, which reflect their needs. Support is provided throughout the project to help municipalities implement the activities chosen. Finally, after the initial implementation process, a second assessment is performed to develop a 5-year sustainability plan. Notably, the project euPrevent Senior Friendly Communities receives support from Interreg Euregio Meuse-Rhine with means coming from the European Regional Development Fund [11].

7.4 Strategic priority Area-4

7.4.1 *Statement: strengthening research and the evidence base*

The author opines that *strengthening research and the evidence base* should form part of strategic priority area. Policy makers and collaborative partners should strive to:

- a. further improve the evidence for policy, and
- b. facilitate dissemination and exchange of knowledge (which is especially needed to fill gaps in comparable data).

Findings of research studies must be disseminated and exchanged among stakeholders and researchers. Most importantly, knowledge transfer should continue to be key in projects for HA, including at the local levels [8].

7.4.2 *Evidence in support of statement*

Here, the author presents example of the Longitudinal Study of Aging and Health in the Philippines (LSAHP) in support of priority area-4 (named Strengthening Research and the Evidence Base). It is pertinent to note that the LSAHP is the first study, which is research and evidence-based in nature, that was undertaken in the Philippines in the year 2018. It is multi-actor longitudinal study on aging [12]. Data and information for the study were collected from:

- a. older Filipinos,
- b. their caregivers, and
- c. adult children.

Under the LSAHP project, the 2018 baseline data provides comprehensive information on the health, economic status, and overall well-being of a nationally representative sample of older Filipinos aged 60 and older. It is pertinent to note that these data are considered as valuable resource for the crafting of evidence-based policies and programmes for aging population in the Philippines. With regard to objectives, the LSAHP aimed to (1) investigate the health status and well-being, as well as their correlates, of Filipinos aged 60 years and over; and (2) assess and ascertain the determinants of health status and transitions in health status and overall well-being. This initiative (LSAHP), which is part of a comparative study of the Philippines and Viet Nam, is funded by the Economic Research Institute for ASEAN and East Asia (ERIA). The ERIA is an international organization established in Jakarta, Indonesia in the year 2008 by a formal agreement among Leaders of 16 countries in the East Asian region. It aims to conduct research activities and make policy recommendations for further economic integration in the East Asia. The ERIA works very closely with both the ASEAN Secretariat and 16 research institutes to undertake and disseminate policy research under the three pillars. They are: “Deepening Economic Integration”. The LSAHP is implemented by the Demographic Research and Development Foundation, Inc. [12].

8. Section-2: priority interventions

Four Priority areas, as outlined above, form the basis for priority interventions. These interventions are prominent in national or subnational plans related to healthy aging. Worldwide, evidences are growing about effectiveness and contribution of interventions to the sustainability of health and social policies for aging population. The evidence-based policies provide a foundation for the further strengthening of international exchange and knowledge transfer for ensuring HA for all [8]. The author herewith suggests four priority areas in which interventions are needed for the purpose of furthering well-being of elderly population. They are: (a) prevention of falls, (b) promotion of physical activity, (c) public support for informal care giving (with a focus on home care), and (d) geriatric and gerontological capacity building among the health and social care workforce. Description on how these priority interventions enable HA, across the regions of the globe, is presented below:

8.1 Fall prevention

In terms of health risks among older people, findings of the research studies undertaken across the regions of the globe are suggestive of the fact that the risk of falls increases steadily with aging process. More specifically, older women are more vulnerable than older men. Two contributing factors for this trend, according to medical professionals, is that women (a) tend to have less muscle strength, and (b) are more likely to have osteoporosis. In addition, it is pertinent to note that fall-related injuries during old age are more likely to be severe. Doctors have reported that once injured, older people are more susceptible to longer-lasting ill health (or hospital) stays, with fatal complications of various types. Again, in terms of

expenses to be incurred towards treatment, “*fall-related injuries*” (mainly “*hip fractures*”) involve considerable amount of costs for two medical aspects, namely, (a) “*hospital admissions*”, and (b) “*rehabilitation interventions*” [8]. In terms of other factors responsible for fall and related injuries, reasons include (a) muscle weakness, (b) balance disturbances, (c) previous history of falls, and (d) multiple medication. Scientific and convincing evidences drawn from research studies indicate that “*most falls are preventable*”.

At this juncture, the author of this paper make a specific point herewith that some of the “*preventive measures*” tend to be “*cost-effective*” (or “*cost-saving*”). Importantly, there are “*good-practice examples*” of how fall prevention strategies can be successfully implemented in different settings, when supported by enabling public policies [8].

In terms of viable and non-medical interventions needed to prevent fall resulting health complications among older people, appropriately designed advocacy initiatives have been found to be effective. This will, however, require multi-sectoral approach. For instance, combination of creating and raising awareness of risk factors, exercise programmes, physical therapy and balance retraining have potential to reduce (a) falls, and (b) number of injuries per fall. It is for this reason that many countries, today, have designed and implemented programmes aimed at home safety assessments. It has also been discovered that scientific modification in home exercises by trained professionals can also reduce incidents of falls and other related injuries. Some developmental projects have, in place, more specialized preventive measures for high-risk groups of older people. Preventive measures advice (for instance, wearing of hip protectors) makes difference in case of fall prevention among older people. In this context, what is of utmost significance is that prevention of falls is prominent in quality management programmes for HA for all in various settings [8].

8.2 Promotion of physical activity

It has been found that physical activity is one of the strongest predictors of HA. Several groups of medical professionals suggest that regular physical activities, in moderate volumes, help older people promote mental, physical and social well-being. Also, such activities enable them to prevent: (a) ‘*illness*’, (b) ‘*injury*’, and (c) ‘*disability*’. In support of this research statement, the author of this work makes statement that those sections of people who are physically fit when they enter into old age, tend to stay healthier for longer time. One should also note that physical activities among older people is beneficial not only in preventing diseases, but also in (a) “*lowering the risk of injuries*”, (b) “*improving mental health*”, (c) “*further improving cognitive function*”, and (d) “*enhancing social involvement*” [8].

8.3 Public support for informal care giving (with a focus on home care)

With aging population, witnessed in several nations and regions of the globe, older people (with functional limitations of various types), from different social-settings, need support with the activities of daily living. What is alarming in this context is that the growing prevalence of dementia will further increase the demand for this support. Thus, public support for informal care giving (with a focus on home care) is one aspect that requires special attention in initiatives aimed at HA for all [8].

Demographers and researchers (including the office of the WHO) have found that in many of the European countries, most care (in terms of hours) is provided mostly by women informally at home settings. This phenomenon is witnessed even

in countries that have well-developed publicly supported elderly care sectors in place. The author of this work advocates that public support for informal care giving is one of the most important public policy measures that needs to be taken in order to ensure future sustainability of health and social care in aging populations [8]. The fact remains is that this type of informal care, with a focus on home care, is a response to multiple disorders. It requires an evolving and tailored combination of six considerations, namely,

- a. *acute care*,
- b. *rehabilitation*,
- c. *chronic disease management*,
- d. *social care*,
- e. *dementia care*, and
- f. *palliative care* [8].

Another important dimension of policy for public support for informal care giving that requires intervention from policy makers and all involved stakeholders is that where these services are available, they (a) are often fragmented, and (b) may be prohibitively expensive. *Further*, many of the older people, with chronic health or social care needs, opt for living at home. They prefer to remain independent at home, as long as possible, over the alternative of “*assisted living*” in institutional settings [8]. However, it should be noted that without public support, caring for a relative or friend can result in:

- a. reduced workforce participation,
- b. higher risk of poverty, and
- c. long-term loss of employment opportunities for the care giver [8].

Furthermore, lack of support can also have a negative impact on the relationship between care giver and recipient. Also, it can potentially lead to (a) mental and other health problems, (b) the social isolation of both parties, and (or) (c) elder maltreatment. Although most public funding of long-term care is still provided through institutions, in some countries in the European Union region, long-term care provided at home is seen as a preferred and cost-effective alternative to care provided in a nursing home or other facility. In these countries, it has become an important component of publicly funded services [8].

8.4 Geriatric and gerontological capacity building among the health and social care workforce

Gerontological capacity building among the health and social care providers is key in ensuring HA for all. In this context, it is pertinent to note that significant progress in geriatric education has been made in many countries over the years. Geriatrics, today, has become a full-fledged recognized specialty in medical schools: at both undergraduate and postgraduate teaching levels, including as a part of continuous training of health care staff at medical institutions in various parts of the

world. However, the progress made in this direction has been uneven. But the growing number of very old population in some nations and regimes has made it urgent to further strengthen national and sub-national capacity for training in geriatrics and gerontology. It has also become necessary to promote a stronger profile for geriatric training, including cross-specialty training. What is more alarming is that the greatest challenges are still gaps in the geriatric knowledge of general practitioners and other health care practitioners, *on the one hand*, and insufficient specialist training and a shortage of specialists in geriatrics itself, *on the other* [8].

9. COVID-19 response to ensure healthy lives and promote well-being for all at all ages

As outlined in previous sections by the author, ensuring healthy lives and promoting well-being at all ages is essential to SD. There are, therefore, several challenges associated with health that need to be addressed, especially in view of aging population. In addition to this, the globe is confronted with another health crisis: COVID-19. This pandemic is (a) spreading human suffering, (b) destabilizing the global economy, and (c) upending the lives of countless number of people around the globe. It is important to note that before the pandemic (COVID-19) emerged, notable progress was made in improving the health conditions of millions of people. However, the current health emergency poses added global risk. It has shown the critical need for health preparedness at all levels, and in all countries [13].

In addition to the initiatives undertaken by the United Nations Development Programme (UNDP), the WHO has been leading the global effort to tackle COVID-19 crisis, in the form of coordinating global efforts. In terms of COVID-19 response, the WHO (in collaboration with its collaborating partners) has come out with the “*Strategic Preparedness and Response Plan*” (SPRP). The SPRP envisages the public health measures that countries need to respond to COVID-19 health crisis. Again, the Strategy (the SPRP) provides guidelines for the public health response to COVID-19 (at national and sub-national levels). Also, it (SPRP) highlights the coordinated support that is required from the international community to meet the challenge of COVID-19 [13].

The COVID-19 Solidarity Response Fund has been institutionalized. The Fund supports work of the WHO work in order to: (a) track and understand the spread of the virus, (b) ensure patients get the care they need, (c) ensure frontline health workers get essential supplies and information, and (d) accelerate research and development of a vaccine and treatments for all who need them.

Notably, the WHO, together with partners, also provides guidance and advice for elderly people to look after their mental health during the COVID-19 pandemic. Aged people (including older adults) are at increased risk of being infected with the COVID-19 [13].

10. Summing up

The discussion presented above highlights need for ensuring HA in line with SDGs. Several deliberations have taken place at national and international platforms on this subject area. Also, the conceptual framework of Decade of Healthy Aging (2021–2030) has come into existence. All these developments have resulted in desired commitments and strategies, including plan of action: both at policy (macro) and ground (micro) levels. However, there many crucial gaps in

'knowledge' and 'capacity'. This fact emphasizes need for "capacity-building" in areas where programme implementers have (a) either 'failed', and/or (b) "achieved little success". Several initiatives are underway throughout the world for 'bridging' and 'narrowing' the gap. In this very context, the author of this work specifically points out that several of the initiatives DO NOT have in-built scientific mechanism to measure or evaluate the outcomes in exact terms. For instance, one can come across instances wherein an organization has: the objective of reaching out to 100 college student population with messages on "what society at large should do to care for those older people living in isolation". The author states that:

- a. Above should not be objective (in true programme management terms). Rather, it (this action/initiative) should be looked at as: "means of achieving HA".
- b. Several of the initiatives (if not all) DO NOT aim to quantify the outcomes in QUANTIFIABLE TERMS (QTs). The term QTs, according to the author, should enable the project managers and project evaluators to match 'objectives' with 'outcomes'. This will enable one to know both "success and failure areas", including the extent. This, *in turn*, should necessarily enable both project managers and project evaluators (including policy makers and other involved stakeholders) to identify the areas and exact means (or strategies) to make improvements.

In view of very specific statements made above by the author, there is need to propose "time-bound" Programme of action (PoA) in the area of HA. Such PoAs should necessarily envisage following two key aspects: (a) availability of resources, including resource support from collaborating agencies (working at local, national, international, and inter-governmental levels); and (b) locally prevailing socio-economic and demographic profile.

In order to ensure that above outlined aspects form the integral part of the initiatives aimed at ensuring HA for all, the author suggests, in this paper, that those responsible for implementation at the actual ground/community levels programmes propose "time-bound projects" (TBPs). Such TBPs, in the context of mega cities (which are demographically characterized with, among other factors, huge population base), should envisage two significant considerations: (a) *resource support that will be actually available at the time of programme implementation*, and (b) *likely hindrances that may come up*. In the absence of ascertaining answer to these questions on needed resource support and likely obstacles, initiatives aimed at HA for all may not yield desired outcomes [14].

Author of this paper has outlined above concrete actions that are required if the Decade [UN Decade of Healthy Aging (2021-2030)] is to be a success (in terms of HA for all). However, the priority areas should be left open to series of dialogs and consultations among: (a) expert, and (b) stakeholders [15]. *Most importantly*, (a) POAs needs to commence immediately, and (b) actual project implementation is possible ONLY through collaboration with many key partners. The author outlines that: Policy coherence and equitable impact will only be achieved if there is coordination and integration between the stakeholders and actions. Actual implementation of the POAs require resourcing (that may sound like: "investments").

At this juncture, it is important to outline that the emergence of UN Decade of Healthy Aging (2021–2030) is a significant development. This initiative (2021–2030), sought to be undertaken, in global collaboration, is aligned with the last ten years of the SDGs that brings together all partners (including governments, civil society, international agencies, etc.) to improve the lives of older people, their

families, and the communities they live in. Health for all is need of the hour, as populations around the world are aging at a faster pace (than in the past). This demographic transition will have an impact on almost all aspects of society in relation to aging process [16]. To sum up, there is need for life-course approach to aging. This calls for protecting and promoting the rights of older adults in the implementation of the 2030 Agenda [17].

The author briefly presents here the strengths and limitations of this study. In terms of strengths, this paper has extensively researched into strategic interventions that need to be taken by the providers of health care, policy makers and other stakeholders involved in order to ensure HA all, in the context of SDGs that are set to be met by the year 2030. Most importantly, this research work has also looked into selected relevant initiatives that have been undertaken, at both macro and micro levels, in various countries. The initiatives have been quoted in support of each strategic intervention that the author has suggested in this work (in view of general and specific objectives). Based on findings and data analysis, significant lessons have been learnt (that are briefly outlined above). With regards to limitations, the author has outlined very few and selected actual initiatives undertaken in various parts of the globe in support of each suggested strategic intervention. Many more projects on HA for all have been implemented, over the years, by developmental agencies (including national governments, and inter-governmental agencies), across the regions of the globe. However, the author could not incorporate all of them, mainly because of space limitation that was suggested. Selection of initiatives that form part of this study (chapter) was made by the author, using research wisdom, including envisaging consultations with demographers in the network of the author. However, this does not, in any way, undermine the significance of this research work. Quoted initiatives are ample demonstration of need for interventions needed in the area of HA for all, including for meeting SDGs in timely manner.

None of us should forget that investments in a future that enables people to live longer and healthier lives are key. Also, it is significant for policy makers to ensure that they have the opportunity to contribute to the society, so that THEY ARE NOT BE LEFT BEHIND). These two aspects are key to creating societies that respect elderly population [18].

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Demographic Analysis - Selected Concepts, Tools, and Applications presents basic definitions, practical techniques, and methods, as well as examples of studies based on the usage of demographic analysis in various institutions and economic entities. The volume covers studies related to population distribution, urbanization, migration, population change and dynamics, aging, longevity, population theories, and population projections. It is an asset to academic and professional communities interested in advancing knowledge on diverse populations in various contexts such as public policies, public services, education, and labor markets. The book aims to help students of demography as well as practitioners of other fields of social sciences and people in government, business, and nonprofit organizations.

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