Literature Survey By: ADITHYA M

Determinants of life expectancy and clustering of provinces to improve life expectancy: an ecological study in Indonesia

By: Sekar Ayu Paramita, Chiho Yamazaki & Hiroshi Koyama

REFERENCE LINK: [Determinants of life expectancy and clustering of provinces to improve life expectancy: an ecological study in Indonesia | BMC Public Health | Full Text (biomedcentral.com)](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-020-8408-3)

**Summary:**

Life expectancy is a population measure of the performance of healthcare systems. Regional disparities in life expectancy in Indonesia have been there for a long and now have become a public health policy challenge. A systematic clustering of provinces can be a valuable alternative for organizing cooperation that aimed to increase life expectancy and reduce disparities. Here we aim to identify determinants of life expectancy and designate clusters of Indonesian provinces with similar characteristics. We will also see if there is an alternative method that can be implemented.

We carefully select variables that impact life expectancy and gather 2015 data from Indonesia’s Ministry of health. We then perform structural equation modelling (SEM) to select domains that needed to work on from these theoretical models. Then from the results we get from the SEM, we perform cluster analysis to arrange cooperation groups.

**Result:**

**SEM:**

We got an adequate fit after 133 iterations where the chi-square value was 0.005 and CFI value was 0.935 and the SRMR value was 0.054. With nine observed variables in the final model out of which six constructs with biblical correlations towards each other and their magnitude of correlation ranged between 0.83 to 0.36.  
The result of SEM can be useful to understand the relationship among the variables and is also useful towards designing organized cooperation strategies.

From this SEM we found out the strongest among the six constructs was EXPENDITURE PER CAPITA, which meant enhancing the economy was the most effective approach to improving life expectancy than the other constructs.

**CLUSTER ANALYSIS:**

Five clusters of provinces were generated which were sorted based on best to the worst fit of characteristics.

The results of this study show that expenditure per capita is the most influential and core factor in improving life expectancy, as are the health workforce, healthcare facilities, environment, and mean years of schooling.

The result of cluster analysis may be useful to improve coordination between provincial and national governments. These exchanges have the potential to impact provincial integration processes and health policy debates. Cooperation among clusters may strengthen and accelerate health development across the clusters.

**Conclusion:**

The conclusion we come to here is as the clustering of provinces makes it easier to organize cooperation within and between clusters. Provinces within the same cluster have similar characteristics so they should also have similar goals so these provinces can work together towards the common goal. Also, the national government should support local governments, especially in provinces within the more economically challenged clusters

**Pros and Cons:**

**Pros-**

Evaluation criteria were taken initially to ensure the quality of the data. The final model has an adequate fit.

**Cons-**

The study subject was only the provinces, so the number of observations was only 34.

**ABBREVIATIONS USED:**

CFI: Comparative fit index.

SEM: Structural equation modelling.

SRMR: Standardized root mean square residual.

The impact of increasing education levels on rising life expectancy: a decomposition analysis for Italy, Denmark, and the USA

By: Marc Luy, Marina Zannella, Christian Wegner-Siegmundt, Yuka Minagawa, Wolfgang Lutz & Graziella Caselli

REFERENCE LINK: [The impact of increasing education levels on rising life expectancy: a decomposition analysis for Italy, Denmark, and the USA | Genus | Full Text (springeropen.com)](https://genus.springeropen.com/articles/10.1186/s41118-019-0055-0#Sec2)

**Summary:**

We see that Life expectancy particularly in the industrialized country has a strong increase due to the significant reduction in mortality rate. Here we question to what extent does life expectancy increases, i.e., its gain related to change in populations due to increasing education levels.

We decompose change to total population life expectancy at the age of 30 for people in Italy, Denmark, and the US. We call the education mortality change as “M Effect” and population education change as “P Effect”. We use the Replacement decomposition analysis to further subdivide the effects into contributions by individual education groups. The P effect ranges from 15% in USA men to 40% in Denmark women.

The mortality rate in Europe began to decrease due to communicable disease at young ages, including neo-natal and childhood ages, to non-communicable conditions more prevalent at advanced ages, cardiovascular revolution, new medical advancements, improvement in living conditions, and health-related behaviours.

Naturally, higher education does not automatically lead to better health. It is also unclear to what extent education itself plays a direct role inside the complex network of various health-related socioeconomic factors.

The analysis requires age and education-specific related data for the populations at risk and the deaths for the start and end years of our observation. For Italy information’s about the population by age, sex, and education level was taken from Italian Census data which is available online at the data warehouse of the National Statistical Institute of Italy. For Denmark Information about the population by age, sex, and education level comes from nationwide population registers, covering the ages 30 to 100. For the USA the information is collected from data collection IPUMS-USA.

The estimated education-specific differentials in life expectancy cannot be directly compared between the populations, as the characteristics of the underlying data differ between our study populations. So, to compare results across our study populations we construct a life table as the basis for the decomposition analysis. Their life tables are constructed as consistently as possible.

**Result:**

While the most powerful contributor to increasing life expectancy was the effect of decreasing mortality within education groups, the changing educational structure of the populations also contributed substantially to the increase in the difference in life expectancy at age 30 in all three countries.

The smaller absolute increases in the P effect in the USA can be explained by the smaller overall increase in life expectancy.

We also saw that Danish women experienced the greatest shifts in the educational structure during our study period, with the largest decrease in the proportion of less educated and the largest increase in the proportion of highly educated individuals.

This study examined the extent to which changed in the educational structure is related to change in life expectancy at age 30 in Italy, Denmark, and the USA.

Three main findings emerged from this analysis: -

1. There were considerable changes in the educational composition in all three countries during the study period. The proportion of those with low educational attainment decreased, while the proportion of high and medium-educated individuals increased. In Italy and Denmark, there were particularly large increases.
2. Life expectancy was distributed in a graded fashion across education groups. Life expectancy was highest for those who had more than high school education, followed by those who had medium and then low-level educational attainment levels.
3. The results from decomposition analysis show that the structural change in education accounted for a substantial proportion of improvements in overall life expectancy in all three countries. Specifically, we found the populations changes in educational attainment explained between around 15% (men in the USA) and approximately 40% (women in Denmark) of the increases in life expectancy at age 30.

**Conclusion:**

The study provides some extension of our understanding of the mechanisms behind recent improvements in life expectancy in Europe. Our results demonstrate the importance of education in the process of increasing life expectancy. Education helps individuals to develop health-related resources, allowing highly educated people to enjoy longer and healthier lives.

This study demonstrates that progress in education has been made important contributions to increasing life expectancy in Italy, Denmark, and the USA over the past two decades. These findings are in line with the theoretical heterogeneity approach, which states that mortality levels and differences in mortality are strongly influenced by the specific risk group composition of the populations. In addition to all the other important benefits of education, it can also be viewed as a powerful health policy that allows more people to enjoy both better and longer lives. We tried to provide a piece of evidence to “Enhancing health outcomes through improved educational attainment is attractive, although we still need better evidence that interventions to improve educational attainment will increase life expectancy”.

**Pros and Cons:**

**PROS**

* As we use the Replacement decomposition technique we find an advantage that replacement can be performed separately for each education subgroup.
* Due to the Replacement decomposition technique, we can create a cross-country comparison of differentials in life expectancy by education levels.

**CONS**

* Our results can be affected by the definition used for education levels, the restriction of the decomposition to changes between a start and an end year of the observation period, the chosen observation period itself, and the decomposition technique used.
* There might be further sources for bias connected to some other technical and conceptual issues.

Global age-sex-specific fertility, mortality, healthy life expectancy (HALE), and population estimates in 204 countries and territories, 1950–2019: a comprehensive demographic analysis for the Global Burden of Disease Study 2019

By: The Author(s). Published by Elsevier Ltd

REFERENCE LINK: [Global age-sex-specific fertility, mortality, healthy life expectancy (HALE), and population estimates in 204 countries and territories, 1950–2019: a comprehensive demographic analysis for the Global Burden of Disease Study 2019 - The Lancet](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30977-6/fulltext#seccestitle10)

**Summary:**

Age-specific mortality rates are a crucial dimension of population health. Fertility rates and population size and composition also have profound effects on the challenges faced by health systems. With rising mean age, for example, diseases such as dementia are a greater burden on individuals, families, and health providers. Assessing the trends in key demographic indicators is a core challenge for global health surveillance.

A variety of sources are available on fertility, mortality, population, and migration, but they vary widely in the quality and completeness of registration. In this study, we represent the 2019 version of the demographic for the Global Burden of Diseases, Injuries, and Risk Factor Study (GBD). This incorporates newly released census, surveys, vital registration, and sample registration data. We generate a total of 990 locations at the most detailed level. To better characterize where countries are in the demographic transition, we have developed a seven-category taxonomy.

The analysis can be divided into seven main steps:

1. Age-specific fertility estimation
2. Under-5 mortality estimation
3. Adult mortality estimation
4. Age-specific mortality estimation using a relational model life table system
5. HIV adjustment
6. Accounting for fatal discontinuities such as wars or natural disasters
7. Population estimation.

Below, we provide a low-level description of each analytical component, with an emphasis on new steps for GDB 2019.

**Geographical units, age groups, and time periods:**

For the demographic analysis, we seek to make the most of rich demographic data, more readily available and robust at the aggregate level, and increase the precision of estimates at the aggregate level by running the modelling process at both the most detailed level, and at the aggregate level.

**Fertility estimation:**

We used spatiotemporal Gaussian process regression (ST-GPR) to model age-specific fertility rates for the 5-year age group between ages 15 and 49 in each location from 1950 to 2019.

**Under-5 mortality estimation:**

Follows the analytical framework. We similarly estimate mortality for the more detailed age groups younger than 5 years and constrained these estimates to equal U5MR.

**Adult mortality estimation:**

We use five different methods to assess completeness, which are – the generalized growth balance method (GGB), the synthetic extinct generations (SEG) method, and a combined method (GCB-SEG), Bayesian model (BCCMP).

**HIV adjustment:**

We use relational model life table and Estimation and Projection Package Age-Sex Model (EPP-ASM)

**HALE:**

We use the Socio-demographic Index and HALE to calculate Pearson’s correlation coefficient for the analytical method.

**Result:**

Our paper presents a comprehensive assessment of demographic changes in 204 countries and territories from 1950 to 2019, with a focus on the past two decades. There have been substantial changes in the demographics of most countries and territories since the turn of the millennium. Both life expectancy and HALE have been expanded Almont universally during our study period. While there have been impressive improvements in mortality predictions. Recent slowdowns and reversals in improvements observed especially among adults indicate that process is not a guaranteed thing. In 2019 we see that half the nations in the world had below-replacement fertility and 34 had a cruder birth rate than the crude death rate. 17 countries were in the precarious state of having a negative rate of population change and negative net migration. Demographic transition, which has largely been a story of faster or slower rate of change, is entering a new phase in many countries with high levels of development.

Low fertility and rising average age might lead to inverted population pyramids, which will be fiscally and socially challenging.

Our analysis shows that at the global level, all major mortality indicators and HALE have been improving.

**Conclusion:**

The most recent decade continued the trend of general progress in reducing global fertility and global mortality. While most countries are following this pattern of progress, there is evidence that the world is nearing a demographic infection point. Half of the 204 countries and territories in our analysis had below-par replacement fertility in 2019. Nearly one in five had entered the post-transition state where the natural rate of increase was negative, with negative net immigration. Those demographic shifts, combined with the trend towards stagnation in or reversals or mortality improvements in some high SDI countries, highlight that continued declines in mortality are not guaranteed.

Additionally, sustained low fertility in the setting of slowing or reversing mortality could hasten the no of countries entering the challenging post-transition phase.

**Pros and Cons:**

**PROS**

* The comprehensive nature of this study of fertility, mortality, migration, and population helps revise the taxonomy of the demographic transition.
* The data processing steps required to account for known biases, and the data synthesis stage, which deals with the challenges of both missing measurements in given location-years and the common problem of different measurements disagreeing with each other.

**CONS**

* Our computational resources did not allow us to propagate uncertainty for some covariates through our analytical process.
* Our migration estimates could be improved.