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Causes of Death of Indigenous Ecuadorians

Efstathios Stefos

School of Physical Sciences and Mathematics, Faculty of Exact and Natural Sciences, Pontifical Catholic University of the Ecuador, Proyecto Prometeo, Quito, Ecuador

Email address

estefos@aegean.gr

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Abstract

The study investigates the causes of death of indigenous Ecuadorians and the correlation between these causes and gender, age, marital status, region of residence, natural region and level of instruction. We investigated the relationship between the variables with the use of chi-square test. Also, a descriptive and a multidimensional analysis were realized. The multidimensional data analysis presented the differentiation criteria of the dead indigenous Ecuadorians and their classification into clusters according to their common characteristics. The results of the study showed that there is a significant part of the dead indigenous Ecuadorians that consists of children younger than 10 years of age whose most common causes of death were influenza and pneumonia. The traffic accidents, suicide, dementia and Alzheimer's disease are the most common causes of death of the indigenous people between 20 and 50 years of age. The most common causes of death of indigenous people older than 60 years were heart failure, malignant neoplasms, chronic lower respiratory diseases and hypertensive diseases.

1. Introduction

The aim of this study is to investigate the causes of death of indigenous Ecuadorians and the correlation between these causes and certain social characteristics. According to the last census of Ecuador, the indigenous people represent 7.02% (1018176 people) of the Ecuadorian population [1].

The Ecuadorian indigenous people consist of a diverse collection of nationalities and peoples. The Kichwa indigenous community is the most populous ethnic group in Ecuador (32.23%) followed by Puruha (13.37%), Shuar (7.83%), Panzaleo (5.99%), Otavalo (5.57%), Kayambi (3.31%), Kañari (2.81%), Saraguro (1.68%), Waranka (1.67%), Tomabela (1.18%), Karanki (1.14%), Chachi (1.00%), Kisapincha (0.99%), Achuar (0.77%), Salasaka (0.63%), Andoa (0.63%), Awa (0.54%), Chibuleo (0.53%), Tsachila (0.29%), Waorani (0.24%), Kitukara (0.24%), Huancavilca peoples (0.20%), Natabuela (0.18%), Cofan (0.15%), Pastos (0.14%), Shiwiari (0.12%), Secoya (0.07%), Siona (0.06%), Zapara (0.05%), Epera (0.05%), Paltas (0.04%), Manta peoples (0.03%) and other smaller indigenous nationalities and peoples.

2. Methodology

The 2010 Census in Ecuador was used in order to present the social profile of indigenous people. The National Mortality Study (NMS) of 2011 was also used in order to investigate the causes of death of indigenous Ecuadorians and the correlation between these causes and social characteristics that include gender, age, marital status, region of

residence, natural region and level of instruction [2].

We investigated the relationship between the variables with the use of chi-square test (χ^2). Also, a descriptive and a multidimensional analysis were realized. The multidimensional data analysis presented the differentiation criteria of the dead indigenous Ecuadorians and their classification into clusters according to their common characteristics. The methods that we used are the Multiple Correspondence Analysis, which defined the differentiation criteria and the Hierarchical Clustering that presented the clusters of the persons according to their common characteristics [3]. In the frame of this study, we used the statistical software SPAD v.4.5 offered by the Faculty of Humanities of the University of the Aegean.

3. The Chi-Square Test

The correlation between the causes of death of indigenous Ecuadorians and gender, age, marital status, area of residence, natural region and level of instruction was investigated with the use of chi-square test (χ^2). Statistically interesting are the correlations in which the V. TEST (Valor test) is greater than or equal to 2. The larger than 2 the V. TEST, the greater the correlation between two variables [4].

The results of chi-square test showed that there is a significant correlation between the variables under investigation:

- Causes of deaths - Gender : $\chi^2 = 340.15 / 64$ degrees of freedom / V.TEST = 13.06
- Causes of deaths - Age : $\chi^2 = 2777.19 / 704$ degrees of freedom / V.TEST = 33.29
- Causes of deaths - Marital status : $\chi^2 = 1271.52 / 384$ degrees of freedom / V.TEST = 20.70
- Causes of deaths - Area of residence : $\chi^2 = 210.50 / 64$ degrees of freedom / V.TEST = 8.44
- Causes of deaths - Natural region : $\chi^2 = 861.57 / 192$ degrees of freedom / V.TEST = 19.56
- Causes of deaths - Level of instruction : $\chi^2 = 1311.03 / 512$ degrees of freedom / V.TEST = 17.84

4. The Descriptive Analysis

According 2010 Census, 49.14% of the indigenous people were men and 50.86% women (Table 1).

Table 1. Gender (Census 2010).

	n	%
Men	500379	49.14%
Women	517797	50.86%
Total	1018176	100.00%

2.16% of them were infants younger than one year of age, 9.96% were children between the ages of 1 and 4 years, 12.83% were children between the ages of 5 and 9 years, 23.05% were young persons between the ages of 10 and 19 years, 16.97% were persons between the ages of 20 and 29 years, 11.79%

were persons between the ages of 30 and 39 years, 8.43% were persons between the ages of 40 and 49 years, 6.23% were persons between the ages of 50 and 59 years, 4.75% were persons between the ages of 60 and 69 years, 2.68% were persons between the ages of 70 and 79 years, 1.00% were persons between the ages of 80 and 89 years, 0.13% were persons between the ages of 90 and 99 years and 0.01% of the indigenous people were older than 99 years of age (Table 2).

Table 2. Age (Census 2010).

	n	%
[0, 1)	21957	2.16%
[1, 5)	101457	9.96%
[5, 10)	130681	12.83%
[10, 20)	234673	23.05%
[20, 30)	172745	16.97%
[30, 40)	120071	11.79%
[40, 50)	85873	8.43%
[50, 60)	63443	6.23%
[60, 70)	48375	4.75%
[70, 80)	27297	2.68%
[80, 90)	10162	1.00%
[90, 100)	1324	0.13%
Older than 99 years of age	118	0.01%
Total	1018176	100.00%

7.98% of these people were in a relationship, 24.76% were singles, 32.18% were married, 0.50% were divorced, 1.32% were separated and 3.17% were widowed (Table 3).

Table 3. Marital status (Census 2010).

	n	%
In a relationship	81268	7.98%
Single	252142	24.76%
Married	327698	32.18%
Divorced	5112	0.50%
Separated	13487	1.32%
Widowed	32274	3.17%
NA	306195	30.07%
Total	1018176	100.00%

21.47% of the indigenous Ecuadorians were living in urban areas and 78.53% in rural areas (Table 4).

Table 4. Area of residence (Census 2010).

	n	%
Urban	218571	21.47%
Rural	799605	78.53%
Total	1018176	100.00%

12.56% of the indigenous Ecuadorians had not attended school, 2.52% had attended Literacy center, 1.07% Preschool education, 35.42% Primary education, 12.56% Secondary education, 13.41% Basic education, 4.15% Middle education, 0.47% Cycle Post-Baccalaureate, 2.86% had attended Higher education and 0.13% had attended Postgraduate education (Table 5).

Table 5. Level of instruction (Census 2010).

	n	%
None	127903	12.56%
Literacy center	25658	2.52%
Preschool education	10856	1.07%
Primary education	360670	35.42%
Secondary education	127906	12.56%
Basic education	136512	13.41%
Middle education	42224	4.15%
Cycle Post - Baccalaureate	4811	0.47%
Higher education	29159	2.86%
Postgraduate education	1357	0.13%
NA	151120	14.84%
Total	1018176	100.00%

According to National Mortality Study (NMS) of Ecuadorian people, during 2011 died 3857 indigenous people. 52.19% of the indigenous Ecuadorians who died during 2011 were men and 47.81% women (Table 6).

Table 6. Gender (NMS 2011).

	n	%
Men	2013	52.19%
Women	1844	47.81%
Total	3857	100.00%

2.67% of the indigenous Ecuadorians who died during 2011 were infants younger than one year of age, 4.25% were children between the ages of 1 and 4 years, 3.27% were children between the ages of 5 and 9 years, 4.49% were young persons between the ages of 10 and 19 years, 5.52% were persons between the ages of 20 and 29 years, 4.43% were persons between the ages of 30 and 39 years, 5.16% were persons between the ages of 40 and 49 years, 8.37% were persons between the ages of 50 and 59 years, 11.95% were persons between the ages of 60 and 69 years, 18.64% were persons between the ages of 70 and 79 years, 23.05% were persons between the ages of 80 and 89 years and 8.19% were persons between the ages of 90 and 99 years (Table 7).

Table 7. Age (NMS 2011).

	n	%
[0, 1)	103	2.67%
[2, 5)	164	4.25%
[5, 10)	126	3.27%
[10, 20)	173	4.49%
[20, 30)	213	5.52%
[30, 40)	171	4.43%
[40, 50)	199	5.16%
[50, 60)	323	8.37%
[60, 70)	461	11.95%
[70, 80)	719	18.64%
[80, 90)	889	23.05%
[90, 100)	316	8.19%
Total	3857	100.00%

2.26% of the indigenous Ecuadorians who died during 2011 were in a relationship, 17.22% were singles, 41.43% were married, 0.57% were divorced, 0.23% were separated and 24.89% were widowed (Table 8).

Table 8. Marital status (NMS 2011).

	n	%
In a relationship	87	2.26%
Single	664	17.22%
Married	1598	41.43%
Divorced	22	0.57%
Separated	9	0.23%
Widowed	960	24.89%
NA	517	13.40%
Total	3857	100.00%

34.35% of the indigenous Ecuadorians were living in urban areas and 65.65% in rural areas (Table 9).

Table 9. Area of residence (NMS 2011).

	n	%
Urban	1325	34.35%
Rural	2532	65.65%
Total	3857	100.00%

79.54% of the indigenous Ecuadorians were living in the mountain range of Ecuador, 4.59% in coast region, 15.76% in Amazon basin and 0.10% in insular region (Table 10). This variable is not available in 2010 Census.

Table 10. Natural region (NMS 2011).

	n	%
Mountain range	3068	79.54%
Coast region	177	4.59%
Amazon basin	608	15.76%
Insular region	4	0.10%
Total	3857	100.00%

67.23% of the indigenous Ecuadorians who died during 2011 had not attended school, 2.26% had attended Literacy center, 23.52% Primary education, 3.29% Secondary education, 0.47% Basic education, 0.10% Middle education, 0.08% Cycle Post-Baccalaureate and 0.39% had attended Higher Education (Table 11).

Table 11. Level of instruction (NMS 2011).

	n	%
None	2593	67.23%
Literacy center	87	2.26%
Primary education	907	23.52%
Secondary education	127	3.29%
Basic education	18	0.47%
Middle education	4	0.10%
Cycle Post - Baccalaureate	3	0.08%
Higher education	15	0.39%
NA	103	2.67%
Total	3857	100.00%

According to National Mortality Study (NMS) of Ecuadorian people, during 2011 1.22% of the indigenous Ecuadorians died from accidental drowning and submersion, 0.83% from accidental falls, 0.62% from accidental poisoning, 1.01% from accidents that obstruct the respiration, 0.16% from acute respiratory diseases except influenza and pneumonia, 0.05% from aortic aneurysms and dissection, 0.67% from appendicitis, hernia and intestinal obstruction, 1.27% by assault (homicide), 0.21% from atherosclerosis, 0.18% from

benign neoplasms, in situ and of uncertain behaviour, 0.78% of cardiac arrest, 0.08% of cardiac arrhythmias, 0.08% of cardiomyopathy, 0.36% of cardiopulmonary disease and diseases of the pulmonary circulation, 3.71% of cerebrovascular diseases, 1.01% of certain conditions originating in the perinatal period, 2.02% of chronic lower respiratory diseases, 0.10% of chronic rheumatic heart disease, 1.74% of cirrhosis and other liver diseases, 0.49% of congenital malformations, deformations and chromosomal abnormalities, 5.44% of dementia and Alzheimer's disease, 1.50% of diabetes mellitus, 0.21% of diseases of the musculoskeletal system and connective tissue, 1.97% of diseases of the urinary system, 0.36% of disorders of fluid, electrolytes and acid-base balance, 0.34% of epilepsy and status epilepticus, 0.80% of events of undetermined intent, 0.08% of gunshot not intentional, 3.99% of heart failure, complications and ill-defined diseases, 0.18% of human immunodeficiency virus (HIV), 2.57% of hypertensive diseases, 1.53% of infectious intestinal diseases, 6.72% of influenza and pneumonia, 2.64% from intentional self-harm (suicide), 1.53% of ischemic heart diseases, 4.95% died in land transport accidents, 0.05% from malignant neoplasm of breast, 0.34% from malignant neoplasm of colon, sigmoid, rectum and anus, 0.03% from malignant neoplasm of kidney except renal pelvis, 0.52% from malignant neoplasm of prostate, 0.23% from malignant neoplasm of the brain, 0.23% from malignant neoplasm of the esophagus, 0.44% from malignant neoplasm of the gallbladder, 0.03% from malignant neoplasm of the larynx, 0.65% from malignant neoplasm of the liver and biliary tract, 0.21% from malignant neoplasm of the ovary, 0.31% from malignant neoplasm of the pancreas, 2.67% from malignant neoplasm of the stomach, 0.70% from malignant neoplasm of the uterus, 0.41% from malignant neoplasm of trachea, bronchus and lung, 0.05% from malignant neoplasm of urinary bladder, 0.52% from malignant neoplasms of lymphoid, hematopoietic and related tissues, 2.00% from malnutrition and nutritional anemia, 0.16% from melanoma and other malignant neoplasms of skin, 0.18% from meningitis, 1.27% from mental and behavioural disorders due to use of psychoactive substances, 0.08% from nonrheumatic valvular heart disease, 0.08% from Parkinson's disease, 0.75% died during pregnancy, childbirth and puerperium, 0.60% from pulmonary edema and other respiratory diseases affecting the interstitium, 1.37% from septicaemia, 0.34% from shortness of breath, 0.78% from tuberculosis, 3.09% from vaccine-preventable diseases and 30.52% died from ill-defined causes [5].

5. The Results of the Multiple Correspondence Analysis

In the frame of this study, we used the Multiple Correspondence Analysis that is based on the correlation of all the variables at the same time [6]. The results set the three factorial axes which simultaneously are the differentiation criteria of the dead indigenous Ecuadorians [7]. The

differentiation criteria correspond to the axes of the Multiple Correspondence Analysis which are presented in order of significance [8].

First differentiation criterion (First factor axis – inertia percentage 6.91%):

The first differentiation criterion is consisted on one hand of persons between 20 and 40 years of age who died in traffic accidents. These people were single and their level of instruction was the Primary and Secondary education. On the other hand, there are widowed persons, without education, older than 70 years of age who were living mainly in the mountain range. These people died mainly by ill-defined causes.

Second differentiation criterion (Second factor axis – inertia percentage 5.41%):

The second differentiation criterion is consisted on one hand of married and widowed persons older than 60 years of age. The level of instruction of these people was Primary education and they died mainly by heart failure, cerebrovascular and hypertensive diseases. On the other hand, there are children younger than 10 years of age who were living mainly in Amazon basin and their most common causes of death were influenza, pneumonia and certain conditions originating in the perinatal period.

Third differentiation criterion (Third factor axis – inertia percentage 4.25%):

The third differentiation criterion is consisted on one hand of married men, older than 50 years who died mainly by malignant neoplasms and accidents. The level of instruction of these people was Primary education and Literacy center. On the other hand, there are single women between 20 and 30 years of age whose level of instruction was Secondary education and widows older than 80 years of age.

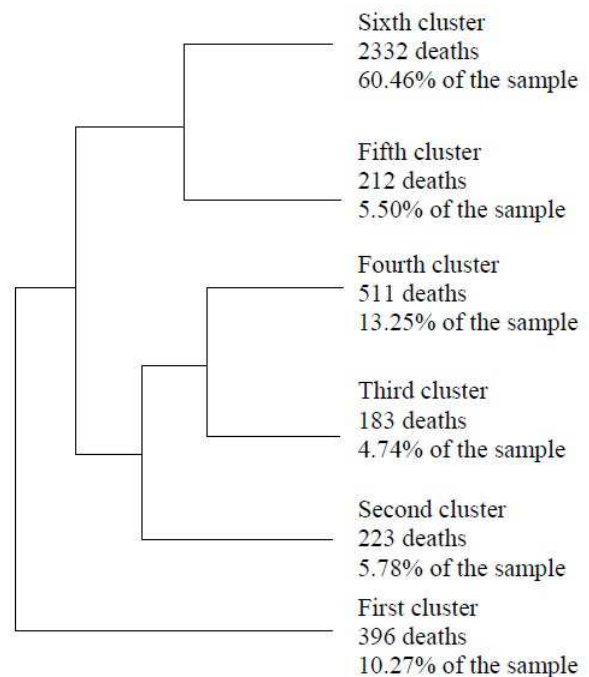


Figure 1. The Hierarchical Classification.

6. The Results of the Hierarchical Classification

We used the method of Hierarchical Classification looking for a classification of the the dead indigenous Ecuadorians. This method offers the advantage of representing the centroids of the clusters on the factor levels aiming to a detailed interpretation of the differences between the groups [9]. The Hierarchical Classification led to the formation of six clusters which are presented in Figure 1.

First cluster (396 deaths, 10.27% of the sample):

The first cluster consists of children younger than 10 years of age who were living mainly in Amazon basin and their most common causes of death were influenza and pneumonia.

Second cluster (223 deaths, 5.78% of the sample):

The second cluster consists of persons between 20 and 50 years of age who died mainly in traffic accidents. The majority of these people were married and their level of instruction was the primary and secondary education.

Third cluster (183 deaths, 4.74% of the sample):

The third cluster consists of persons younger than 20 years of age, singles whose level of instruction was the Secondary education, were living mainly in Amazon basin and their most common cause of death was intentional self-harm. The third cluster also consists of persons between 20 and 30 years of age

who died by dementia and Alzheimer's disease.

Fourth cluster (511 deaths, 13.25% of the sample):

The fourth cluster consists of persons between 30 and 50 years of age whose level of instruction was the Primary education, they were in a relationship and their most common causes of death were accidents, suicide, dementia and Alzheimer's disease.

Fifth cluster (212 deaths, 5.50% of the sample):

The fifth cluster consists of people who were living in urban areas of the coast region of Ecuador, their most common causes of death were the hypertensive diseases, they were singles and their level of instruction was the Primary education.

Sixth cluster (2332 deaths, 60.46% of the sample):

The sixth cluster consists of widowed persons, older than 60 years of age who were living mainly in the mountain range of the country. The most common causes of the death of these people were heart failure, malignant neoplasms and chronic lower respiratory diseases.

These differentiations are presented in Figure 2 where the centroids of the six clusters are presented on the level of the first two axes. The positions of the clusters regarding to the two axes showcase the differences and the similarities of the characteristics demonstrated in each cluster [10].

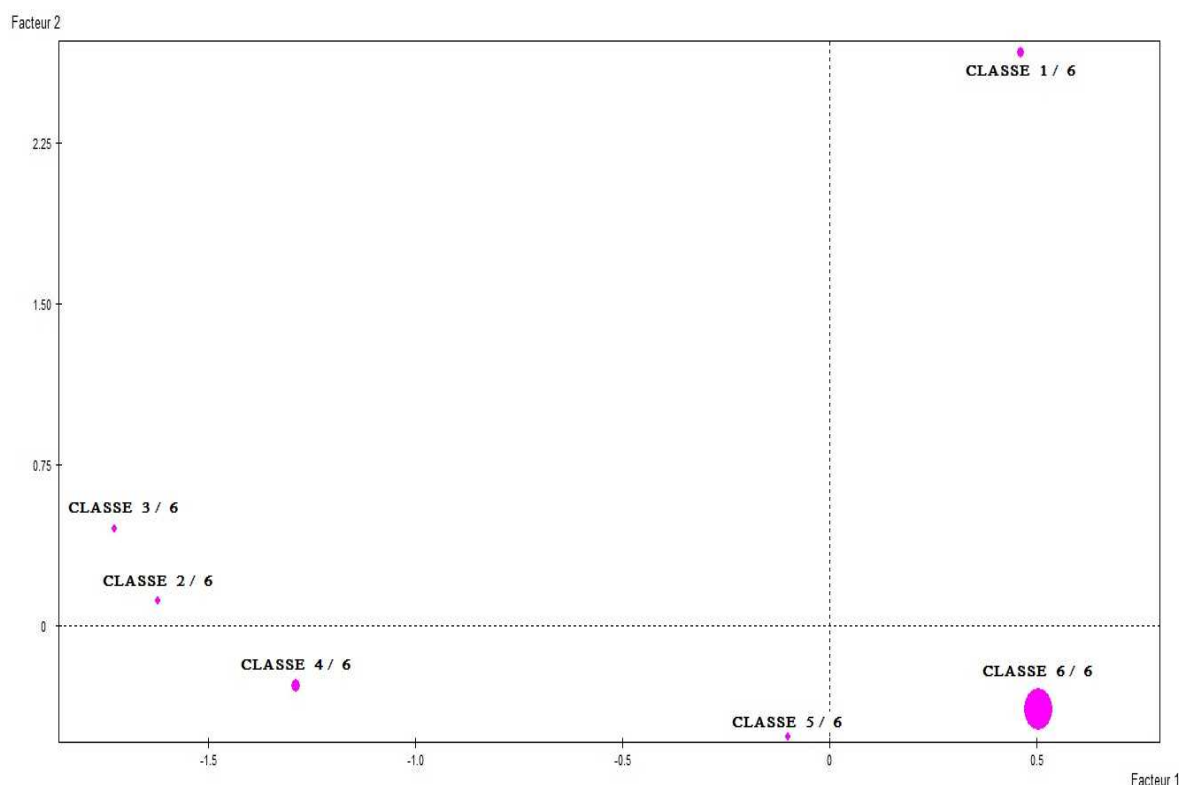


Figure 2. The Correspondence Analysis.

7. Conclusion

The aim of the present study was to investigate the causes of death of indigenous Ecuadorians and the correlation between

these causes and social characteristics. In this frame, we presented the social and educational profile of the indigenous people who live in Ecuador using certain variables of 2010 Census [11].

We used the National Mortality Study of 2011 in order to

present the causes of death of these people and investigate the correlations between these causes and gender, age, marital status, region of residence, natural region and level of instruction. We also used the chi-square test that showed that there is a significant correlation between the variables under investigation.

The descriptive analysis showed that 48% of the indigenous population in Ecuador is younger than 20 years of age. 78.53% of the indigenous people in Ecuador live in rural areas, 12.56% have no education and the level of instruction of 35.42% of the population is only Primary education [12].

The results of the multidimensional data analysis showed that there is a significant part of the dead indigenous Ecuadorians that consists of children younger than 10 years of age whose most common causes of death were influenza and pneumonia [13]. The traffic accidents, suicide, dementia and Alzheimer's disease are the most common causes of death of the indigenous people between 20 and 50 years of age. The most common causes of death of the people older than 60 years were the heart failure, malignant neoplasms, chronic lower respiratory diseases and hypertensive diseases [14].

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