Correlation between birth and national mortality

Correlación entre natalidad y mortalidad nacional

Laura T. Beltrán L.
Universidad Distrital Francisco José de Caldas
tatis230699@hotmail.com

Rubert O. Mieles V.
Universidad Distrital Francisco José de Caldas
mrubertorlando@yahoo.com

This article aims to raise a correlation between birth and death rates in Colombia. According to public data, it seeks to make known the meaning of the numbers, their possible interrelationship, and the various statistics obtained by the different sources of demographic data. The related data in the national census and civil registry platforms will be valuable since these sources provide the necessary material for in-depth research on population changes.

Keywords: Birth rate, colombian population, demographic impulse, life expectancy, mortality rate, overpopulation, social development

Este artículo tiene como objetivo plantear una correlación entre los índices de natalidad y mortalidad en Colombia. De acuerdo a los datos públicos, se busca dar a conocer el significado de las cifras, su posible interrelación, y las diversas estadísticas obtenidas por las diferentes fuentes de datos demográficos. Serán de utilidad los datos relacionados en las plataformas de los censos nacionales y el registro civil, ya que estas fuentes proporcionan el material necesario para la investigación profunda sobre los cambios de población.

Palabras clave: Desarrollo social, expectativa de vida, impulso demográfico, índice de mortalidad, índice de natalidad, población colombiana, sobrepoblación

Introduction

The birth rate refers to the number of births that occur in a specific place and time, also relating the amount of fertile population (Reshadat et al., 2018; Song, Ahn, Lee, & Roh, 2018; You, Symonds, Rühli, & Henneberg, 2018). These studies are reflected in different statistics made by entities that indicate various sectors of the country, and dates where these births occurred. On the other hand, the mortality rate, as its name indicates, refers to the number of deaths that occur in a time, bearing in mind that death refers to the permanent disappearance of the vital functions of a human being (Dwyer-Lindgren et al., 2016; Ebmeier et al., 2017; Sidney et al., 2016). Throughout this article, different types and causes of mortality can be observed, based on studies carried out at the national level by the corresponding entities in each case.

The population census is in charge of collecting, compiling, evaluating, analyzing, and publishing the demographic, economic, and social data related to the inhabitants of a country or a certain area of it (Balcells & Steele, 2016; Dobbs, Hernández-Moreno, Reyes-Paecke, & Miranda, 2018). The civil registry is the continuous counting of births, deaths, migrations, marriages, and divorces (Estrada, Restrepo, Ceballos, & Mardones, 2016; Pachón, Carroll, & Barragán, 2017). Both databases are based on information that will help in the development and planning of a country, and in this research, they function as a primary source for analysis (Rendón, Guevara, & Martínez, 2017; Sanchez-Serra, 2016). In the study of each of the positions, the existing correlation can be identified (Delnord, Blondel, & Zeitlin, 2015; Dharmarajan et al., 2017).

Colombian demography

The Colombian population is concentrated in the Andean areas and on the Atlantic coast where the demographic nuclei of the savannah of Bogota can be seen, formed by Bogota and Soacha, in the Aburra Valley, which includes Medellin, Bello, and Itagüi, in the Cauca Valley, composed by Cali and Palmira. Also the Atlantic Coast, Cartagena, Barranquilla, and Santa Marta. As well as in the area of the Santanderes comprising Bucaramanga and Cúcuta and in the coffee axis Huila and Tolima.

Colombia is the third most populated country in Latin America after Brazil and Mexico according to information revealed for 2017 (Wikipedia, 2017). Colombia has experienced rapid population growth like other countries in the region, with a slight decline in recent years. This is despite the number of people living abroad, which is around three million, some because of the armed conflict and others by choice. In recent years the population in Colombia has increased disproportionately due to the number of immigrants who have arrived in the country.

Demographic index

We're going to start by talking about what the demographic index is, also called the population growth rate. This index expresses the increase or decrease of the population in a given territory during a defined time, expressed as a percentage at the beginning of each period.

The demographic index is defined by certain fundamental variables. In the first part is the entry of the population, which is made up of the number of born and the number of immigrants. The other fundamental variable that must be taken into account when determining the variation in the growth rate is the population outflow, which refers to the number of deaths and emigrants over time and in the defined territory. This data is obtained by subtracting the number of deaths and immigrants from the number of deaths and emigrations. The formula used to find the population growth rate is (*Birth rate - Mortality rate*) + (*Immigration - Migration*).

A population growth rate can be positive. This indicates that the population is growing (more births and immigrants). If the growth rate is negative, it indicates that the population has decreased (more deaths and migrations). However, there is also a constant population rate that indicates that there was no change in the number of people in both times, which means that the number of births and immigrants was equal to the number of deaths and emigrations. The latter indicates that there was not a net difference, and a point of equilibrium was achieved despite changes in some variables, but the effect is compensated by the others (Wikipedia, 2019b). In this way, for the development of this article, we will take into account these two fundamental variables, as well as all the demographic factors and indicators that give us a better idea and better result of the exercise (Fig. 1).

Birth rate

The birth rate is a measure of the quantification of fertility. It refers to the relationship that exists between the number of births that occur in a certain period and the total number of effective in that same period. The normal time established to be able to calculate the crude birth rate is one year, and it is read as the number of births in a population per thousand inhabitants. This unit represents the number of individuals in a population born alive per unit of time (Wikipedia, 2019a).

Knowing this, and relating it to our particular case, Colombia, the study data are selected (table 1). These data from these statistics are collected in the country by the National Administrative Department of Statistics (DANE). This entity is responsible for planning, organizing, processing, analyzing, and disseminating all official statistics in Colombia. With the help of this entity, we will try to
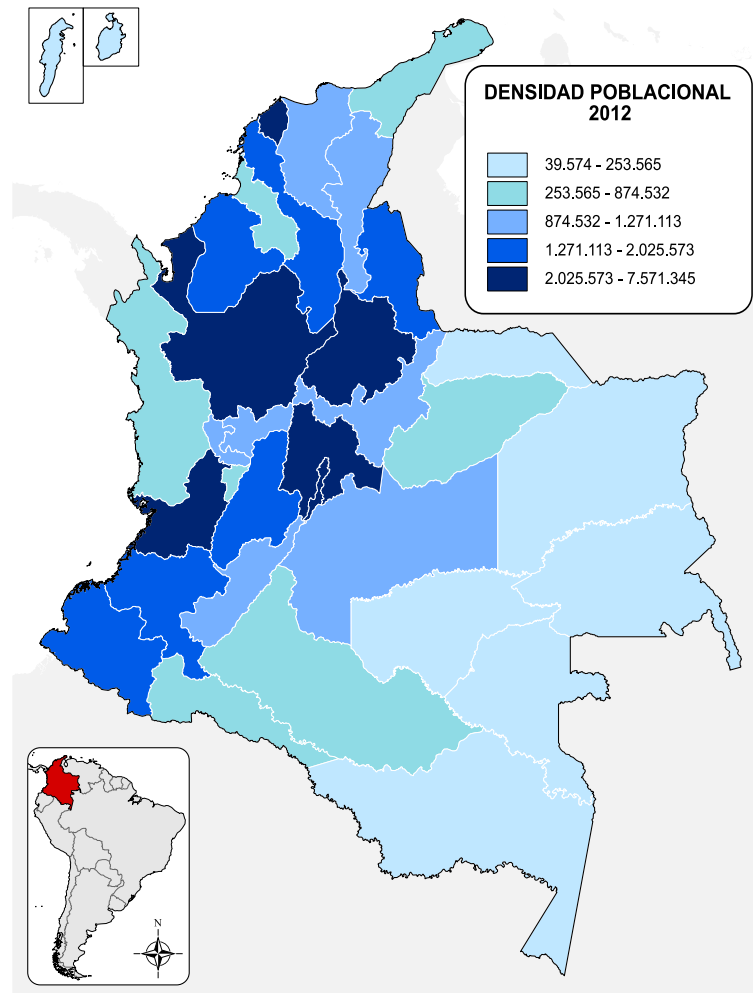
Figure 1. Population density in Colombia (Shadowxfox, 2015).

provide a solution and a real look at the problem raised in this article (Cardona, 2017).

Table 1
Birth information table (Paipa, 2016).

Date	Births	Male births	Female births	Birth rate	Fertility rate
2014	-	-	-	15.77%	1.90
2013	649742	333299	316443	16.08%	1.92
2012	676471	346890	329581	16.39%	1.95
2011	665499	341406	324093	16.73%	1.98
2010	654627	337025	317602	17.08%	2.01
2009	699775	360578	339197	17.45%	2.04
2008	715453	369752	345701	17.84%	2.08
2007	709253	364352	344901	18.25%	2.12
2006	714450	366728	347722	18.66%	2.16
2005	719968	370628	349340	19.08%	2.20
2004	723099	371229	351870	19.48%	2.24
2003	710702	364795	345795	19.87%	2.27
2002	700455	359315	341140	20.23%	2.31
2001	724319	371846	352473	20.59%	2.35
2000	752319	387020	365814	20.96%	2.39
1999	746194	382606	363588	21.36%	2.43
1998	720984	369378	351606	21.80%	2.48

Mortality rate

Mortality is considered to be the process of disappearance of life in a population in a given time. It is studied using flow charts, various statistics that help to interpret the information more effectively. This phenomenon is analyzed through the registration of deaths, not only taking into account the number of deaths but also age, causes, socio-economic characteristics, among others.

The mortality statistic is identified as different between men and women, as there has been over-mortality in men throughout their lives. Mortality has an important influence on various social and economic factors. The study of mortality by cause of death has been grouped into two major categories:

• Mortality due to endogenous or biological causes, which will have greater weight in the first month of life, as well as in advanced ages as a result of the aging that the population is suffering.

• Mortality by exogenous causes, as the result of the action of some means that will prevail in the childhood and young adults, although it is present in all ages (infectious diseases and accidents).

With the passing of time and the evolution of medicine, it is evident that mortality from endogenous causes is beginning to be more important and to receive more attention, while the second group turns out to be more controllable with hygienic and preventive measures (Fig. 2) (EcuRed, 2019).

Changes in Colombian demographics

In this section we will talk about the changes that have occurred in the Colombian population during the last few years, taking into account numbers and data provided by the different organizations and institutions involved, knowing that both national and world demographics have increased significantly and disproportionately.

Demographic statistics

Taking into account that in our country a national census was made in 2005, and to date, no other has been carried out, the statistical data obtained are valid. However, according to data obtained by the DANE, another national census is planned for 2018, which will begin in January and will have its first results in May, to obtain data about the population in the country, and thus know the reality of the increase in Colombian demography and the impact that this increase may have on the political, social and economic (Fig. 3).

In Colombia, the relative growth of the potentially active population continues with normal growth. This is between 15 and 64 years of age, which is 65.7% compared to the inactive population, which is made up of those under 15 and over 64, with a percentage of 34 percent. This is what Pro Familia tells us through the National Demographic and Health Survey (ENDS), which is conducted every five years with the collaboration of the Ministry of Health and Social Protection. In this survey, an analysis was made with the figures shown in the demographic changes that have occurred in the country. In the results obtained, the reduction in fertility is noted, which has led to the transformation of the structure by age of the population, in the same way, it is clear the decrease in infant mortality and the different changes in the size and composition of Colombian households.

This organization has been doing important work in education and in guaranteeing sexual and reproductive rights. Thus, throughout these years it has managed to reduce the fertility rate in the country. According to the ENDS, the fertility rate by area fell. They went from 2.8% to 2.6% in the rural area, and from 2% to 1.8% in the urban area. Another issue worked by the organization is the indicators of infant mortality, which continues to fall, this was reduced by half from the period 1990-1995 until today.

Although the country is ethnically and culturally diverse, there is still a high level of discrimination against these groups (Fig. 4). This discrimination is perceived in their levels of poverty, exclusion, and marginalization. Concerning ethnic groups, the survey shows that 14.4 percent of the country's population recognized that they belong to an indigenous or Afro-descendant population. The indigenous population is distributed with a greater geographical concentration in the Orinoquia, Amazon, Pacific, and Atlantic regions.

Among other results obtained in this survey is the marked decrease in the size of households, which is a common phenomenon among other Latin American countries. There was an increase in single-person households from 9.4% to 11.1%, while at the same time there was a decrease in households made up of more than four people. Similarly, there has been a continuous increase in the number of women heads of household, which stands out in urban areas with 36.4% and in rural areas with 25.5%.

Another important indicator taken from this survey is the percentage of children in the country who are not registered and are exposed to the risk of being excluded from the benefits and services indispensable for the good development of their physical, intellectual, and emotional capacities. The 1.4% of children who are under five years old were not registered, this percentage is higher in the rural area 2.5% than in the urban area 0.9%.

The data presented by the ENDS shows how the country has lived and is living an accentuated process of demographic transition which has implied some significant changes in the roles, behaviors, and demographic trends in the country (Marcas, 2017).

Causes of population growth

The population in Colombia has increased considerably and disproportionately in recent years. Among the causes of this phenomenon is:

• **The decrease in mortality**. This has occurred due to the sanitary, economic and technological advances that made possible the disappearance of epidemics and the diffusion of new industrial techniques. Similarly, the different processes carried out in the country such as the peace process and by which since the ceasefire has decreased mortality in the most affected areas.

• **Life expectancy**. It refers to the increase of the time of life, on average in Colombia the men live 72 years and the women reach 78 years while in 1950 the men were not reaching 50 years and the women 52 years. This phenomenon of continuing to increase can lead to massive and uncontrollable overpopulation for the country's leaders (Tiempo, 2005).

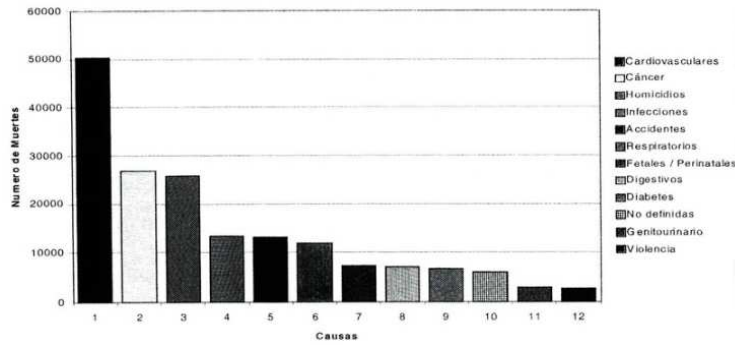• Demographic momentum. The population tends to continue growing with a decrease in mortality and the

Figure 2. Mortality rate notability (Zambrano & Camacho, 2002).

Figure 3. Overcrowding in Bogotá (Colombia) (Soncas, 2015).

Figure 4. Ethnic minorities in Colombia (Aida, 2017).

absence of migration. Taking into account the age structure reveals a young population that will soon enter the reproductive age the largest generation of adolescents in history, overall there will be more than enough births to maintain population growth in the coming decades (Glosarios, 2015).

• **Immigration**. It is the phenomenon that most affects our country today. The great entrance of foreigners to our country, especially Venezuelans and Colombians with dual nationality who, due to the hard political, economic and social situation in the neighboring country, decide to cross the border in search of better work opportunities and a better quality of life. The number of people from the neighboring

country who have entered during the year can only be known after next year's census; however, the possibility of people continuing to enter in the following years without any decrease is not foreseen. To this phenomenon, we must add that due to internal processes such as the peace process and its ceasefire and the restitution of land it is very likely that these affected people will take the initiative to create a home and have children by increasing the birth rate of the country (Figs. 5 to 10) (Dinero, 2017).
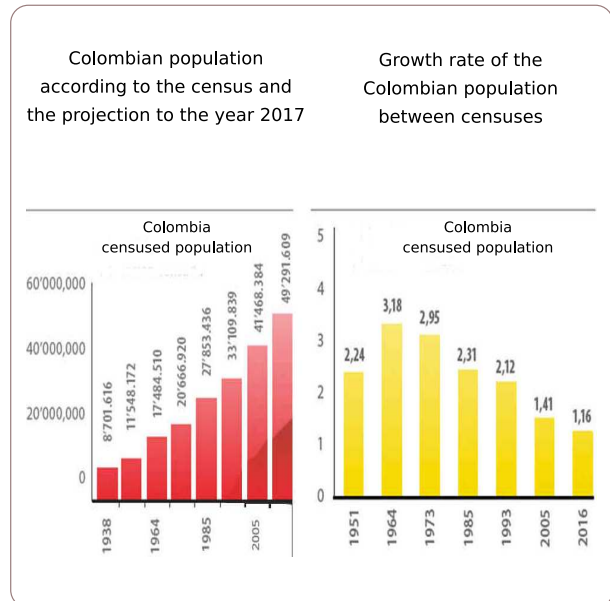

Figure 5. Population growth in Colombia according to national census (Dinero, 2017).

What to do about overpopulation in Colombia?

Taking into account that overpopulation is a phenomenon that not only affects Latin American countries but also occurs worldwide, it is evident that it affects various aspects such as the economy, politics, and the environment in a negative way. The population in Colombia has multiplied disproportionately, this phenomenon is not
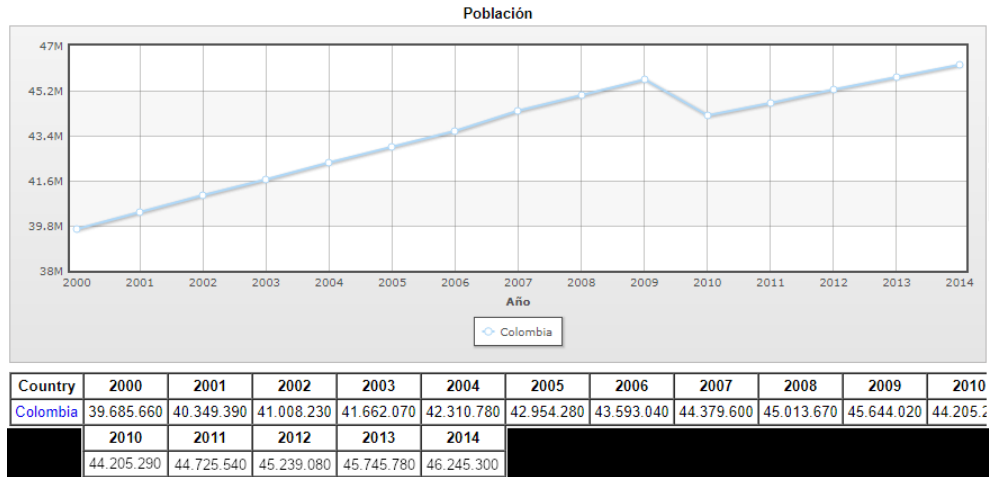
Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Colombia	39.685.660	40.349.390	41.008.230	41.662.070	42.310.780	42.954.280	43.593.040	44.379.600	45.013.670	45.644.020	44.205.2

2010	2011	2012	2013	2014
44.205.290	44.725.540	45.239.080	45.745.780	46.245.300

Figure 6. Historical behavior of population density in Colombia (Index, 2014).

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Colombia	36,58	37,15	37,72	38,28	38,97	39,52	40,08	38,81	39,27	39,72	40,17	40,6
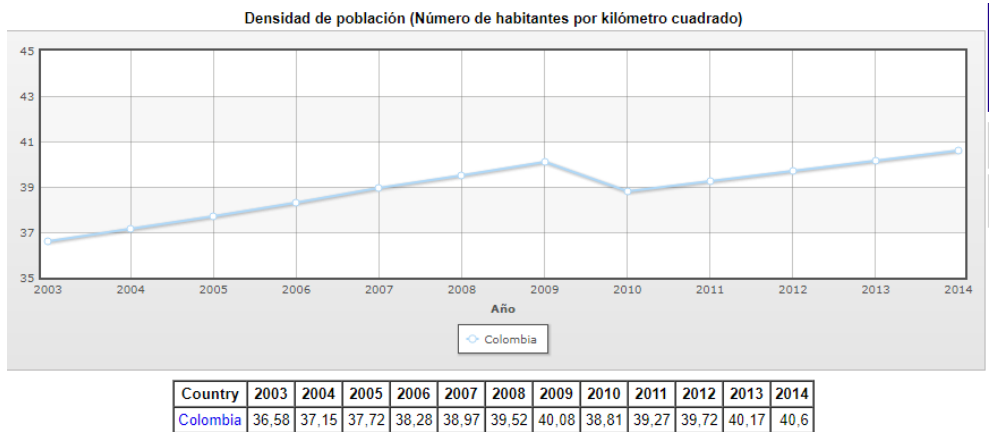
Figure 7. Population density in Colombia (number of inhabitants per square kilometer) (Index, 2014).

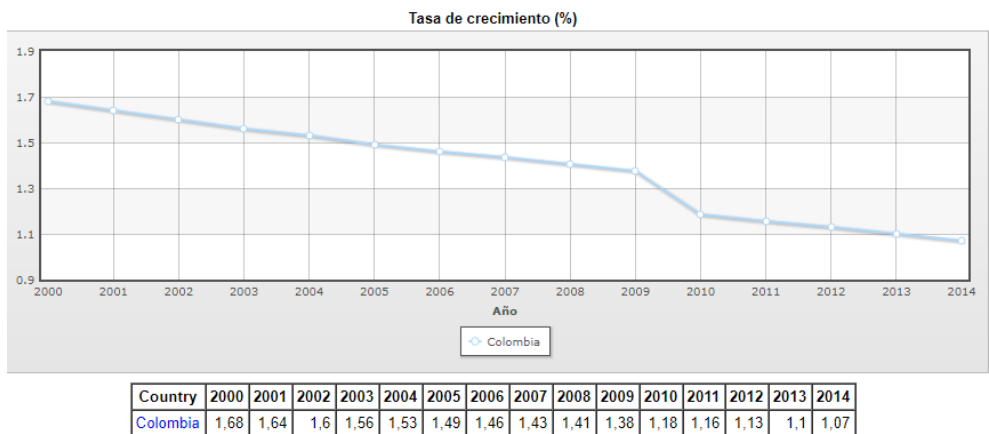| Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Colombia	1,68	1,64	1,6	1,56	1,53	1,49	1,46	1,43	1,41	1,38	1,18	1,16	1,13	1,1	1,07

Figure 8. Historical growth rate in percentage (Index, 2014).

evident in developed countries, because the birth rates are counterbalanced by the death rates, while in Colombia the opposite is the case, while there are more births, there are fewer deaths and also, the large number of immigrants who enter our country daily.

The problem is more serious than is thought since the number of inhabitants has almost reached fifty million
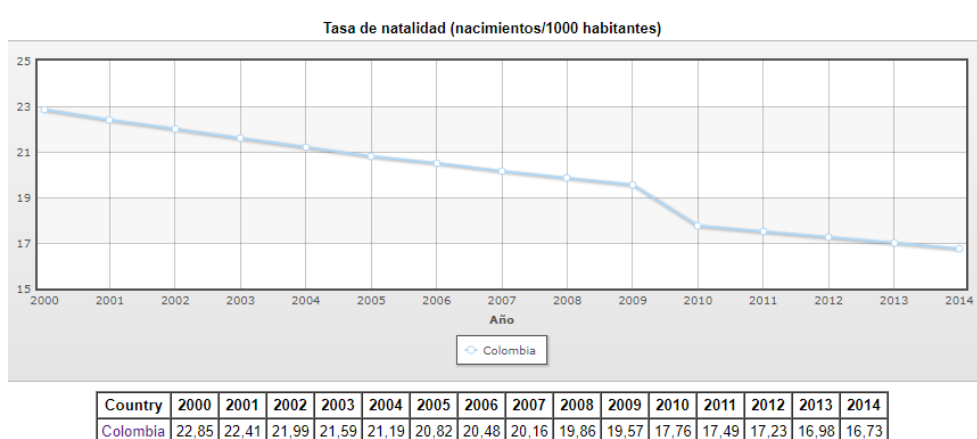
Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Colombia	22,85	22,41	21,99	21,59	21,19	20,82	20,48	20,16	19,86	19,57	17,76	17,49	17,23	16,98	16,73

Figure 9. Historical birth rate (births per 1000 population) (Index, 2014).

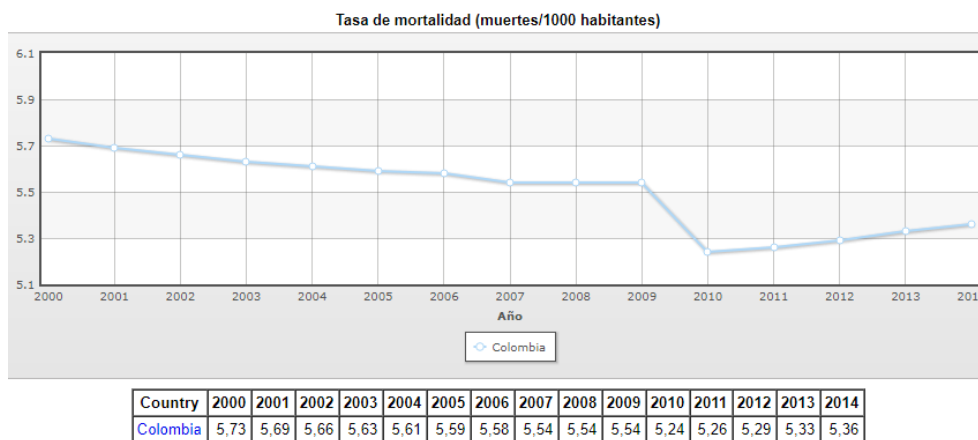| Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Colombia	5,73	5,69	5,66	5,63	5,61	5,59	5,58	5,54	5,54	5,54	5,24	5,26	5,29	5,33	5,36

Figure 10. Historical mortality rate (deaths per 1000 population) (Index, 2014).

(50,000,000), a number that will be surpassed in a certain time. One of the most important problems derived from overpopulation is unemployment, the rate of unemployed increases significantly, generating a higher level of poverty and directly affecting the country's economy.

It can be concluded that this problem has no real solution. It is difficult, almost impossible to prevent humanity from continuing to reproduce itself despite the existence of an infinite number of contraceptive methods and different organizations that are responsible for generating protection campaigns to lower the birth rate and prevent disproportionate population growth.

Contraceptive solution

Any method or device that prevents pregnancy. Several contraceptive methods have the same objective, but different levels of effectiveness. At least, sterilization is one of the most effective methods, through vasectomy in men and tubal ligation in women. Although intrauterine devices,

subdermal contraceptives, hormonal contraceptives, and barrier methods can also be considered (Semana, 2017).

- **Intrauterine (IUD)**. A method of contraception that prevents pregnancy by killing the man's sperm, or preventing it from entering the woman's uterus (staff, 2000).
- **Subdermal (IS)**. A device made up of one or two matchstick-sized rods that are inserted under the skin of a woman's arm and release a progestin that acts as a contraceptive (Fertilab, 2019).
- **Hormonal**. This method is based on the consumption of hormone products whose administration is by different routes, causes an inhibition of ovulation, which therefore prevents fertilization and pregnancy (Metodoss, 2016).
- **Barrier methods of contraception**. They have the same function as the above-mentioned contraceptives, although they must be used adequately in every sexual relationship since they not only prevent pregnancies, but also diverse sexually transmitted diseases (Figs. 11 to 14).

Figure 11. Male condoms (Infogen, 2016).
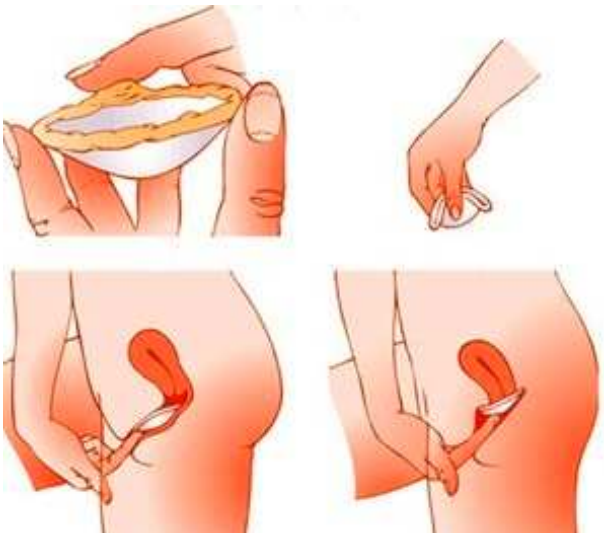

Figure 12. Female diaphragm (Verywell, 2019).

Figure 13. How to use the diaphragm (Anticonceptivas, 2019).

Family planning organizations

At the national level the most important organizations are:
- Pro Familia.
- WHO (World Health Organization).
- Contraception - Ministry of Health and Social Protection.

Figure 14. Vaginal sponges (Hoy, 2016).

- FUDEN - Foundation for the development of nursing.

Conclusions

This paper highlights through national statistics the sustainable increase of the population density in Colombia. Specific numbers are shown for factors that influence this population growth such as cultural, educational, migratory, and recent changes in the internal armed conflict. As an alternative to a social solution, some proposals are made that can help reduce the rate of growth, reducing the social and economic burden of the country.

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