DECISION SCIENCES INSTITUTE

Causes of Mortality by Ethnicity and Gender in the USA: An advanced Comparative Analysis

ABSTRACT

The mortality rate in the United States is different for the ethnicities and genders, in such a way that the mortality rates were analyzed and found some important differences that suggest the opportunity of using the unique characteristics of the ethnic and gender groups to reduce mortality on the others. This study focuses on projecting the national mortality data for the future identifying areas of research opportunities by ethnicity groups and gender.

KEYWORDS: regression, mortality, ethnicities, sensitivity analysis and health

INTRODUCTION

The United States is a country that has an amalgam of cultures, ethnicities, races, languages and religions that shape the country as a place for migrants looking for the land of opportunity. The country population of around 325 million people in 2017, and it continues growing by organic growth as well as migration. The composition of the population can be seen in figure 1 that clearly shows that most of the population is in the white persons' category.

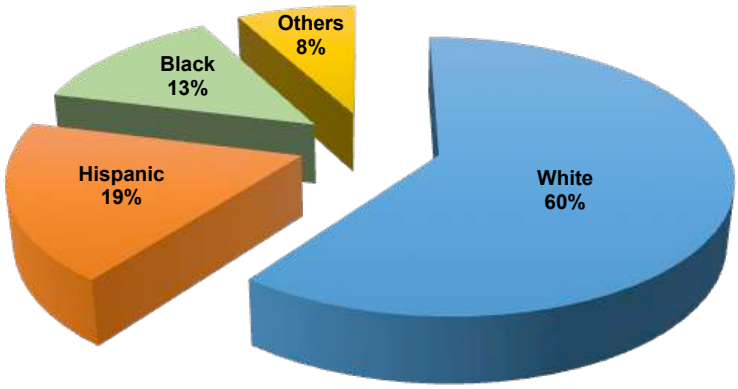

Figure 1: Races and Ethnicities' Composition of the USA Population

An important finding while analyzing the demographics, is that we expected a comparative difference between genders, but this is not true because there are 2.67 million more black women than men, that is 11% more in comparison to males, while in the case of white women, they are 3% more than men. In the case of Hispanics genders are almost perfectly balanced according to the Census numbers.

Table 1: USA Population by Race and Gender

Male		Group	Female	
29.67%	95,842,609	White	98,885,235	30.61%
9.31%	30,058,779	Hispanic	30,094,010	9.32%
6.17%	19,922,595	Black	22,599,391	7.00%
3.78%	12,212,462	Others	13,381,513	4.14%

The mortality line from 2006 to 2015 shows a R-square of 0.905 with a slope or growth of 28,683 per year at national level, while the population growth is significantly higher with 2,380,488 per year (Census, 2017). This figure shows that there is an aging population in the country as the number of births and migrants is well over the deaths. The cities are growing, and people are living longer, but this study is going to go beyond the surface and into the details of the cause of deaths by ethnicity and gender.

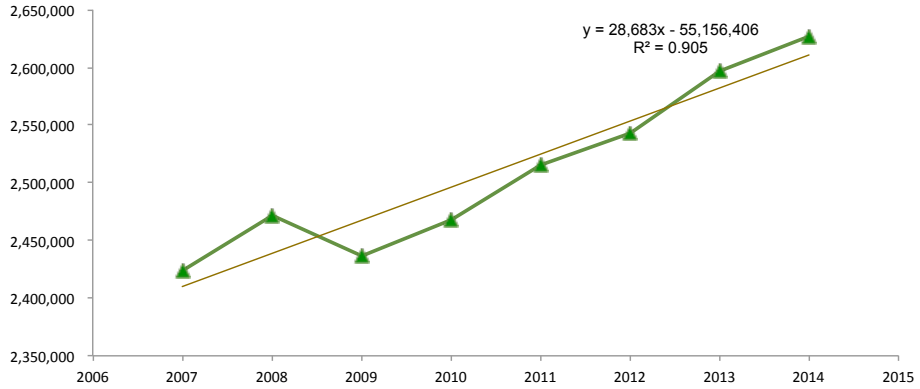

Figure 2: Mortality Numbers in the USA

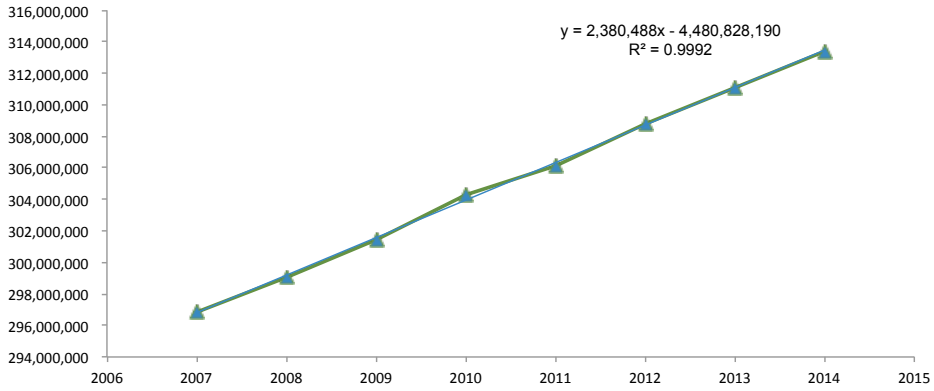

Figure 3: Population growth as Estimated by the Census Office

VIOLENT DEATHS ANALYSIS

We can separate deaths in the United States into two major groups: diseases and violent deaths. The study is based on the available information at the Centers for Disease Control and Prevention (CDC). We are looking at the period between 2007 and 2014 because the County information is not available for comparison, so we will go as far as all three levels of information are available.

The first point to address is the importance of the violent deaths in the country. The percentage of homicides, suicides and accidents is only 7.2% of all deaths, but the behavior of these deaths follows the polynomial non-linear regression with a R-square of 0.937, which is showing an alarming growth of rate on the last four years after a positive trend of reduction. For this particular study, we are only going to separate these statistics by gender and group to have a better idea of where the trend is going.

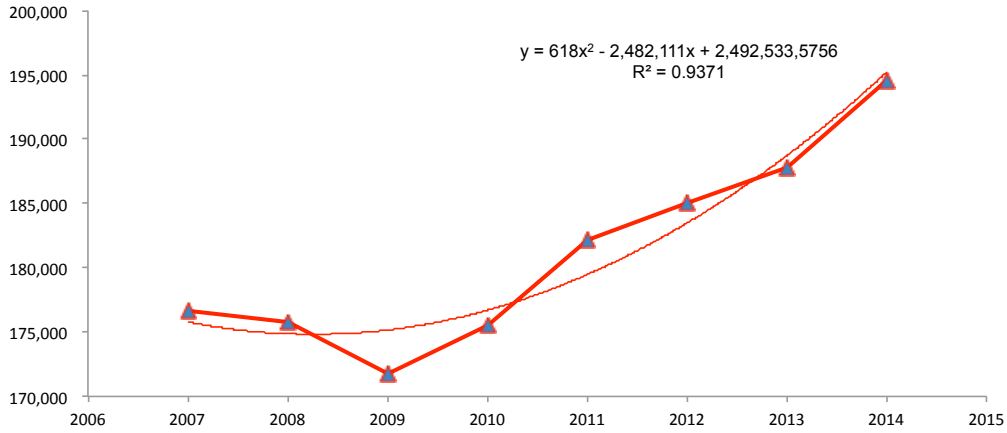

Figure 4: Total Violent Deaths in the USA

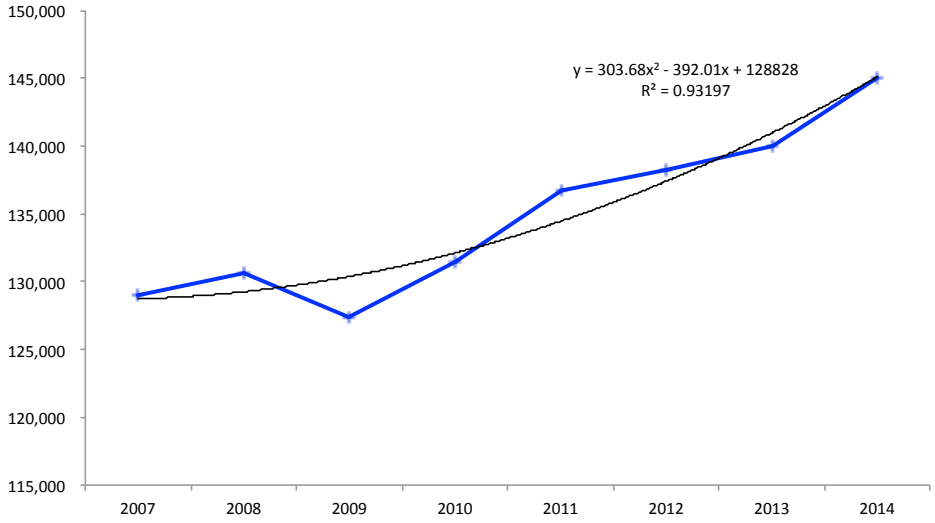

Figure 5: Violent Deaths for White Persons in the USA

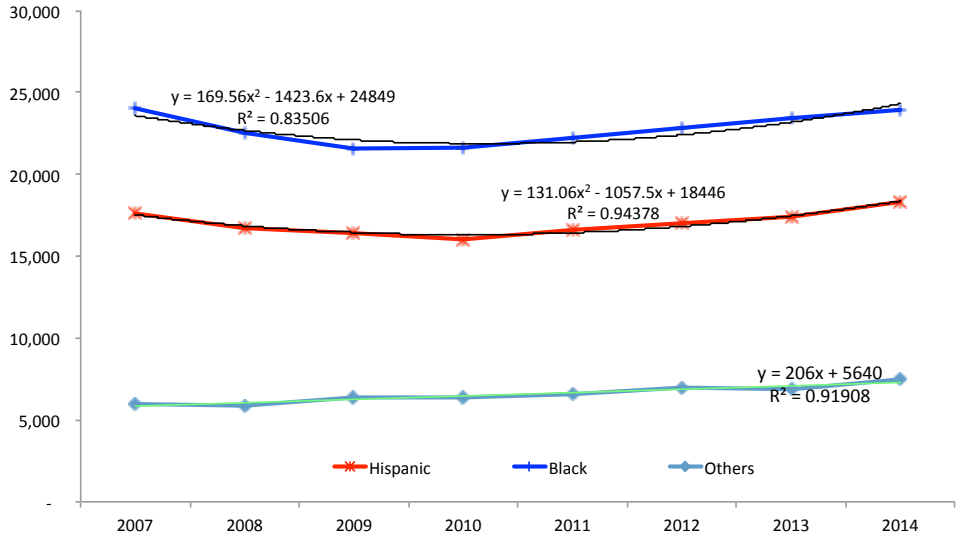

Figure 6: Violent Deaths for Minorities in the USA

The white population definitively drives the curve slope of violent deaths because of its number and proportion. Looking at table 2, we can see that the proportion of violent deaths is almost the same for Hispanics and the others' group, while the black and white groups are higher, being the white people the highest.

Table 2: Proportion of Violent Deaths for Groups to the Group's Population

Group	2007	2008	2009	2010	2011	2012	2013	2014
White	0.066%	0.066%	0.065%	0.067%	0.069%	0.071%	0.072%	0.074%
Hispanic	0.039%	0.036%	0.035%	0.033%	0.033%	0.033%	0.033%	0.034%
Black	0.064%	0.060%	0.057%	0.056%	0.057%	0.058%	0.058%	0.059%
Others	0.033%	0.032%	0.034%	0.033%	0.033%	0.032%	0.031%	0.032%

Table 3: Proportion of Violent Deaths by Gender and Group to the Specific Population

Males	2007	2008	2009	2010	2011	2012	2013	2014
White	0.089%	0.090%	0.087%	0.089%	0.092%	0.094%	0.095%	0.098%
Hispanic	0.060%	0.055%	0.052%	0.049%	0.049%	0.049%	0.049%	0.050%
Black	0.104%	0.097%	0.091%	0.090%	0.091%	0.093%	0.093%	0.094%
Others	0.045%	0.044%	0.047%	0.046%	0.047%	0.045%	0.043%	0.045%
Females	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
White	0.043%	0.044%	0.043%	0.045%	0.047%	0.048%	0.049%	0.051%
Hispanic	0.017%	0.016%	0.016%	0.016%	0.017%	0.016%	0.016%	0.017%
Black	0.029%	0.027%	0.027%	0.026%	0.027%	0.026%	0.027%	0.028%
Others	0.021%	0.020%	0.022%	0.021%	0.021%	0.020%	0.019%	0.021%

Table 3 shows the critically of gender while analyzing accidental deaths because females in all groups have a much lower proportion of violent deaths than men. A point to address at this point is that black male violent deaths were going down until 2010, when they started climbing again. It is noteworthy that white and black males have a similar proportion of violent deaths.

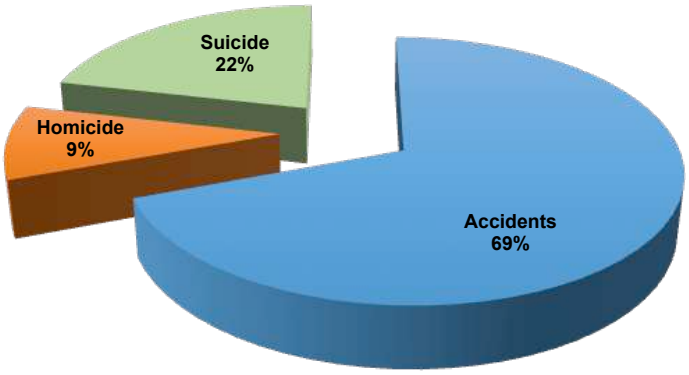

Figure 7: Violent Deaths by Categories in the USA

More than two-thirds of the violent deaths in the country are accidents, while suicides are the second largest contributor with 22% of all violent deaths.

Table 3: Causes of Violent Death by group and Gender in the USA

	White		Black		Hispanic		Others	
Violent Death Cause	Male	Female	Male	Female	Male	Female	Male	Female
Accidents (unintentional injuries)	0.062%	0.038%	0.047%	0.020%	0.033%	0.012%	0.029%	0.015%
Assault (homicide)	0.004%	0.002%	0.038%	0.005%	0.010%	0.002%	0.005%	0.002%
Intentional self-harm (suicide)	0.026%	0.007%	0.010%	0.002%	0.009%	0.002%	0.012%	0.004%

In table 3 we can easily see that the major contributors for accidental deaths are the males, and there is another important fact about the black males being the ones with the largest proportion of homicide deaths. Another subject recommended for further investigation is the higher than normal proportion of suicides from white persons.

DISEASES DEATHS ANALYSIS

The CDC identifies several causes of death due to illnesses, and for this study, we will focus on the major illnesses based on the national mortality data published by the CDC.

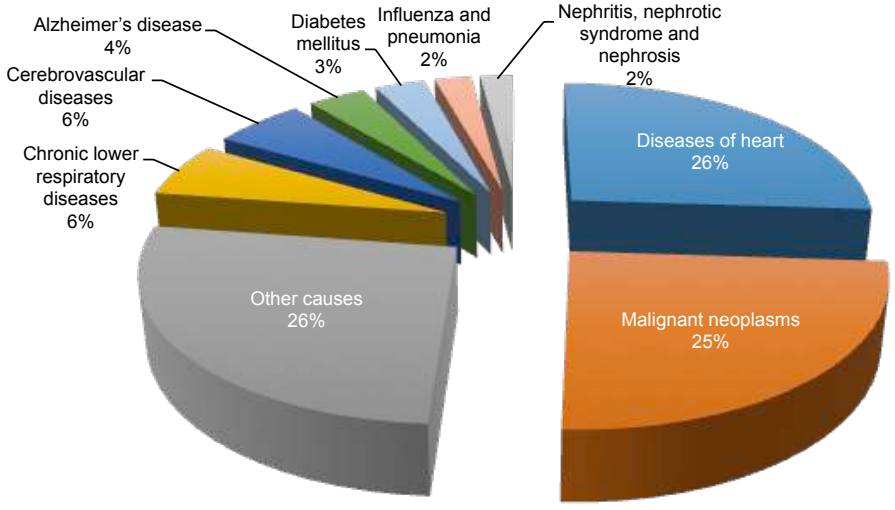

Figure 8: Top Diseases in the USA

The figure shows that Disease of the Heart and Cancers are the top two causes of death by illness in the United States as they add to over 50% of the deaths. The next contributors are much smaller because the following one on the list is the respiratory disease with only 8% of the deaths. Having identified the main causes of death, we now proceed to analyze by gender and then by ethnic group to identify possible trends or differences on the proportions.

Table 4: Causes of Mortality by Gender

Male		Group	Female	
0.209%	312,868	Diseases of heart	293,599	0.189%
0.201%	301,584	Malignant neoplasms	274,242	0.176%
0.166%	248,348	Other causes	300,553	0.193%
0.045%	66,733	Chronic lower respiratory diseases	74,165	0.048%
0.036%	53,276	Cerebrovascular diseases	77,721	0.050%
0.017%	25,139	Alzheimer's disease	58,172	0.037%
0.025%	37,404	Diabetes mellitus	35,039	0.023%
0.017%	25,149	Influenza and pneumonia	28,534	0.018%
0.016%	23,532	Nephritis, nephrotic syndrome and nephrosis	24,039	0.015%
0.011%	16,776	Septicemia	19,461	0.013%
0.014%	21,492	Chronic liver disease and cirrhosis	11,609	0.007%

The table shows that Cerebrovascular and Alzheimer's diseases have a larger percentage in women than in men. The difference is more noticeable in the Alzheimer's disease because the number of deaths is more than twice as much. Aronson et al. (1990) stated that women were over 3 times more likely to develop dementia than men despite controlling for baseline demographic, psychosocial, and medical history variables.

Table 5: Proportions of Death by Group and Gender

	White		Black		Hispanic		Others	
Diseases Causing Death	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
Diseases of heart	0.261%	0.239%	0.195%	0.165%	0.067%	0.058%	0.092%	0.068%
Malignant neoplasms	0.251%	0.219%	0.185%	0.154%	0.066%	0.062%	0.095%	0.083%
Other causes	0.199%	0.241%	0.173%	0.169%	0.070%	0.070%	0.076%	0.076%
Chronic lower respiratory diseases	0.061%	0.067%	0.025%	0.021%	0.009%	0.009%	0.015%	0.011%
Cerebrovascular diseases	0.042%	0.062%	0.039%	0.043%	0.014%	0.017%	0.021%	0.024%
Alzheimer's disease	0.023%	0.051%	0.008%	0.019%	0.005%	0.010%	0.005%	0.010%
Diabetes mellitus	0.027%	0.024%	0.032%	0.032%	0.014%	0.014%	0.016%	0.014%
Influenza and pneumonia	0.021%	0.023%	0.014%	0.013%	0.007%	0.007%	0.011%	0.010%
Nephritis, nephrotic syndrome and r	0.018%	0.017%	0.021%	0.022%	0.006%	0.006%	0.007%	0.007%
Septicemia	0.013%	0.015%	0.015%	0.016%	0.004%	0.005%	0.005%	0.005%
Chronic liver disease and cirrhosis	0.016%	0.009%	0.010%	0.005%	0.013%	0.006%	0.008%	0.005%

Looking at the two diseases that were showing higher incidence of women than men, we see now that the Alzheimer disease causing death is showing the same behavior for all groups, because the proportion is more than twice as much as the men. Cerebrovascular diseases seem to be only found for white women because in all other cases the difference between males and females is very close. World studies suggest that CVD are going down in the world for both sexes but the statistics for white women in the USA are still high (Levi et al., 2002).

COMPARING THE RESULTS OF THE USA WITH TEXAS

The population in Texas has a different composition because white population is still a majority, but closely followed by Hispanics. If the proportions that we have seen in a national level are impacted by ethnicity, then they should present a different behavior due to the demographics of the state. The idea of Hispanic migrants having better access to health care than the poor native Hispanics could have an improvement effect on the statistics (Gresenz et al., 2009).

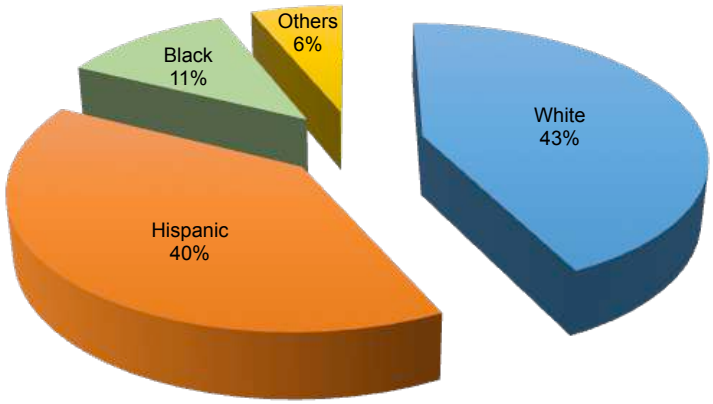

Figure 9: Races and Ethnicities' Composition of the Texas Population

In Texas, all ethnic groups have a close balance between males and females, as their differences on quantities are insignificant

Table 6: Texas Population by Race and Gender

Male		Group	Female	
21.18%	5,753,306	White	5,871,575	21.62%
19.95%	5,417,985	Hispanic	5,322,471	19.60%
5.54%	1,506,024	Black	1,608,163	5.92%
3.03%	821,995	Others	860,423	3.17%

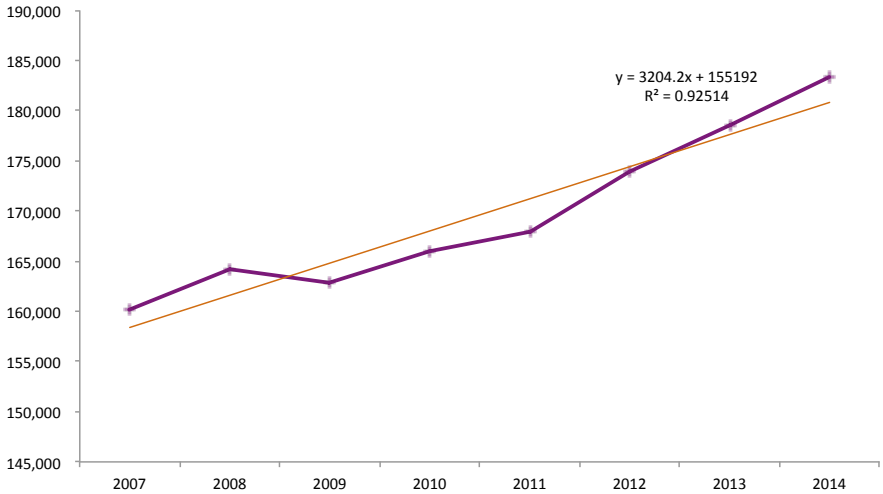

Figure 10: Mortality Numbers in Texas

The mortality line from 2006 to 2015 shows a R-square of 0.925 with a slope or growth of 3,204 per year at the state level, while the population growth is significantly higher with 449,629 per year (Census, 2017). These figures show that there is an incredible growth on population with a small mortality rate that is causing a larger than expected demographic growth.

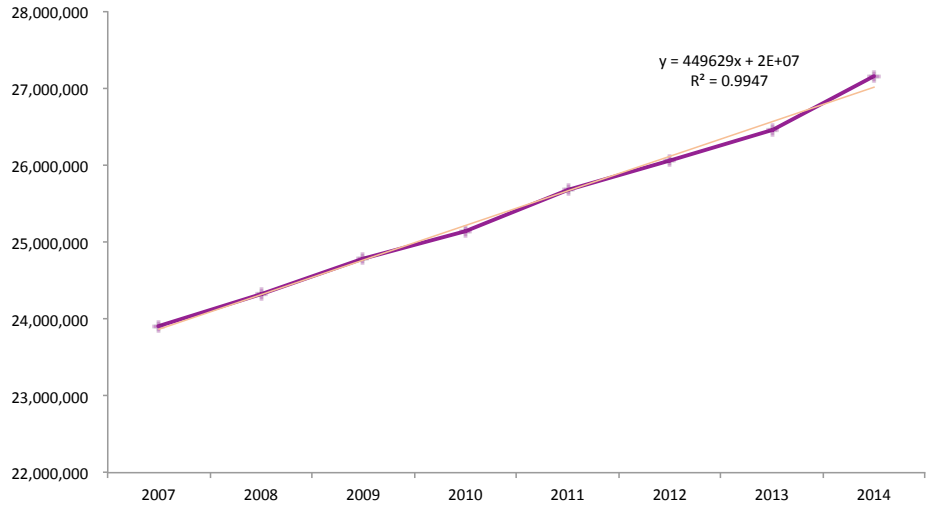

Figure 11: Population growth as Estimated by the Census Office

VIOLENT DEATHS IN TEXAS

The percentage of violent deaths in Texas is only 8% of all deaths, but the behavior of these deaths follows the polynomial of the third order non-linear regression with a R-square of 0.928, which is showing a stable period and the same alarming growth of rate on the last four years as seen in the national chart.

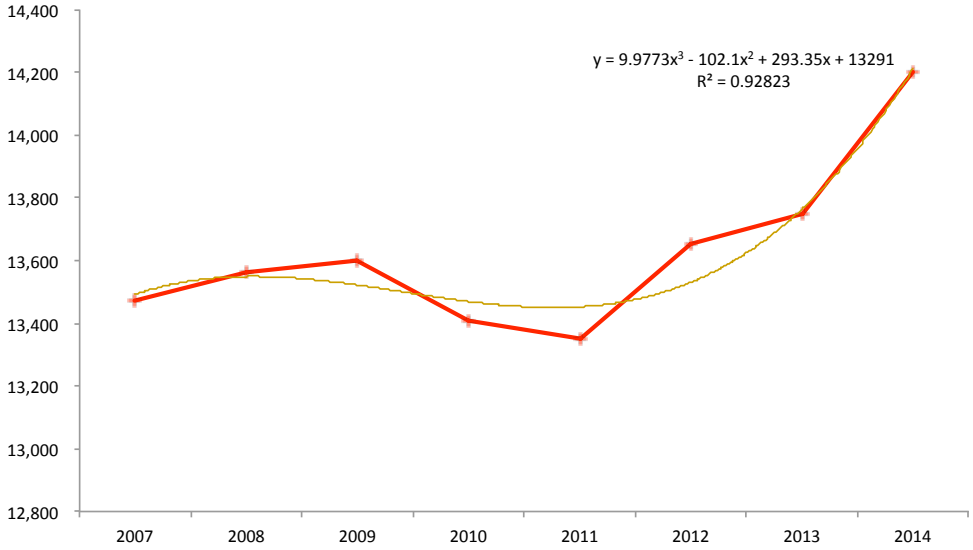

Figure 12: Total Violent Deaths in Texas

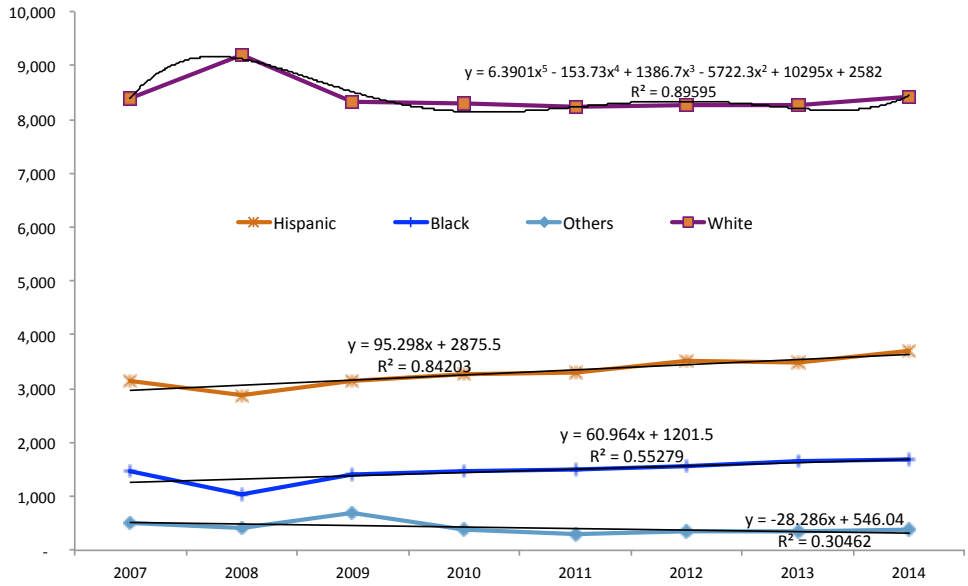

Figure 13: Violent Deaths for All Groups in Texas

Although the white and Hispanic populations are almost the same, the number of deaths of Hispanics is much lower than for white persons, and on regards to the national numbers, the number of violent deaths of Hispanics is comparable to the national proportion. Table 7 shows the critically of gender while analyzing accidental deaths because females in all groups have a much lower proportion of violent deaths than men. A point to address at this point is that black male violent deaths have been at the same level for the past eight years.

Table 7: Proportion of Violent Deaths by Gender and Group to the Specific Population

Males	2007	2008	2009	2010	2011	2012	2013	2014
White	0.099%	0.111%	0.097%	0.095%	0.097%	0.097%	0.097%	0.098%
Hispanic	0.052%	0.046%	0.049%	0.051%	0.050%	0.052%	0.050%	0.050%
Black	0.081%	0.054%	0.075%	0.072%	0.075%	0.080%	0.084%	0.083%
Others	0.071%	0.054%	0.091%	0.050%	0.030%	0.032%	0.029%	0.032%
Females	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
White	0.049%	0.053%	0.050%	0.050%	0.048%	0.047%	0.048%	0.048%
Hispanic	0.018%	0.017%	0.017%	0.018%	0.017%	0.018%	0.017%	0.018%
Black	0.026%	0.020%	0.026%	0.026%	0.029%	0.026%	0.027%	0.028%
Others	0.029%	0.028%	0.036%	0.018%	0.011%	0.014%	0.014%	0.014%

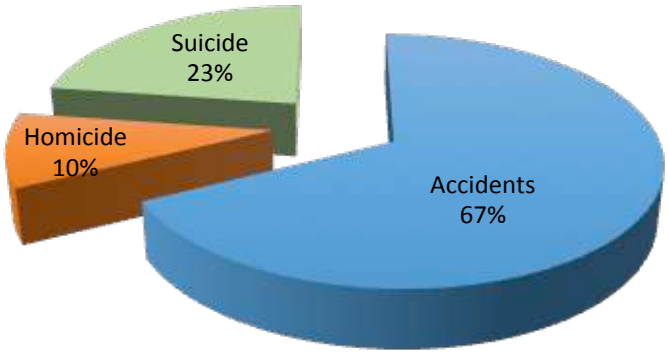

Figure 14: Violent Deaths by Categories in Texas

The same as in the national figures, more than two-thirds of the violent deaths in the state are accidents, while suicides are the second largest contributor with 23% of all violent deaths.

Table 8: Causes of Violent Death by group and Gender in the USA

	White		Hispanic		Black		Others	
Violent Deaths	Male	Female	Male	Female	Male	Female	Male	Female
Accidents	0.064%	0.039%	0.034%	0.014%	0.043%	0.020%	0.028%	0.013%
Homicide	0.005%	0.002%	0.008%	0.002%	0.024%	0.005%	0.008%	0.002%
Suicide	0.029%	0.008%	0.008%	0.002%	0.009%	0.002%	0.009%	0.004%

In table 8 we can easily see that the major contributors for accidental deaths are the males, and there is also the same factor of homicides being the cause of more black males.

DISEASES DEATHS ANALYSIS IN TEXAS

Following the analysis that we did for the diseases as reported by the CDC, we find that the top illnesses are very much the same as for the national level.

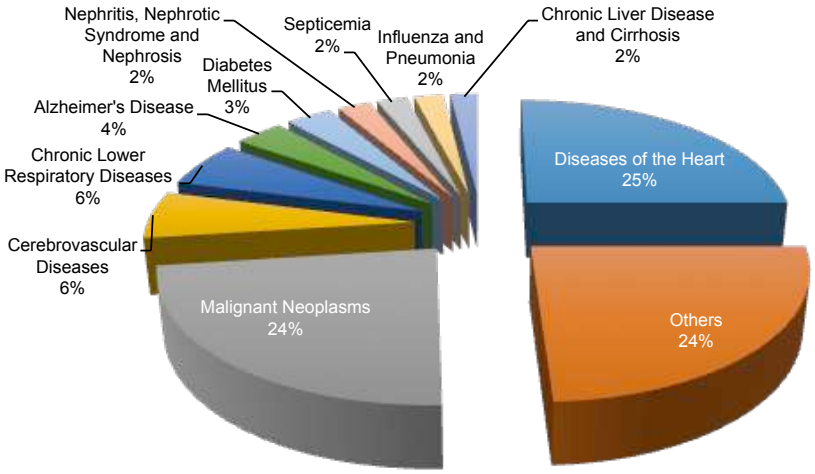

Figure 15: Top Diseases in Texas

The figure shows that Disease of the Heart and Cancers are the top two causes of death by illness in the United States as they add to over 50% of the deaths. The next contributors are much smaller because the following one on the list is the respiratory disease with only 8% of the deaths. Having identified the main causes of death, we now proceed to analyze by gender and then by ethnic group in order to identify possible trends or differences on the proportions.

Table 9 shows that Cerebrovascular and Alzheimer's diseases have also a larger percentage in women than in men. The difference is more noticeable in the Alzheimer's disease because the number of deaths is more than twice as much.

Males		Diseases causing Death	Females	
0.164%	20,771	Diseases of the Heart	18,258	0.143%
0.137%	17,420	Others	20,508	0.161%
0.156%	19,716	Malignant Neoplasms	17,164	0.134%
0.031%	3,936	Cerebrovascular Diseases	5,406	0.042%
0.035%	4,418	Chronic Lower Respiratory Diseases	4,650	0.036%
0.013%	1,654	Alzheimer's Disease	3,714	0.029%
0.020%	2,586	Diabetes Mellitus	2,496	0.020%
0.014%	1,792	Nephritis, Nephrotic Syndrome and Nephrosis	1,837	0.014%
0.012%	1,581	Septicemia	1,805	0.014%
0.012%	1,535	Influenza and Pneumonia	1,712	0.013%
0.016%	1,996	Chronic Liver Disease and Cirrhosis	1,034	0.008%

Table 10: Proportions of Death by Group and Gender

Diseases Causing Death	White		Hispanic		Black		Others	
	Male	Female	Male	Female	Male	Female	Male	Female
Diseases of the Heart	0.250%	0.219%	0.075%	0.062%	0.172%	0.150%	0.069%	0.049%
Others	0.195%	0.238%	0.077%	0.081%	0.153%	0.162%	0.061%	0.059%
Malignant Neoplasms	0.235%	0.198%	0.072%	0.065%	0.165%	0.143%	0.075%	0.065%
Cerebrovascular Diseases	0.043%	0.063%	0.017%	0.019%	0.038%	0.047%	0.016%	0.018%
Chronic Lower Respiratory Diseases	0.064%	0.069%	0.009%	0.007%	0.023%	0.018%	0.009%	0.007%
Alzheimer's Disease	0.023%	0.050%	0.005%	0.010%	0.007%	0.018%	0.002%	0.006%
Diabetes Mellitus	0.024%	0.020%	0.017%	0.018%	0.026%	0.030%	0.009%	0.008%
Nephritis, Nephrotic Syndrome and Nephrosis	0.018%	0.017%	0.009%	0.010%	0.020%	0.022%	0.007%	0.006%
Septicemia	0.016%	0.018%	0.008%	0.009%	0.016%	0.019%	0.006%	0.006%
Influenza and Pneumonia	0.018%	0.020%	0.007%	0.007%	0.011%	0.011%	0.005%	0.005%
Chronic Liver Disease and Cirrhosis	0.018%	0.010%	0.016%	0.008%	0.009%	0.005%	0.005%	0.003%

Some interesting findings on the table 10 are that Hispanic men and women have higher diabetes and lower respiratory issues than white people; white and black women have an alarming rate of Alzheimer disease compared to the other minority groups; and diseases of the heart are predominantly higher for white people in proportion to the other ethnic groups.

CONCLUSION

In this paper, we started the conversation about the ethnicities' differences on the number of deaths by causes. It is our intent that future medical research can answer the above mentioned questions so that developing a health atlas, we can identify the unique cultural and habit practices of people for nourishment, exercise and how do they take care of themselves, so that those practices can be presented to the other groups as a way of reducing the ratios of death by those causes.

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