Title: Blindness Disparities Between Racial/Ethnic Groups in the State of Texas

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ABSTRACT. Up to 250 words

Background

There are disparities in health outcomes between races. Blindness is associated with decreased quality of life and negative health outcomes. There is little published data investigating the difference in the prevalence of blindness between races/ethnicities nationally and in Texas.

Methods

This retrospective observational study investigates the differences in crude prevalence of blindness between different race/ethnicities in Texas. Data was gathered from the Centers for Disease Control and Prevention (CDC) website Vision and Eye Health Surveillance System (VEHSS) using the most recently available Compositive Estimate data from the state of Texas. The variables compared were age groups and race/ethnicity categories of Black, non-Hispanic, Hispanic, any race and White, non-Hispanic. Referred to as “Black,” “Hispanic,” and “White” respectively. The Logs of the relative ratios and Z scores were used to compare each age group.

Results

The Black group consistently had the highest crude prevalence of blindness across age groups; The White group had the lowest prevalence. The Hispanic group consistently had prevalence rates that were between the Black and White groups. No differences were found to be statistically significant.

Conclusion

This data shows that, despite ongoing diversity and inclusion efforts, ongoing inequalities exist in healthcare outcomes. In the state of Texas, this is made apparent by the difference in blindness prevalence between Black, Hispanic, and White populations. These data can be used to bring about change that needs to be addressed at the state and institutional level.

Key Words: Ethnicity, Quality of Life, Prevalence, Cultural Diversity, Texas, Centers for Disease Control and Prevention, U.S., Outcome Assessment, Health Care, Blindness, Health Disparities

INTRODUCTION.

There are disparities that exist between races Today in America. This is made evident by the racial wage gap, recent pushes for cultural awareness, and incorporation of diversity and inclusion into schools and work places.[1,2] In 2021, the American Association of Medical Colleges released a framework addressing structural racism in academic medicine following the nationwide movement for Black Lives.[3]

Healthcare disparities have been defined as "differences in health outcomes that are closely linked with social, economic and environmental disadvantage."[4] The impact of race, socioeconomic status, education and geographic location on healthcare has been reported by national and international organizations.[5,6] For example, Blacks and Hispanics are less likely to have health insurance than their Caucasian counterparts.[4] Further, even when controlling for insurance status, income, age, and severity of incomes, there are persistent racial and ethnic disparities in health care access, utilization and outcomes.[7,8,9,10,11]

Vision loss is among the top ten disabilities among adults 18 and older.[12,13] Vision loss is associated with decreased productivity, decreased quality of life and negative health outcomes.[14,15,16] Data is lacking in associated outcomes in minorities and older age groups. Studies have been done globally examining causes of blindness in different age groups and populations, but few explore the rates of disparities between races and ethnicities.[17,18,19]

[1]Berisha E, Dubey RS, Olson E. Monetary policy and the racial wage gap. Empir Econ [Internet]. 2022 Apr 6 [cited 2022 Sep 13]; Available from: https://doi.org/10.1007/s00181-022-02233-5

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The purpose of this study is to investigate publicly available data to identify what disparities, if any, exist in the prevalence of blindness between different racial and ethnic groups in Texas. Specifically, this study will investigate the prevalence of blindness by detailed age groups within Black, non-Hispanic, Hispanic, any race and White, non-Hispanic groups. This is with the goal of awareness and calls for intervention.

METHODS

This cross-sectional study was conducted using data gathered from the publicly available Centers for Disease Control and Prevention (CDC) website Vision and Eye Health Surveillance System (VEHSS).[20] The data used are estimates based on 2017 population, (released May 2021, revised July 2022) Compositive Estimate data from the state of Texas as of January 2023. Cases were chosen based on the presence of blindness, cases with vision loss were excluded in the study. Blindness is defined as "best corrected visual acuity in the better seeing eye ≤20/200." Under the category of composite estimates, the Crude Prevalence Estimates for blindness by detailed age groups was used. The variables compared were age groups (variable 1) by race/ethnicity (variable 2). Detailed age groups were broken down into 0-11 years, 12-17 years, 18-24 years, 25-29 years, 30-34 years, 35-39 years, 40-44 years, 45-49 years, 50-54 years, 55-59 years, 60-64 years, 65-69 years, 70-74 years, 75-79 years, 80-84 years, and 85 years and older. Race/Ethnicity groups were "Black, non-Hispanic", "Hispanic, any race", "White, non-Hispanic" and "other." These groups will be referred to as "Black", "Hispanic", and "White" respectively. For the purposes of this study, the "other" group was not used due to inadequate comparative sample size. All genders were included.

The Log of the relative ratio of "Hispanic vs White," "Black vs White" and "Black vs Hispanic" was used to compare between ethnicities within each age group. Standardized Z-scores were calculated for contrasts "Black Vs White," "Hispanic vs White" and "Black vs Hispanic." Analyses were conducted within and across age groups. Statistical testing was two-sided with significance level .05. Analysis was conducted in Rstudio.

[20] Available at this website.

RESULTS.

A total of 28,304,596 blind patients were identified in the state of Texas for this study. Of these, 3,336,453 were Black, non-Hispanic, 11,160,514 were Hispanic, any race and 11,856,625 were White, non-Hispanic. The prevalence for each Race/Ethnicity by detailed age group is seen in figure 1.

Age	Black	Hispanic	White
0-11	0.08	0.08	0.04
12-17	0.15	0.13	0.06
18-24	0.20	0.15	0.08
25-29	0.21	0.15	0.08
30-34	0.21	0.14	0.08
35-39	0.22	0.14	0.09
40-44	0.22	0.14	0.09
45-49	0.22	0.14	0.09
50-54	0.23	0.14	0.09
55-59	0.24	0.15	0.11
60-64	0.54	0.35	0.26
65-69	1.04	0.68	0.54
70-74	1.56	1.06	0.88
75-79	2.15	1.43	1.28
80-84	3.33	2.45	2.32
85-89	7.24	5.61	6.02

Figure 1: Crude Prevalence of Blindness by Race/Ethnicity in detailed age groups

The Black group consistently had the highest crude prevalence of blindness across all age groups; The White group had the lowest prevalence. Crude prevalence in the “Hispanic” group was between the black and white groups for all ages. As a general trend, prevalence of blindness was lowest under the age of 17 and increased with age in all Race/Ethnicities, especially after the age of 55. The logarithmic prevalence of each Race/Ethnicity for each age group was plotted on a scale in figure 2.

Figure 2: Prevalence of Blindness by Race/Ethnicity

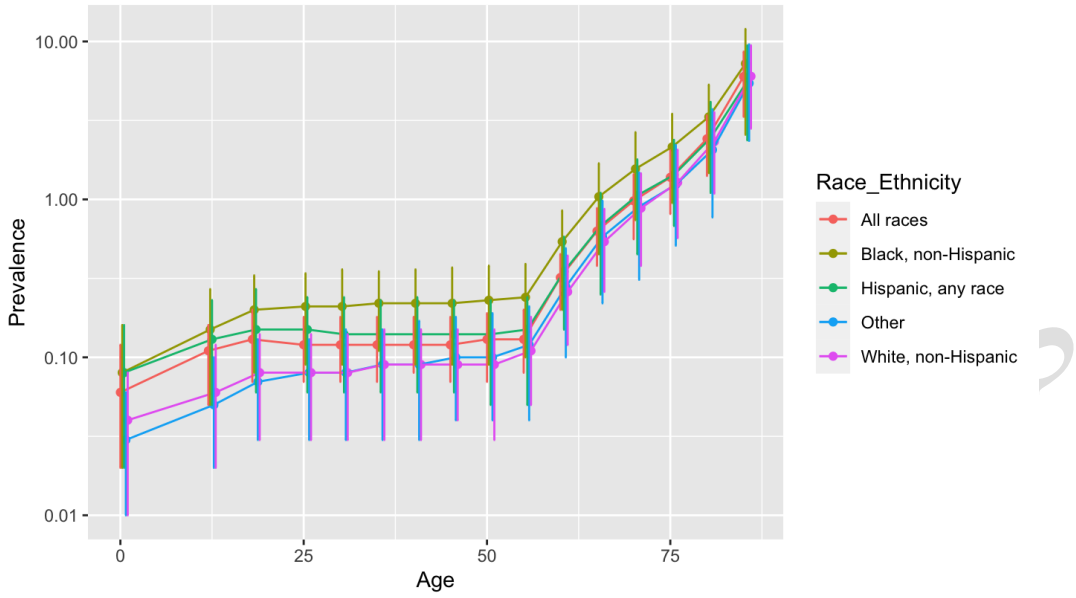

Figure 2: Logarithmic Prevalence of Blindness by Race/Ethnicity. The prevalence of blindness is higher in Blacks than Hispanics and Whites. Whites having the lowest prevalence of the three groups. The logarithmic prevalence relationship seen in figure two reiterates the relationship in blindness prevalence seen between the Black, Hispanic, and white groups.

The largest differences in prevalences between the three groups are seen between adults ages 18-55. The largest difference in blindness prevalence across all age groups was seen between the Black and White groups. When looking at these two races, the crude prevalence of blindness was approximately twice as high in blacks as it was in whites under the age of 70. Over this age, the black group maintained a higher prevalence of blindness when compared to the white group. While these data were striking, none of these differences were found to be statistically significant. Z scores and P values are for each age group and ethnicity are found in figure 3.

Age	Z score: Black Vs White	Z score: Hispanic Vs White	Z score: Black Vs Hispanic	P value: Black Vs White	P value: Hispanic Vs White	P value: Black Vs Hispanic
0-11	1.0222025	1.0222025	0.0000000	0.3066851	0.3066851	1.0000000
12-17	1.4896906	1.3598002	0.2814390	0.1363056	0.1738932	0.7783737
18-24	1.7574049	1.1811087	0.6125639	0.0788488	0.2375595	0.5401647
25-29	1.9038553	1.3273273	0.7790730	0.0569290	0.1844004	0.4359367
30-34	1.7835853	1.1377091	0.8628670	0.0744911	0.2552420	0.3882106
35-39	1.9379256	0.9611387	1.0880326	0.0526323	0.3364825	0.2765807
40-44	1.7599334	0.9245003	0.9861337	0.0784191	0.3552259	0.3240675
45-49	1.7285385	0.9877296	0.9769000	0.0838917	0.3232851	0.3286187
50-54	1.7843084	0.9245003	1.0547257	0.0743736	0.3552259	0.2915508
55-59	1.6362236	0.6949956	1.0383655	0.1017928	0.4870581	0.2990999
60-64	1.5458941	0.6716371	0.9751607	0.1221301	0.5018147	0.3294805
65-69	1.4472629	0.5352545	0.9578526	0.1478233	0.5924739	0.3381371
70-74	1.2347320	0.4183502	0.8542018	0.2169303	0.6756911	0.3929932

75-79	1.1852240	0.2654218	0.9448516	0.2359289	0.7906846	0.3447347
80-84	0.8832288	0.1327563	0.7175709	0.3771127	0.8943861	0.4730219
85-89	0.4239414	-0.1690794	0.5536678	0.6716085	0.8657342	0.5798062

Figure 3: Z scores and P values for Black, Hispanic and White groups by detailed age.

Blindless crude prevalence in the black group is the highest of the three groups. This trend is most prevalent in ages 18-55, where the crude prevalence is, on average, higher than the Hispanic group by 0.8 and higher than the white group by 0.13 (crude prevalence average for ages 18-50 in Black, Hispanic and White groups is 0.22, 0.14 and 0.09, respectively). Although most prevalent in the aforementioned age group, the trend is seen across all age groups when compared to Hispanic and White Race/Ethnicities.

Crude prevalence of blindness in the Hispanic group is consistently lower than the Black group and higher than the White group. The crude prevalence of blindness was very similar between Hispanics and Blacks up to age 17. From age groups 18 and up, the crude prevalence of blindness was higher in the black population than it was in the Hispanic population per age group.

Blindness crude prevalence in the White group is the lowest overall under the age of 85. In the age group 85-89, the crude prevalence of blindness is 6.02 in the white group, which is greater than 5.61 in the Hispanic group.

DISCUSSION.

This data review has revealed striking blindness disparities between races in Texas. These differences highlight how Race and Ethnicity affect patient outcomes. Disparities lead to decreased quality and efficiency in the healthcare system.[5] In fact, a 2009 study estimated excess direct medical care expenditures due to health inequalities to be $229.4 billion,[21] making this an opportunity for saving costs in society. Further, a 2013 study estimated the economic burden of vision loss and disorders of the eye in people under the age of 40 to be $27.5 billion.[22] These data potentiate the mistrust of health care providers that has been documented in minorities, thus leading to decreased medical adherence and poor patient outcomes. [23]

The largest disparities in crude prevalence of blindness are seen between the Black and White groups. Below the age of 75, crude prevalence of blindness is nearly double when all Black age groups are compared to their White counterparts. While this relationship is striking, it was not found to be statistically significant; The data closest to proving statistical significance are age groups 25-29 and 35-39 having p values that were .057 and .053, respectively. The “Hispanic, any race” group consistently showed prevalence data that was between that of the Black and White groups. As the largest minority in Texas, this data highlights the fact that underlying socioeconomic inequities influence access to vision healthcare services.[24] [25] [26] [27] This further exacerbates the well-documented pattern that adults with blindness or visual impairment have self-reported lower access to and use of health care than those without.[13,28] This data is consistent with previous literature showing that there are Racial/Ethnic differences in the prevalence of major eye disease that are known to lead to blindness.[29,30,31,32] Of note, the differences in blindness rates were largest in the ages 18-55, which was the majority of the population in 2017.[33] Therefore the effect of these disparities was applicable to most adults. It is also important to consider the impact of vision loss on life expectancy. Vision loss poses many challenges to daily living, increasing stress past what a person with full vision might experience. Studies have shown a consistent

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association between blindness or visual impairment and mortality.[34,35,36] Therefore, it is probable that people with vision impairments aren't living to the higher ages included in the study. This effect of mortality due to visual impairments causes a sampling bias in the higher age groups. This can be considered as a reason for the converging of prevalences seen in all Race/Ethnicities within the higher age groups.

Although large strides have been made with respect to diversity and inclusion in healthcare, this data proves that there are still ongoing inequalities that thwart efforts being made. There are many social, personal, and economic factors that influence these outcomes. This data is showing that the State of Texas needs to address these disparities at the state and institutional level.

Limitations.

First, the blindness prevalence data was taken from one source, the publicly available CDC website VEHSS; This causes inherent sampling bias despite being a reputable reference. A future direction will be to use multiple sources to compare reporting and prevalence of blindness. Second, the CDC VEHSS reports prevalence estimates. These estimates were generated by statistical models from multiple data sources, not reported values. There were no comments about steps taken to avoid inherent biases that occur in this type of data reporting. Third, this data is from 2017 and was 5 years old at the time this study was conducted. Therefore, this data does not consider the impact of recent racial equality movements improving medical treatments, COVID-19 or political influences on blindness prevalence.

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SUMMARY - ACCELERATING TRANSLATION

Title: Blindness Disparities Between Racial/Ethnic Groups in the State of Texas

There are disparities that exist between races today in America. Healthcare disparities have been defined as "differences in health outcomes that are closely linked with social, economic and environmental disadvantage." The impact of race, socioeconomic status, education and geographic location on healthcare has been reported by national and international organizations. Vision loss is associated with decreased productivity, decreased quality of life and negative health outcomes. Data is lacking in associated outcomes in minorities and older age groups. Studies have been done globally examining causes of blindness in different age groups and populations, but few explore the rates of disparities between races and ethnicities. The purpose of this study is to investigate publicly available data to identify what disparities, if any, exist in the prevalence of blindness between different racial and ethnic groups in Texas. Specifically, this study will investigate the prevalence of blindness by detailed age groups within Black, non-Hispanic, Hispanic, any race and White, non-Hispanic groups. This is with the goal of awareness and calls for intervention.

This cross-sectional study was conducted using data gathered from the publicly available Centers for Disease Control and Prevention (CDC) website Vision and Eye Health Surveillance System (VEHSS). The data used are estimates based on 2017 population, (released May 2021, revised July 2022) Compositive Estimate data from the state of Texas as of January 2023. Cases were chosen based on the presence of blindness, the Crude Prevalence Estimates for blindness by detailed age groups was used. The Log of the relative ratio of "Hispanic vs White," "Black vs White" and "Black vs Hispanic" was used to compare between ethnicities within each age group. Standardized Z-scores were calculated for contrasts "Black Vs White," "Hispanic vs White" and "Black vs Hispanic." Analyses were conducted within and across age groups.

As a general trend, the crude prevalence of blindness was highest in the Black group and lowest in the White. Hispanic group consistently had a prevalence that was in between the other two groups. This relationship was best seen between the ages of 18-55. The largest disparities in crude prevalence of blindness are seen between the Black and White groups. Below the age of 75, crude prevalence of blindness is nearly double when all Black age groups are compared to their White counterparts. While this relationship is striking, it was not found to be statistically significant; The data closest to proving statistical significance are age groups 25-29 and 35-39 having p values that were .057 and .053, respectively. The "Hispanic, any race" group consistently showed prevalence data that was between that of the Black and White groups.

Although large strides have been made with respect to diversity and inclusion in healthcare, this data proves that there are still ongoing inequalities that thwart efforts being made. There are many social, personal, and economic factors that influence these outcomes. This data is showing that the State of Texas needs to address these disparities at the state and institutional level.

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FIGURES AND TABLES.

Figure 1. Crude Prevalence of Blindness by Race/Ethnicity in detailed age groups

Age	Black	Hispanic	White
0-11	0.08	0.08	0.04
12-17	0.15	0.13	0.06
18-24	0.20	0.15	0.08
25-29	0.21	0.15	0.08
30-34	0.21	0.14	0.08
35-39	0.22	0.14	0.09
40-44	0.22	0.14	0.09
45-49	0.22	0.14	0.09
50-54	0.23	0.14	0.09
55-59	0.24	0.15	0.11
60-64	0.54	0.35	0.26
65-69	1.04	0.68	0.54
70-74	1.56	1.06	0.88
75-79	2.15	1.43	1.28
80-84	3.33	2.45	2.32
85-89	7.24	5.61	6.02

Figure 2. Logarithmic Prevalence of Blindness by Race/Ethnicity.

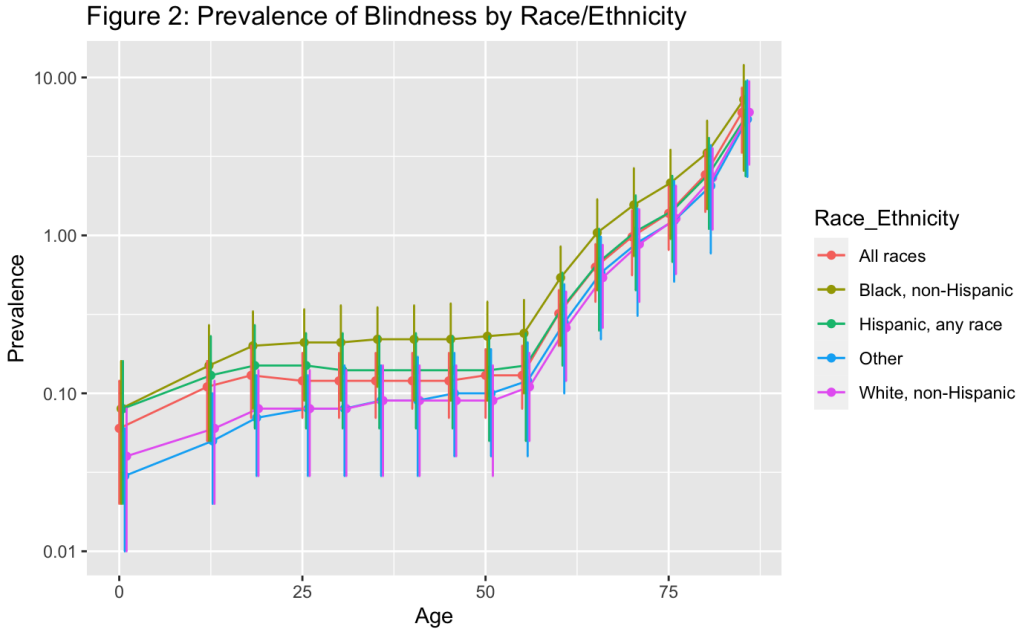

Figure 3. Z scores and P values for Black, Hispanic and White groups by detailed age.

Age	Z score: Black Vs White	Z score: Hispanic Vs White	Z score: Black Vs Hispanic	P value: Black Vs White	P value: Hispanic Vs White	P value: Black Vs Hispanic
0-11	1.0222025	1.0222025	0.0000000	0.3066851	0.3066851	1.0000000
12-17	1.4896906	1.3598002	0.2814390	0.1363056	0.1738932	0.7783737
18-24	1.7574049	1.1811087	0.6125639	0.0788488	0.2375595	0.5401647
25-29	1.9038553	1.3273273	0.7790730	0.0569290	0.1844004	0.4359367
30-34	1.7835853	1.1377091	0.8628670	0.0744911	0.2552420	0.3882106
35-39	1.9379256	0.9611387	1.0880326	0.0526323	0.3364825	0.2765807
40-44	1.7599334	0.9245003	0.9861337	0.0784191	0.3552259	0.3240675
45-49	1.7285385	0.9877296	0.9769000	0.0838917	0.3232851	0.3286187
50-54	1.7843084	0.9245003	1.0547257	0.0743736	0.3552259	0.2915508
55-59	1.6362236	0.6949956	1.0383655	0.1017928	0.4870581	0.2990999
60-64	1.5458941	0.6716371	0.9751607	0.1221301	0.5018147	0.3294805
65-69	1.4472629	0.5352545	0.9578526	0.1478233	0.5924739	0.3381371
70-74	1.2347320	0.4183502	0.8542018	0.2169303	0.6756911	0.3929932
75-79	1.1852240	0.2654218	0.9448516	0.2359289	0.7906846	0.3447347
80-84	0.8832288	0.1327563	0.7175709	0.3771127	0.8943861	0.4730219
85-89	0.4239414	-0.1690794	0.5536678	0.6716085	0.8657342	0.5798062

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