CVD

- CVD is the 3rd leading cause of death in Texas (1)
- Between 1999-2003 it killed 52,532 people (2)
- It causes an estimated 150,000 deaths annually across the United States Alone, and is responsible for long term disability
To examine spatial distribution of stroke and related variables in Texas counties: water hardness, race, and income and how they relate with CVD
Cerebrovascular disease includes all disorders in which an area(s) of the brain affected by a restriction in blood supply or bleeding in one or more of the cerebral blood vessels.

Typically the arteries of the brain become defective, resulting in stroke which is synonymous with CVD.
Risk Predictors of CVD

• Previous research suggested that hard water may serve as a protective factor in CVD mortality.

• In the US, African Americans have higher CVD mortality rates than any other race/ethnic group

• Hispanics had rates that were substantially lower than those of other races
Methodology

- ICD-10 code 181.
- Mortality data from the years 1999-2003 were extracted from **Expert Health Data Programming**
- The mortality data has been adjusted to the United States 2000 census.
- The Texas Water Development Board’s ground water data base was used to find mean water hardness for all 254 Texas Counties.
Hypothesis

• Hypothesis 1: Increased water hardness is related to lower CVD mortality. Counties with soft water will have higher CVD mortality rates.

• Hypothesis 2: Black populations will experience higher mortality rates, while Hispanic populations will experience lower mortality rates.

• Hypothesis 3: Texas counties with lower median income experience slightly higher mortality rates.
Geographic Distribution of CVD

Texas County CVD Mortality Rates

Figure 1

Legend
Texas County CVD Age Adjusted Death Rates
n26pmxfy.AA_DTH_RT1
0.000 - 34.700
34.701 - 55.600
55.601 - 72.400
72.401 - 95.700
95.701 - 140.900
Mean 62.24
- Aquifers

-Mann Whitney U was used to establish a relationship between the two. The relationship between CVD mortality and water hardness was significant $P<5$

-Independent Samples T-test Revealed Trinity aquifers counties 70.07 deaths per 100,000 population compared to 59.44 in the Ogallala, confirming the hypothesis (difference 10.63)
Aquifers in Texas

Texas County CVD Mortality Rates

Figure 1

Legend
Texas County CVD Age Adjusted Death Rates
n26pxfxy.AA_DTH_RT1
0.000 - 34.700
34.701 - 55.800
55.601 - 72.400
72.401 - 95.700
95.201 - 140.000 Mean 62.24

Explanation
Ogallala
Gulf Coast
Edwards (BFZ)
Outcrop
Edwards-Trinity (Plateau)
Outcrop
Downdip
Seymour
Hueco-Mesilla Bosion
Carizo-Wilcox
Outcrop
Downdip
Cenozoic Pecos Altuvium

Outcrop (That part of a water-bearing rock layer that appears at the land surface)
Downdip (That part of a water-bearing rock layer that dips below other rock layers)
CVD and Black Population

• positive correlation between Cerebrovascular mortality rates and percent black population

• consistent with previous research which found the incidence of stroke is approximately twice as high for African Americans when compared to white Americans.
Black Population Concentration

Texas County CVD Mortality Rates

Figure 1

Legend
Texas County CVD Age Adjusted Death Rates
n26pmxly,AA_DTH_RT1
0.000 - 34.700
54.701 - 55.600
55.601 - 72.400
72.401 - 95.200
95.201 - 140.800  Mean 62.24

Black Population Concentrations

Fig. 3

Legend
texascounties
Percent Black
0.3
4 - 8
6 - 10
18 - 21
22 - 34
Hispanic Population and CVD

- There was a negative correlation between percent Hispanic population and cerebrovascular mortality rates.
- The Hispanic paradox explains this might be due to the fact that Hispanics are a younger population, and are more susceptible to communicable diseases as opposed to degenerative ones (such as cerebrovascular disease).
- Hispanics are more likely to have a stroke at a younger age as well.
Hispanic Population Concentration

Texas County CVD Mortality Rates

Figure 1

Hispanic Population Concentrations

Fig. 4

Legend
Texas County CVD Age Adjusted Death Rates
n26pmlx3_y.AA_DTH_RT1

0.000 - 34.700
34.701 - 55.600
55.601 - 72.400
72.401 - 95.500
95.501 - 140.900
Mean 62.24

Legend
Texas Counties
Percent Hispanic
1 - 11
12 - 24
25 - 40
41 - 66
67 - 96
Median Income and CVD

- No correlation found the relationship was not statistically significant
- Perhaps since the Hispanic population (lower income overall) in Texas generally has a negative correlation with the disease, this might introduce various confounding factors.
Conclusions

- Water hardness appeared to be a protective factor in those counties being supplied by hard water, resulting in lower mortality rates.
- It also seems that black populations have a race marker that makes them more susceptible to the disease. While Hispanics seem to be less susceptible.
- Median income was not found to be a significant variable.
Suggestions for Future Research

• Further research is needed. Is it the aquifers or race contributing to the area’s mortality rates?
• hardness and drinking water needs to be probed more vigorously.