



# A Statistical Analysis of Pregnancy Mortality Based on Race

Cornelius Scott

School of Computing and Information Systems, Grand Valley State University, Allendale, MI, USA  
Health and Bioinformatics

## Abstract

Currently the United States of America has the second highest pregnancy mortality rate of developed countries in the world. A more detailed analysis shows a huge discrepancy when it comes to the basis of race for pregnancy mortality. CDC files mortality were analyzed with R statistical software showing no significant connection between diseases by race for pregnancy mortality.

## Background

United States has one of the highest pregnancy mortality rates in the world.

- 2nd highest of developed countries
- 26.4 out of 1000 births result in maternal death

Women of color die at higher rates than white women

- 12.4 per 100,000 live births for white women
- 17.8 per 100,000 live births for Asian and Hispanic women
- 40.0 per 100,000 live births for black women

Pregnancy Mortality Surveillance System

- Started in 1986 by Centers for Disease Control and Prevention (CDC) [1]
- Information to fill data gaps about pregnancy mortality
- Death occurs during or up to 1 year after birth

## Method

CDC mortality files were downloaded from their vital statistics website. [2]

- The file containing almost 3 million entries and 240 variables was cleaned and statistically analyzed.
- R software was used to manipulate and run statistics on the dataset.
  - CSV loaded into R
- 10 variables were chosen because of their significance in current health issues.
  - mbrace = race
  - f\_mpcb = prenatal care
  - cig0\_r = cigarette smoking

## Method

- rf\_pdiab = prediabetes
- rf\_phype= prehypertension
- ip\_gon = gonorrhea
- ip\_syph = syphilis
- ip\_chlam = chlamydia
- ip\_hepatb = hepatitis b
- ip\_hepatc = hepatitis c

Groups were divided into black women and all other women (White, Asian and Native American)

- Logit regression analysis
- Chi-square analysis

CIA mortality files were downloaded (CSV) and linked to tableau visualization software [3]

- Two images were created
  - All countries in the world with mortality rates (Figure 2)
  - Only developed countries in the world (Figure 3)
- Statistical analysis was analyzed at the end

## Statistical & Visual Analysis

Based on the fact that black die at higher rates than all other women, two groups were created in R.

- BlackWomen (Containing only information about black women)
- RemainderWomen (Containing information from white, Asian and native American women)
- Logit Models were created to show the regression of the race with each each the variables listed above

Chi-Square analysis was conducted with each individual race and the variable combinations.

- mbrace == 1 (white women)
- mbrace == 2 (black women)
- mbrace == 3 (native American women)
- mbrace == 4 (Asian women)

Visual analysis by tableau was conducted

- Mapping of countries values for mortality to country locations
- Green to red scale (low mortality to high mortality)

## Results of Analysis

Analysis showed that the 10 selected variables did not play a significant role in the mortality of the women by race. The chi-square analysis also showed no statistically important relationship between them as well.

- Figure 1 below shows logit analysis output for only the black women race
- All of the P values are either 1 or NA (resulting from the data having unknown entries)

Chi-square analysis also showed to have no significance as well.

```
Deviance Residuals:
    Min       1Q   Median       3Q      Max
-0.4104 -0.4104 -0.4104 -0.4104 -0.4104

Coefficients: (5 not defined because of singularities)
              Estimate Std. Error z value Pr(>|z|)
(Intercept) -2.432e+00  2.495e-02  -97.45  <2e-16 ***
f_mpcb1      6.827e-14  2.499e-02   0.00    1
cig0_r1     -6.742e-14  8.904e-03   0.00    1
cig0_r2     -6.712e-14  7.404e-03   0.00    1
cig0_r3     -6.645e-14  7.239e-03   0.00    1
cig0_r4     -6.518e-14  1.834e-02   0.00    1
cig0_r5     -6.651e-14  4.586e-02   0.00    1
cig0_r6     -6.613e-14  1.904e-02   0.00    1
rf_pdiabu   -2.427e-14  4.582e-02   0.00    1
rf_pdiaby   -5.491e-14  1.410e-02   0.00    1
rf_phypeu   NA          NA          NA     NA
rf_phypey   -5.755e-14  1.050e-02   0.00    1
ip_gonu     -4.944e-14  2.827e-02   0.00    1
ip_gony     -1.683e-14  3.251e-02   0.00    1
ip_syphu    NA          NA          NA     NA
ip_syphy    -4.153e-14  5.094e-02   0.00    1
ip_chlamu   NA          NA          NA     NA
ip_chlamy   -5.302e-14  1.131e-02   0.00    1
ip_hepatbu  NA          NA          NA     NA
ip_hepatby  -6.095e-14  2.879e-02   0.00    1
ip_hepatcu  NA          NA          NA     NA
ip_hepatcy  -2.077e-14  1.797e-02   0.00    1
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Figure 1. Logit regression output for only black women

## Conclusion

The analysis did not show any significance between race and mortality based upon the different health issues. Future analysis would be need to come to a more solid conclusion looking into social determinants of health. A combination of health issues and social determinants can also be analyzed for any significance.

## References

- [1] Centers for Disease Control and Prevention (2018). Pregnancy Mortality Surveillance System. Retrieved from <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-mortality-surveillance-system.htm>
- [2] Centers for Disease Control and Prevention (2018). National Vital Statistics System. Retrieved from <https://www.cdc.gov/nchs/nvss/deaths.htm>
- [3] Central Intelligence Agency (2015). The World Factbook, Pregnancy Mortality. Retrieved from <https://www.cia.gov/LIBRARY/publications/the-world-factbook/rankorder/2223rank.html>

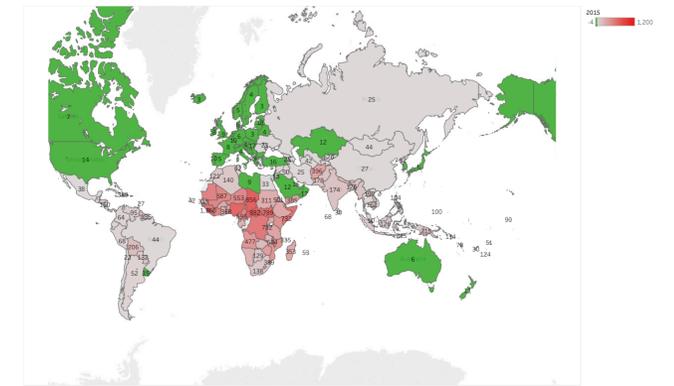


Figure 2. Pregnancy Mortality rates by country for all countries around the world. [3]

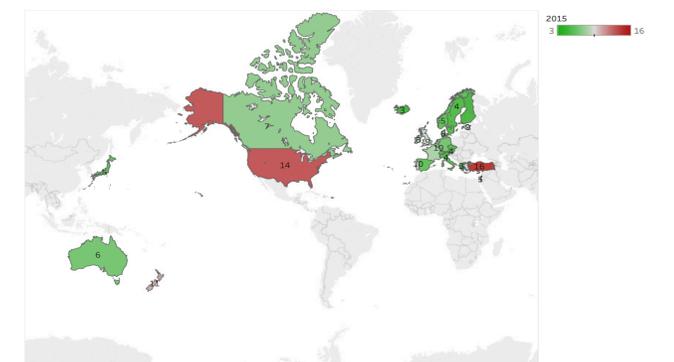


Figure 3. Pregnancy Mortality rates by country for only developed countries around the world. [3]