

Reporting of Eating Disorder Deaths

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ABSTRACT

Those affected by eating disorders experience disturbances in eating behaviors which are often related to underlying psychiatric disorders such as anxiety, depression, or obsessive-compulsive disorder (Parekh, 2017, Drieberg et al., 1998 p.53). The duplicitous nature of the disorder makes it difficult to diagnose, and the toll it takes on an individual's physical health makes its mortality rate the second highest among psychiatric disorders (Guinhut et al., 2021 p.130). Even if the correct education and resources are accessible to certain individuals, negative stigmatization about the disorder can make sufferers unlikely to seek help (Becker et al., 2010). Findings from analysis of death reports from the CDC WONDER database suggest that reported eating disorder deaths do not reflect the true rates of eating disorders within the population, and that minority groups are especially underreported.

INTRODUCTION

Eating disorder diagnoses are classified as a type of mental illness that affects both the body and mind. Those affected experience severe disturbances in eating behaviors which are typically, although not always, related to underlying psychiatric disorders such as anxiety, depression, or obsessive-compulsive disorder. The duplicitous nature of the disorder makes the mortality rate much higher than that of other psychiatric illnesses such as schizophrenia, bipolar disorder, or depression. The most common age of death for Anorexia Nervosa (AN) patients is between 25-34 years, and 35-44 years for Bulimia Nervosa (BN) patients (Maximilian et al., 2010 p.396). In addition to death from malnutrition and an array of cardiac issues, eating disorders may also result in sudden death with no discernable causes. Therefore, lack of medical history can lead to misclassification and subsequent underreporting of the disease (Pisetsky et al. 2013, Garrido and Juaregui-Lobera, 2012 p.91). Smaller scale studies that further investigate eating disorder prevalence through family-reporting methods suggest that eating disorders and death rates are significantly higher in society than observed in national records (Cachelin et al., 2000 p.273., Taylor et al. 2007).

THE PROBLEM

Studies indicate that eating disorders are more often unrecognized in ethnic minorities in standard clinical settings (Becker et al., 2010 p.636, Cachelin et al., 2000, Taylor et al., 2007 p.S13). Evidence also shows that a large percentage of the population, especially minority groups, do not seek specialty help due to lack of education, resources, and negative stigmatization of mental health disorders (Becker et al., 2010 p.636). Additionally, studies have found that because of inaccurate stereotypes physicians are less likely to question ethnic minorities regarding eating disorder behaviors or to anticipate eating disorders in ethnic minority groups. This behavior contributes to the underdiagnoses of eating disorders and perpetuates existing treatment barriers to minority individuals (Becker et al. 2010 pp.634-636, Cachelin et al., 2000, Goode et al. 2020 p.491).

Another concern is that certain regions of the U.S. may be disproportionately affected, either due to lack of medical resources or differences in mental health statuses between populations. Of the

thirteen states in the western region of the United States, eight fall among the twenty states with the highest prevalence of mental illness. Only two western states are classified as having low prevalence of mental illness (SAMHSA 2021). This study investigates disparities in eating disorder death count reporting between race and regional groups to inform the allocation of medical resources needed in the future.

DATA OVERVIEW

COLLECTION

The data was obtained through the Wide-ranging ONline Data for Epidemiologic Research database from the Center for Disease Control (CDC WONDER). Data was compiled using death certificates from across the United States which listed an eating disorder as either the direct or indirect cause of death. Data at the state level from the past two decades was used in this project. These parameters allowed for a larger sample size while also maintaining the integrity of the data by reducing the number of imputations due to small count values. 17 states having relatively smaller population numbers were not included due to the privacy concerns of publishing low death counts.

DATA PREPARATION

States with no data on eating disorder deaths between 2000 and 2019 were not used in analysis. Per CDC WONDER data usage requirements, death count values between 1 and 9 were not directly used in analysis. Death counts between those values were replaced with median values, 1.97 for minority individuals and 4.5 for white individuals. States were grouped into the four census regions, Northeast, Midwest, South, and West. A range of 4-11 states within each region supplied death count data for use in analysis. In order to account for differences in populations and population densities, death rate per million persons was used as the response variable. A log transformation was applied to the death rates variable to correct its right skewed distribution for use in analysis. The full list of variables, including the transformed variables, can be found in the Data Dictionary Table in the Appendix.

ANALYSIS

DATA DISCOVERY

Figure 1 shows the distribution of the recorded state death rates by census region. The mean death rate for all states is 0.37 deaths per one million people over 10 years. Figure 2 illustrates the difference in distributions of death rates between races, with minorities displayed on the left and whites on the right. The white population and the western region have a generally higher mean and wider range in reported death rate values. This finding is unexpected, as research indicates that minority and white populations experience eating disorders at a similar rate (Becker et al. 2010 pp.634-636, Cachelin et al., 2000).

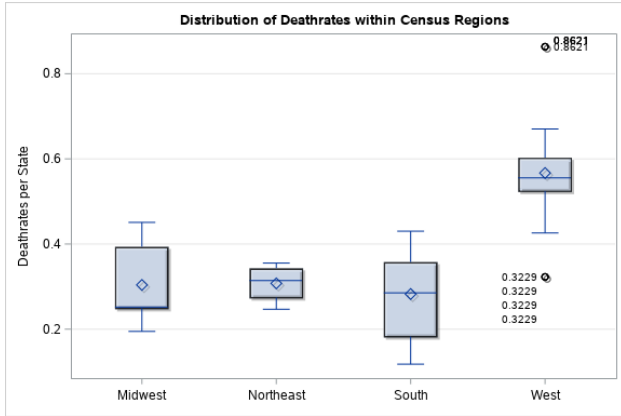


Figure 1. Distribution of Death Rates within Census Regions

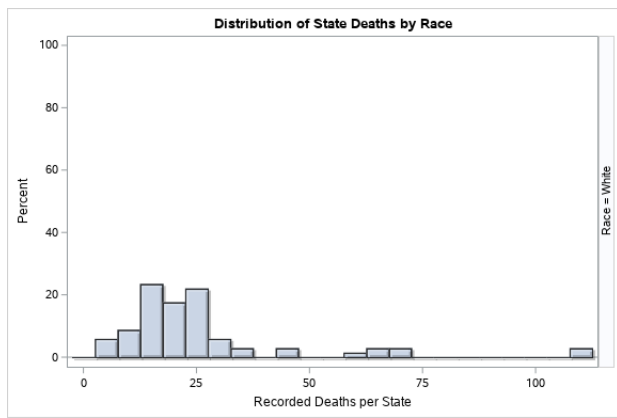
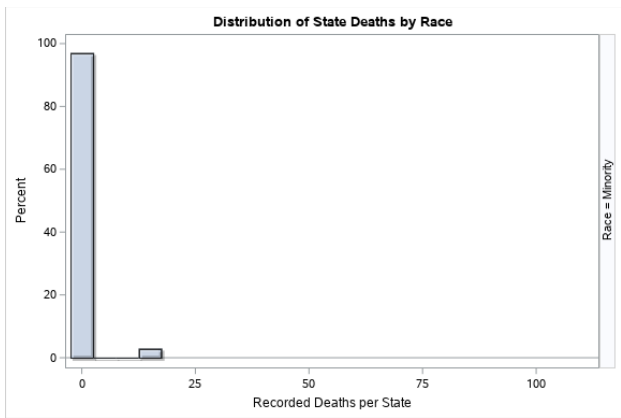


Figure 2. Distributions of State Deaths by Race (Left: Minority; Right: White)

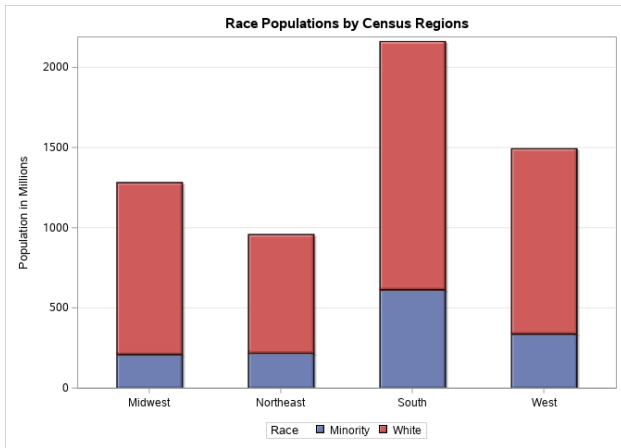


Figure 3. Distribution of Race within Regions

ANALYSIS OF RACE

ANOVA testing indicates that eating disorder death rates are significantly different between races and that race accounts for a significant amount of variation in rates (Table 1). A two-way ANOVA also shows that race has a significant relationship with death rates, but not the interaction between race and region (Tables 2-3). With white individuals having an average death rate of 0.436 and

minority individuals of 0.015, minority individuals are significantly less likely to have one or more eating disorders reported as a cause of death.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	463.32	463.32	796.16	<.0001
Error	134	77.98	0.58		

Table 1. ANOVA Results for Race and Death Rate

Source	Std Dev	Test DF	Power
Race	1	1	>.999
Region	1	3	.942
Race*Region	1	3	.100

Table 2. Two-Way ANOVA of Death Rates Between Race and Region

Source	Std Dev	Test DF	Power
Race	1	1	>.999
West	1	1	.983
Race*West	1	1	.141

Table 3. Two-Way ANOVA of Death Rates Between Race and Western Region

ANALYSIS OF REGION

ANOVA testing suggests that there is no significant difference in mean reported death rates between the four census regions (Table 4). However, when region is analyzed with race in a two-way ANOVA, region is significant (Table 2). Separate two-way ANOVAs are performed for race and individual regions. Of all four regions, the West is the only group with a significantly different death rate than the other three regions (Table 3).

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	17.06	5.69	1.43	0.2364
Error	132	524.24	4.04		

Table 3. ANOVA Results for Region and Death Rate

GENERALIZATION

The data is inclusive of multiple states from all four census regions and covers 66% of total U.S. states over a twenty-year time period. It is justifiable to generalize these results to the regions and country as a whole. A shortcoming in analysis is that eating disorder deaths are often misclassified as cardiac arrest, organ failure, suicide, or other conditions stemming from the disorder. This study assumes that deaths are misclassified consistently over time and within populations of interest, but inconsistencies such as differences in county-level reporting policies could hinder the generalizability of results.

FUTURE STUDIES

Future studies should focus on identifying the true prevalence of eating disorders within different populations. Accurate assessments of these disorders will support allocation of medical resources, educate clinicians on the gap in underdiagnosing, and lead to a greater understanding of the disorders which will ultimately improve and save human lives.

CONCLUSION

Results indicate that minority individuals reportedly die less frequently of eating disorders. However, previous studies illustrate that minority groups are generally affected by eating disorders just as frequently as Caucasian groups (Becker et al. 2010 pp.634-636, Cachelin et al., 2000). This paper concludes that minority eating disorder deaths are underreported just as they are underdiagnosed in the clinical setting. Results also indicate that individuals living in the Western region die more frequently than those in other regions. It can also be speculated that eating disorder deaths are generally underreported within the population due to the extremely low death counts reported over the 20-year period.

REFERENCES

- Becker, A. E., Arrindell, A H., Perloe, A., Fay, K., & Striegel-Moore, R. H. (2010). A Qualitative Study of Perceived Social Barriers to Care for Eating Disorders: Perspectives from Ethnically Diverse Health Care Consumers. *International Journal of Eating Disorders*, 43(7), 633-647.
- Cachelin, F., Rebeck, R., Veisel, C., & Striegel-Moore, R. (2000). Barriers to Treatment for Eating Disorders Among Ethnically Diverse Women. *International Journal of Eating Disorders*, 30(3), DIO: 10.1002/eat.1084
- Center for Disease Control. (2019). Wide Ranging Online Data for Epidemiologic Research. Retrieved from <https://wonder.cdc.gov/>
- Guinhut, M., Godart, N., Benadjaoud, M., Melchior, J., Hanachi, M. (2021). Five-year mortality of severely malnourished patients with chronic anorexia nervosa admitted to a medical unit. *Acta Psychiatrica Scandinavica*, 143(2), DIO: 10.1111/acps.13261
- Garrido, B., and Jauregui-Lobera, I. (2012). Sudden death in eating disorders. *Vascular Health and Risk Management* 8(1), DIO: 10.2147/VHRM.S28652
- Maximilian, M., Fichter, Quadflieg. (2016). Mortality in Eating Disorders - Results of a Large Prospective Clinical Longitudinal Study. *International Journal of Eating Disorders*. 49(4):391-401.
- Pisetsky, E.M., Thornton, L.M., Lichtenstein, P., Pedersen, N.L., & Bulik, C.M. (2013). Suicide attempts in women with eating disorders. *The Journal of Abnormal Psychology* 122(4), DIO: <http://dx.doi.org/10.1037/a0034902>
- Substance Abuse and Mental Health Services Administration (SAMHSA) Center for Behavioral Health Statistics and Quality. (2021). National Survey on Drug Use and Health. Retrieved from <https://www.samhsa.gov/data/sites/default/files/cbhsq-reports/NSDUHMethodSummDefs2017/NSDUHMethodSummDefs2017.htm#secd>

CONTACT INFORMATION

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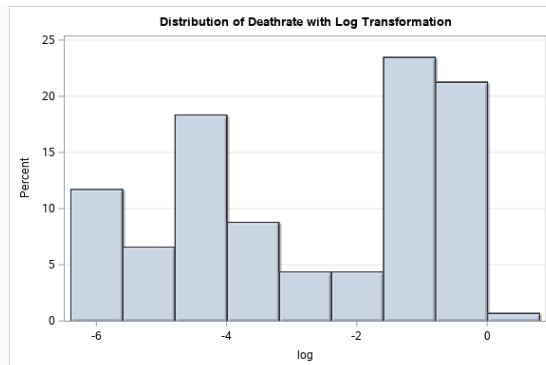
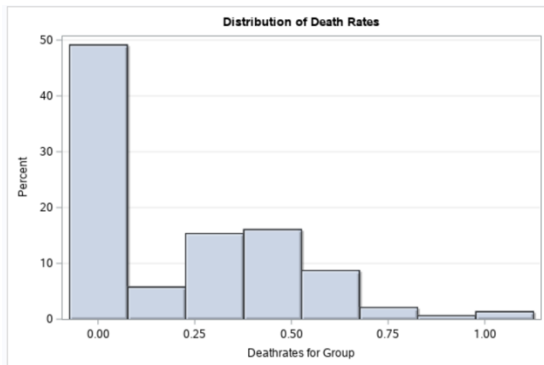
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APPENDIX

Data Dictionary

Variable Name	Type	Description
Population	Numeric	Recorded state population
Population_Minority	Numeric	Recorded minority population
Population_White	Numeric	Recorded white population
Deaths	Numeric	Recorded state deaths due to eating disorders
Deaths_Minority	Numeric	Recorded minority deaths due to eating disorders
Deaths_White	Numeric	Recorded white deaths due to eating disorders
State	Categoric	U.S. state for corresponding records
Race	Binary	1=Minority 0=White
Deathrate	Numeric	Eating disorder deaths per million persons, by race and state over a 10-year time period
State_Deathrate	Numeric	Eating disorder death rate in each state
Log	Numeric	Log transformation of Deathrate
Region	Categoric	Regional groups according to published census divisions. 1=Northeast, 2=Midwest, 3=South, 4=West
Region1	Binary	Northeast, dummy encoded
Region2	Binary	Midwest, dummy encoded
Region3	Binary	South, dummy encoded
Region4	Binary	West, dummy encoded



Distribution of Death Rates Before and After Transformation

The GLMPower Procedure

Fixed Scenario Elements	
Dependent Variable	log
Error Standard Deviation	1
Total Sample Size	136
Alpha	0.05
Error Degrees of Freedom	128

Computed Power			
Index	Source	Test DF	Power
1	race	1	>.999
2	region	3	0.942
3	race*region	3	0.100

Output from Two-Way ANOVA of Race and Region Variable

The GLMPower Procedure

Fixed Scenario Elements	
Dependent Variable	log
Error Standard Deviation	1
Total Sample Size	136
Alpha	0.05
Error Degrees of Freedom	132

Computed Power			
Index	Source	Test DF	Power
1	race	1	>.999
2	region1	1	0.079
3	race*region1	1	0.053

The GLMPower Procedure

Fixed Scenario Elements	
Dependent Variable	log
Error Standard Deviation	1
Total Sample Size	136
Alpha	0.05
Error Degrees of Freedom	132

Computed Power			
Index	Source	Test DF	Power
1	race	1	>.999
2	region2	1	0.426
3	race*region2	1	0.054

The GLMPower Procedure

Fixed Scenario Elements	
Dependent Variable	log
Error Standard Deviation	1
Total Sample Size	136
Alpha	0.05
Error Degrees of Freedom	132

Computed Power			
Index	Source	Test DF	Power
1	race	1	>.999
2	region3	1	0.465
3	race*region3	1	0.084

The GLMPower Procedure

Fixed Scenario Elements	
Dependent Variable	log
Error Standard Deviation	1
Total Sample Size	136
Alpha	0.05
Error Degrees of Freedom	132

Computed Power			
Index	Source	Test DF	Power
1	race	1	>.999
2	region4	1	0.983
3	race*region4	1	0.141

Output from Two-Way ANOVAs of Race and Regions 1-4, tested separately