Death in Chicago: Breast Cancer Disparities

by
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Part I – A Troubling Trend

Dr. Gonzalez was exhausted from her duties in the oncology ward after a very busy day. She wondered if she would ever be able to hand out a cancer diagnosis without being so personally affected. She was in the second year of her residency, and so far, it wasn't getting any easier.

Dr. Gonzalez worked in a hospital that served the Southside of Chicago in a large institution that diagnosed and treated thousands of patients every single year. Her job was to analyze images and read pathology reports in order to determine not only if breast cancer was present, but also if it had spread from the initial (primary) tumor to other parts of body, such as lymph nodes or even beyond to form metastatic tumors.

In Chicago, she had been noticing a startling development that she had not seen during her oncology rotation at her medical school in Nebraska. She was seeing many patients with initial diagnoses of dramatically advanced stages of breast cancer. Advanced breast cancer often involves metastatic tumors and is tougher to treat, and often has worse outcomes than early stage cancer. At first, she attributed the difference to being in a large city where there were just simply a lot more people, but the issue was more complex than that. The part that troubled her most was that, over the first year, Dr. Gonzalez had seen a trend in who was coming in with more advanced disease. Specifically she had noticed that African-American women were more commonly diagnosed with metastatic cancer in their initial diagnosis compared to white and Asian women. She wasn't sure how Hispanic women faired in breast cancer diagnosis, since she did not see many Latina patients.

She wanted to find out more. Were these just anecdotal observations or part of a real trend? What were the data in the city of Chicago for breast cancer diagnoses in different populations? What about in other cities or in the entire United States? She needed to search for the data, but she was so tired, and really needed to head home for dinner and to spend some time relaxing.

Dr. Gonzalez stopped by the office of her mentor, Dr. Lebowitz, to quickly say good night.

"Evelyn, I'm heading home, I need to recharge. I'll see you in the morning." She stoped in the doorway midstride, and paused, a quizzical look on her face. "Evelyn, what do you know about racial disparities in breast cancer here in Chicago? I feel like I've seen some trends with our patients… that African-American women are diagnosed with cancer at a more advanced stage than white and Asian women are."

"Well, there are certainly several groups here within the hospital that are working with both academic and community groups to investigate this issue and propose solutions,"responded Evelyn. "Look Veronica, we can talk about this tomorrow; go home and get some rest."

Dr. Gonzalez did leave, but before relaxing, there was time on the train to do a little research. She headed to a reliable website to get started:

- National Cancer Institute (NCI) at the National Institutes of Health (NIH). 2020. Cancer disparities [webpage]. <https://www.cancer.gov/about-cancer/understanding/disparities>

Questions

Use the webpage that Dr. Gonzalez found to answer the following questions.

1. What are "cancer disparities"?

2. List the various indicators (measures) by which cancer disparities can be detected.

3. Do cancer disparities exist in the United States? What information from the website supports your answer?

4. According to the National Cancer Institute (NCI), what are some factors that contribute to cancer disparities?

Part II – Breast Cancer Mortality in Chicago

Veronica slept like a log. The next morning she felt re-energized after breakfast, and ready to learn more. After a short train ride, Veronica arrived at her campus. When she walked into the residents' office, she noticed a few research articles had been printed and left on her desk. There was a sticky note on the top page that read, "These may be of interest—Evelyn."

Veronica used the twenty minutes before clinic to skim the articles. She was interested to uncover the following data.
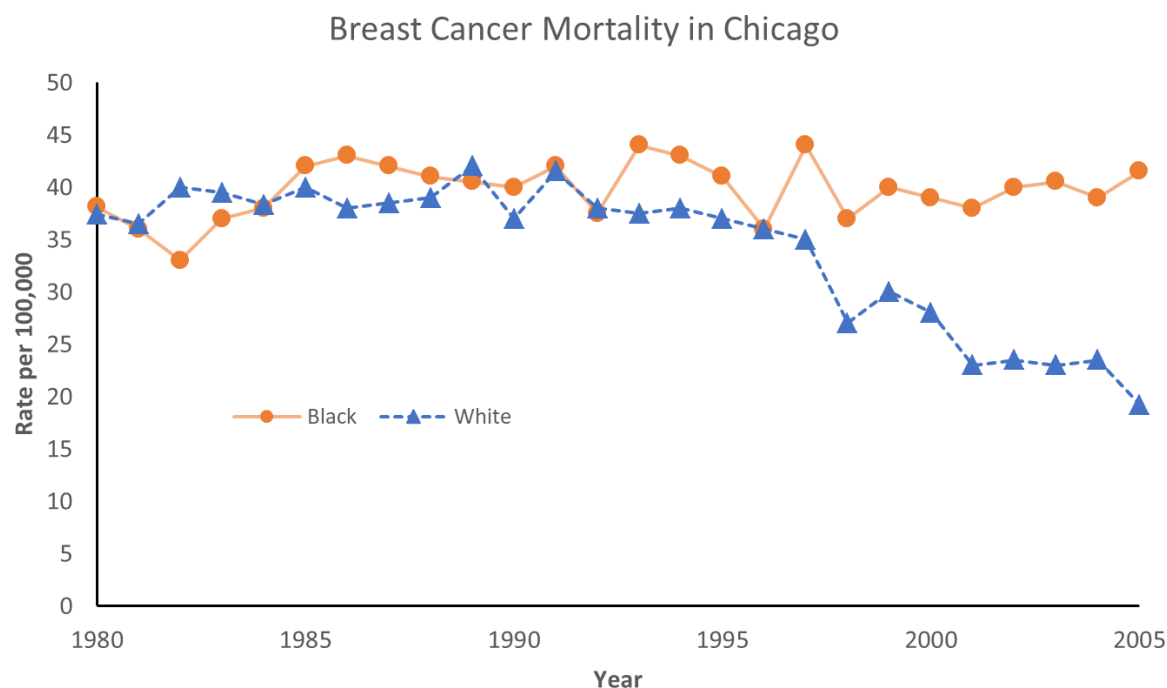

Figure 1. Black and white age-adjusted breast cancer mortality, Chicago 1980–2005. (Based on Ansell *et al.*, 2009.)

Questions

Use Figure 1 to answer the following questions.

5. Describe Figure 1 above, including the *x* and *y* axes, and legend.

6. What was the breast cancer mortality rate in 1980 for white women? For black women?

7. What was the breast cancer mortality rate in 2005 for white women? For black women?

8. How did the mortality rates change over time for each group shown in Figure 1? Be sure to discuss what may have caused the drop around 1997 for the white group.

9. Generate at least two hypotheses for any observed disparity in Chicago in the year 2005. Discuss the reasoning for your hypotheses.

Part III – Mortality Disparity
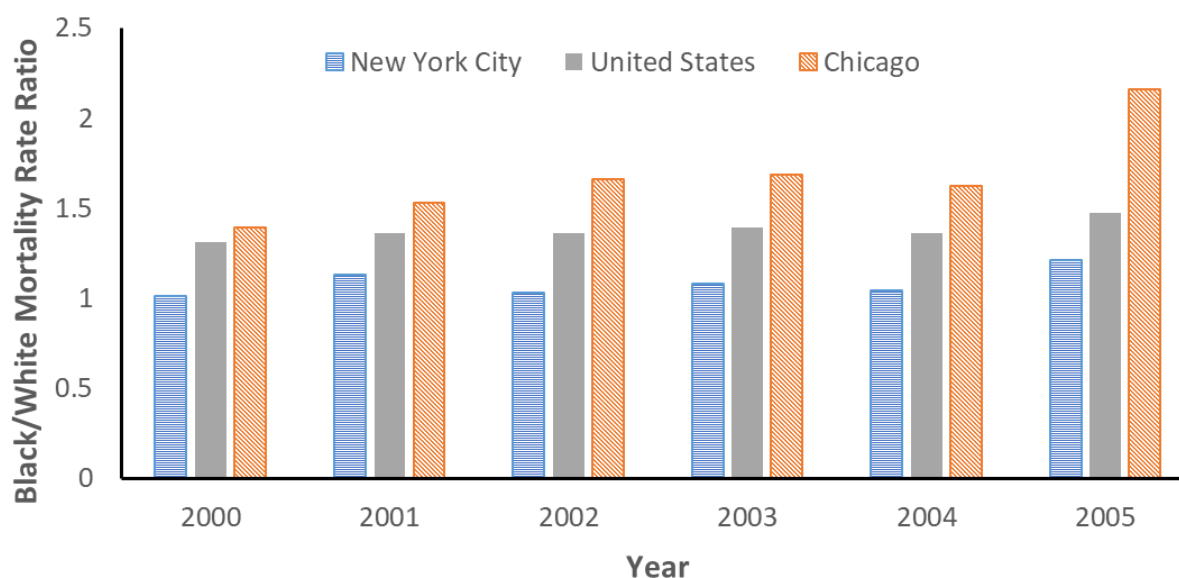
Black vs White Mortality Rate Ratio

Figure 2. Black/white breast cancer mortality disparity ratio, New York City, United States, and Chicago, 2000–2005. (Adapted from Ansell *et al.*, 2009.)

Questions

Use Figure 2 to answer the following questions.

10. In 2000, what was the breast cancer mortality ratio for black versus white women in the United States? In New York? In Chicago? Give a detailed explanation of what these data mean.
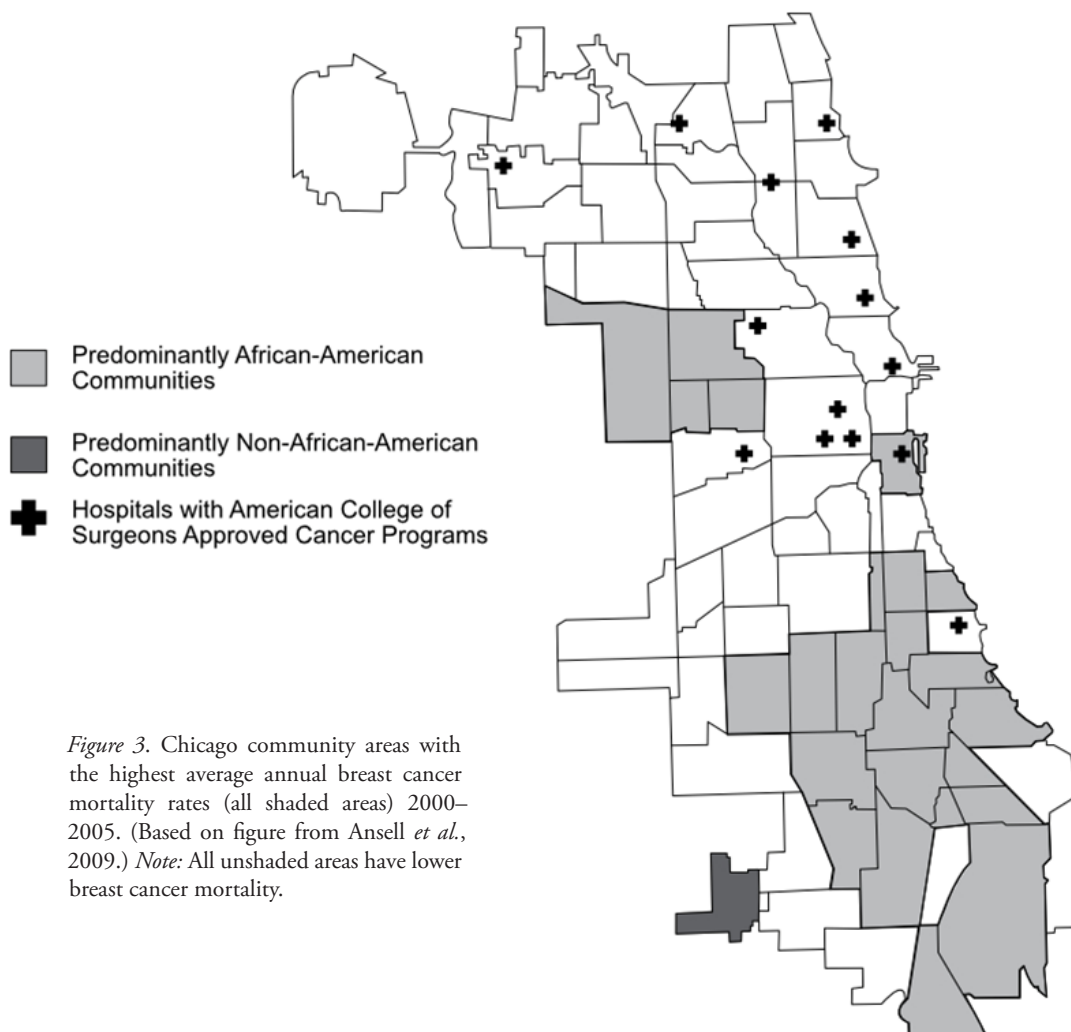
11. In 2005, what was the breast cancer mortality ratio for black versus white women in the United States? In New York? In Chicago? Give a detailed explanation of what these data mean.

12. How did the mortality ratios change over time for each location? Which location faced the biggest change? Which location faced the smallest change?

13. Do these data support or negate either of your hypotheses from Question 9? Explain why or why not and adjust your hypotheses to include your new insight.

Part IV – Chicago Communities

Breast Cancer Mortality Rates of Chicago Communities

Legend:
- ☐ Predominantly African-American Communities
- ■ Predominantly Non-African-American Communities
- ✚ Hospitals with American College of Surgeons Approved Cancer Programs

Figure 3. Chicago community areas with the highest average annual breast cancer mortality rates (all shaded areas) 2000–2005. (Based on figure from Ansell *et al.*, 2009.) *Note:* All unshaded areas have lower breast cancer mortality.

Questions

Use Figure 3 to answer the following questions.

14. What do the shaded areas of the map represent? What area(s) are light gray? What area(s) are dark gray? Count the number of areas for both shades.

15. Where are the Approved Cancer Program Hospitals located in reference to communities with high breast cancer mortality?

16. Do you think that the factors of hospital location and breast cancer mortality are linked? Does this information change your hypotheses from Question 13? Rewrite your hypotheses if necessary.

Part V – The Role of Genetics

Dr. Gonzalez was fascinated by this new information and wanted to know more about why breast cancer mortality disparities exist. She had learned some important facts from her research so far. First of all, she learned that there were racial disparities in certain cancer types between black and white populations. Then, she learned about the serious disparity in breast cancer mortality between black and white women in Chicago. She was puzzeld that this disparity was much higher in Chicago compared to the entire United States, and New York City. She also had learned about the contribution of socioeconomic factors to cancer disparities from the National Cancer Institute (NCI) website, but were those the only reasons?

Many researchers were investigating genetic differences that might contribute to cancer disparities. In fact, just the last week Dr. Gonzalez had attended the dissertation proposal of a Ph.D. candidate from her department, Keisha Williams, about genetics in breast cancer. Keisha had talked about genetic mutations in the "breast cancer genes" BRCA1 and BRCA2. She said that mutations in these genes account for a significant proportion of familial (inherited) risk for breast cancer. Additionally, BRCA1/2 mutations increase the risk of a dangerous form of the disease called triple negative breast cancer (TNBC), which is more common in African-American compared to white women (Lee *et al.*, 2011). TNBC is a type of breast cancer that grows faster, has fewer treatment options, and has worse outcomes than other types of breast cancer. During her talk, Keisha reported some surprising data. She said that different ethnic populations can have different BRCA1 and BRCA2 genetic mutations. For example, the Ashkenazi Jewish population carries different mutations than other populations. She further explained that, in under-studied populations, including African-American women, common mutations in BRCA1/2 related to cancer risk in these women may not be well known. She predicted that mutations more common in African-American women may not be well represented by current genetic tests, and that these uncharacterized mutations may be the drivers of the increased incidence of TNBC in this population. Keisha displayed the following information and data in her presentation (Figure 4, 5).
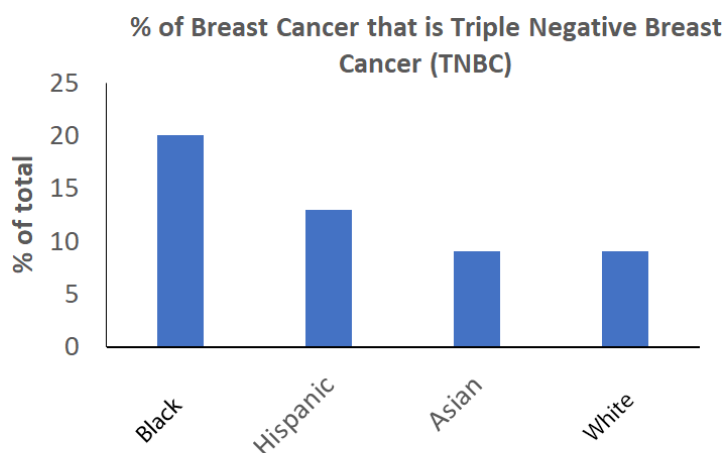

Figure 4. Percent of total incidence that are the aggressive form of breast cancer called "triple negative breast cancer." (Based on Huo *et al.*, 2009.)
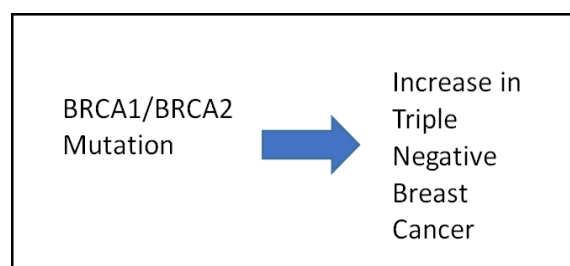

Figure 5. BRCA1/BRCA2 mutations correlate with triple negative breast cancer incidence. (Based on conclusion from Lee *et al.*, 2011.)

Questions

17. Summarize the data in Figure 4, and describe how the percentage of TNBC of total breast cancer diagnoses varies between ethnic groups.

18. According to Figure 5, what role does genetics play in breast cancer? (Cancer biology students may want to refer to the primary literature.)

19. Are there likely to be significant genetic differences between black women in Chicago versus black women in New York City?

Dr. Gonzalez wanted to take a closer look at the total percentage of black and white women who have TNBC to determine if that diagnosis was influencing the increased breast cancer mortality rate in black versus white women. She found the following data from the SEER cancer statistics website of the Surveillance Research Program, National Cancer Institute, <https://seer.cancer.gov/explorer/>.

Table 1. Breast cancer in black and white women in the United States (2010–2017).

Characteristic	Black	White
Incidence of Breast Cancer (rate per 100,000)	127.2	133.1
Mortality (rate per 100,000)	28.5	20.3
Triple negative breast cancer (rate per 100,000)	22.7	12.3

20. Utilize the data in Table 1 to write a detailed response to the following questions.
    a. What is the difference in the incidence of breast cancer between black and white women for all breast cancer?

    b. What about for TNBC?

    c. Does the total incidence of breast cancer correlate with mortality rate? Explain your answer.

    d. Does the incidence of TNBC correlate with mortality rate? Explain your answer.

21. Does this new information change your hypotheses about the breast cancer mortality disparity in Chicago? Explain why or why not.

22. As a group, discuss all of the data that you have reviewed throughout this case. Come to an agreement on the most likely hypothesis for the breast cancer mortality disparity in Chicago and in the United States. Using reliable resources, find at least one piece of additional data or information related to the topic of breast cancer mortality disparities to support your hypothesis. List your reference(s).

Part VI – Conclusion

Dr. Gonzalez was fascinated by the genetic data that showed different BRCA1/2 mutations in various populations. She wondered if the mutations that more commonly occur in black women are underrepresented by genetic tests. This thought was distressing, particularly because studies have shown that women in this population are at higher risk of aggressive types of breast cancer, such as TNBC. She further observed that the overall TNBC rates are higher in black women and that this correlates with increased mortality.

These data made her wonder, *Is genetics the reason why breast cancer mortality is higher in black versus white women here in Chicago? Do black women in Chicago have a higher rate of mortality than black women in New York due to genetic differences that increase their risk of developing TNBC?*

Dr. Gonzalez did not think that significant genetic differences would exist between populations in these two major cities to explain the larger disparity in Chicago, but she did not want to rule out any potential influence of genetics in the higher breast cancer mortality rate of black versus white women across the United States. She concluded that increased genetic profiling of African-American breast cancer patients was critical to understand the potential contribution of genetic mutations.

Since genetics could not explain the dramatic increase in mortality in black versus white women in Chicago compared to New York City, she decided to revisit the resources about cancer disparities that she had discussed with her mentor, Dr. Lebowitz.

The National Cancer Institute website communicated socioeconomic reasons for cancer disparities, including living in poor or medically underserved communities. Dr. Gonzalez knew that the predominantly black communities in Chicago lacked hospitals with cancer centers. This lack of access to facilities could be the barrier to important care including cancer screening. Maybe some of her patients were simply not screened on time. Were they only seeking medical care after symptoms developed? Dr. Gonzalez planned to talk with her mentor the following day to discuss how they could improve outreach to women in the predominantly African-American communities surrounding her institution in south Chicago. She was determined to reduce the number of women that were receiving initial diagnoses of advanced cancer, but she would need help. She headed off to the clinic feeling concerned yet optimistic. She thought to herself, *Let's get to work!*

Question

23. As a group, brainstorm about what could be done to solve the breast cancer mortality disparity between black and white women in Chicago and in the United States. Make a list of the responses.

References

Websites

National Institute on Minority Health and Health Disparities. National Institutes of Health. <https://www.nimhd.nih.gov/>

National Cancer Institute. Cancer Disparities. National Institutes of Health. <https://www.cancer.gov/about-cancer/understanding/disparities>

National Cancer Institute. What are Cancer Disparities? National Institutes of Health. <https://www.cancer.gov/about-cancer/understanding/disparities/what-are-cancer-disparities-infographic>

SEER*Explorer: An interactive website for SEER cancer statistics [Internet]. Surveillance Research Program, National Cancer Institute. <https://seer.cancer.gov/explorer/>

Research Articles

Ansell, D. *et al.* 2009. A community effort to reduce the black/white breast cancer mortality disparity in Chicago. *Cancer Causes and Control* 20, 1681. <https://doi.org/10.1007/s10552-009-9419-7>

Huo, D. *et al.* 2009. Population differences in breast cancer: survey in indigenous African women reveals over-representation of triple-negative breast cancer. *Journal of Clinical Oncology* 27(27): 4515–21. <https://doi.org/10.1200/JCO.2008.19.6873>

Lee, E. *et al.* 2011. Characteristics of triple-negative breast cancer in patients with a BRCA1 mutation: results from a population-based study of young women. *Journal of Clinical Oncology* 29(33): 4373–80. <https://doi.org/10.1200/JCO.2010.33.6446>

Internet references accessible as of June 9, 2021.

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