

Editor-in-Chief's Note

Women and Heart Disease



In the United States, February is designated as American Heart Month.¹ Heart disease is the leading cause of death in both men and women in the United States and globally.² While heart disease risk in women has been underappreciated historically, awareness among women and their health care providers is increasing.³ Sex disparities in diagnosis,⁴ treatment,⁵ and outcomes^{6,7} persist despite this growing recognition, and much work remains to be done to elucidate cardiovascular disease mechanisms in women.⁸

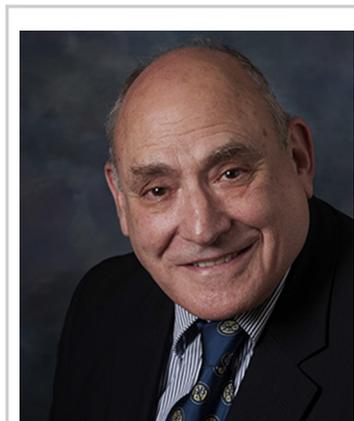
Women and men share four key risk factors for cardiovascular disease: obesity, hypertension, elevated LDL-C levels (≥ 130 – 159 mg/dL), and elevated triglyceride levels (≥ 150 mg/dL). Levels of protective HDL are generally higher in women than in men⁹; however, the presence of some comorbid conditions seems to be more predisposing to heart disease in women than in men. These comorbid conditions include diabetes mellitus, lupus erythematosus, rheumatoid arthritis, smoking, and clinically significant depression.¹⁰

A curious finding in the United States is that there is considerable geographic variation in the prevalence of heart disease-related deaths in women.^{11,12} In England, there is considerable geographic variability for heart disease prevalence among older women.¹³ Although there may be differences elsewhere, I could not locate comparable data for other countries. Figure 1 from the Centers for Disease Control and Prevention illustrates the marked variability that exists in the United States.¹¹ During these same years, there was also marked variation in heart disease death rates for men (Figure 2).¹⁴ Figure 3 identifies the unnamed states in Figures 1 and 2. Comparing the two maps reveals unexplained geographic differences between rates in men and women. For example, Nevada is low for men and high for women, whereas Wyoming is higher for men and low for women.

I have found no documented explanations for this variability; however, some speculations seem reasonable. For example, it is generally accepted that being below or just above poverty levels corresponds with higher obesity and type 2 diabetes mellitus rates in the United States.¹² Consistent with this possibility is the contrast in death rates between Minnesota and Mississippi. In 2013, the median household income in Minnesota was approximately US \$60,900, while in Mississippi it was approximately US \$38,000.¹⁵ On the other hand, the contrast between Arizona (approximately US \$48,500) with its low rates of heart disease deaths and Utah (approximately US \$59,800) with its higher rates does not support this explanation. These contrasts are similar when per capita income is used instead of median household income.¹⁵

Internationally, obesity rates appear to have a nonlinear relationship with gross domestic product (GDP). Obesity is more prevalent in consumption-driven populations in developing countries and in overconsuming wealthier countries where fast foods are widely available.¹⁶ One study suggests that obesity is a middle socioeconomic class problem.¹⁷ I could not find any data linking international GDP to death rates in women from heart disease. However, there appears to be a nonlinear relationship between age at death and GDP.¹⁸ The authors of this finding suggest the following as possible contributing factors to the nonlinearity reported: (1) for some persons in some countries, income is spent on non-necessities after basic needs are met; and 2) for some rich countries, the needs of the poor are ignored, which reduces life expectancy.

Another possible source of variation could be ease of access to appropriate health care. This factor could explain why there is a dark red area in Arizona in Figure 1 for the area that corresponds to the Grand Canyon, whereas the area corresponding to Phoenix is pale. Similarly, all of Massachusetts is pale, and northern Maine is somewhat darker. Florida has low rates of heart disease deaths in women overall, except paradoxically in the vicinity of



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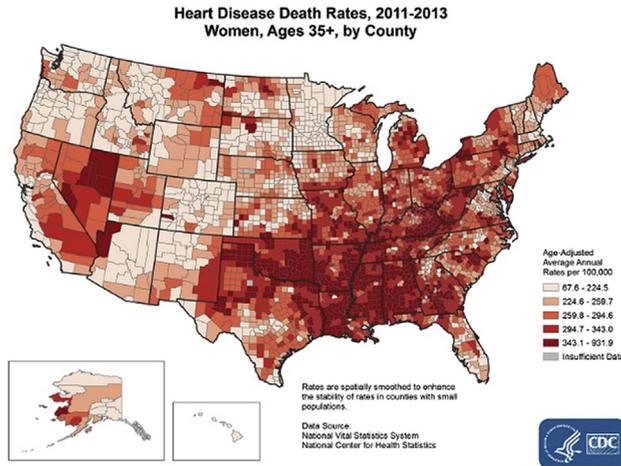


Figure 1. Heart disease death rates for women. Reprinted from Centers for Disease Control and Prevention (CDC). Women and heart disease fact sheet. https://www.cdc.gov/dhsp/data_statistics/fact_sheets/fs_women_heart.htm.

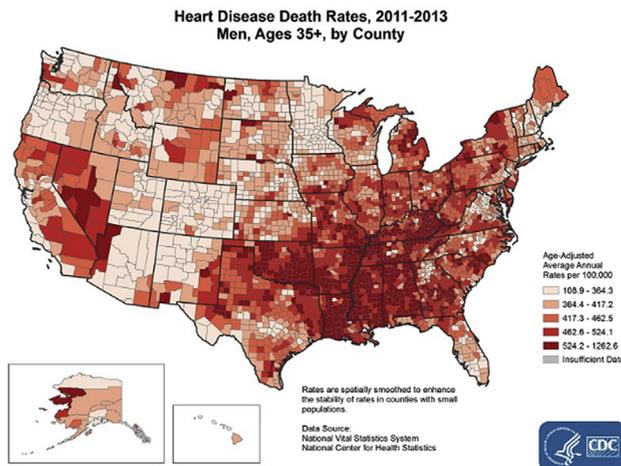


Figure 2. Heart disease death rates for men. Reprinted from Centers for Disease Control and Prevention (CDC). Heart disease facts in men. https://www.cdc.gov/dhsp/data_statistics/fact_sheets/fs_men_heart.htm.

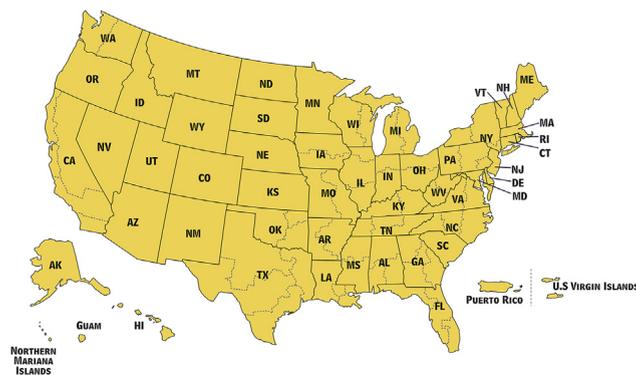


Figure 3. States with capitals. Reprinted from Wikimedia Commons. United States Public Domain Map. https://commons.wikimedia.org/wiki/File:United_States_Public_Domain_Map.svg.

Orlando, an area that has relatively good availability of health care facilities. One possible explanation is that access and utilization may be unrelated; another could be that lifestyle patterns such as tobacco, alcohol, and drug use are contributory.

These explanations are not always relevant when examined from another perspective. For example, Georgia and Colorado have per capita health care expenditure rates of approximately US \$6600 and US \$6800, respectively. These appear to be the lowest expenditure rates in the United States, even though their map colors are very pale.¹⁹ Dark-colored areas such as Mississippi and Louisiana actually spend more, at per capita rates of approximately US \$7600 and approximately US \$7800, respectively. These comparative figures are difficult to interpret because the dollars spent may not reflect per capita resource utilization or the availability of care. In some instances, they may reflect dollars spent because of acuity. Also, there is no way of knowing how much any state is spending on prevention, health care education for children and adults, or early detection.

Yet another possible factor could be the comparative average age of women in various states. I could not locate this information. In my opinion, there is no simple answer to the question of why death rates from heart disease for women and men are so geographically varied. It is likely due to a multifactorial relationship in which factors such as socioeconomic status, age, race and ethnicity, and lifestyle preferences have varied influence across different geographic regions. These differences are important for local health policy and intervention.

Heart disease causes one quarter of all deaths of women.²⁰ This is a major public health concern and a difficult one to address, particularly because ~60% of women who die suddenly of coronary artery disease are likely to have had no premonitory symptoms or signs.²¹ More research is needed to uncover any predictive biomarkers and sex-specific processes to facilitate targeted treatment. There is also a need for better and more reliable information about the roles of diet and exercise as effective prevention strategies.

Although county-level data on potential contributing factors have been made available by the Centers for Disease Control and Prevention in an [interactive atlas](#),²² there is no obvious explanation for the geographic variability in heart disease–related deaths. If any readers have unpublished research that could help to explain this variability in the United States or elsewhere, we would welcome the opportunity to submit such papers to our peer-review process for possible publication.

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REFERENCES

1. US Department of Health and Human Services. American Heart Month. <https://healthfinder.gov/nho/februarytoolkit.aspx>. Accessed January 4, 2019.
2. World Health Organization. Cardiovascular diseases (CVDs). [https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-\(cvds\)](https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)). Accessed January 4, 2019.
3. Terrie YC. *Increasing Awareness About Women and Cardiovascular Disease*. Pharmacy Times; June 14, 2012. <https://www.pharmacytimes.com/publications/issue/2012/june2012/increasing-awareness-about-women-and-cardiovascular-disease>. Accessed January 4, 2019.
4. Lichtman JH, Leifheit EC, Safdar B, et al. Sex differences in the presentation and perception of symptoms among young patients with myocardial infarction. *Circulation*. 2018;137:781–790.
5. Moreno-Arellano S, Delgado-de-Mendoza J, Santi-Cano MJ. Sex disparity persists in the prevention of cardiovascular disease in women on statin therapy compared to that in men. *Nutr Metab Cardiovasc Dis*. 2018;28:810–815.
6. Dreyer RP, Sciria C, Spatz ES, et al. Young women with acute myocardial infarction: current perspectives. *Circ Cardiovasc Qual Outcomes*. 2017;10:e003480.
7. Agarwal S, Percuiti A, Verma J, et al. Women have worse cognitive, functional, and psychiatric outcomes at hospital discharge after cardiac arrest. *Resuscitation*. 2018;125:12–15.
8. Regitz-Zagrosek V, Kararigas G. Mechanistic pathways of sex differences in cardiovascular disease. *Physiol Rev*. 2017;97:1–37.
9. Davis CE, Williams DH, Oganov RG, et al. Sex difference in high density lipoprotein cholesterol in six countries. *Am J Epidemiol*. 1996;143:1100–1106.

10. Mayo Clinic Staff. Heart disease in women: understand symptoms and risk factors. <https://www.mayoclinic.org/diseases-conditions/heart-disease/in-depth/heart-disease/art-20046167>. Accessed January 1, 2019.
11. Centers for Disease Control and Prevention (CDC). Women and heart disease fact sheet. https://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_women_heart.htm. Accessed January 1, 2019.
12. Coulter SA. Epidemiology of cardiovascular disease in women: risk, advances, and alarms. *Tex Heart Inst J*. 2011;38:145–147.
13. Lawlor DA, Bedford C, Taylor M, et al. Geographical variation in cardiovascular disease, risk factors, and their control in older women: British Women's Heart and Health Study. *J Epidemiol Commun Health*. 2003;57:134–140.
14. Centers for Disease Control and Prevention (CDC). Heart disease facts in men. https://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_men_heart.htm. Accessed January 4, 2019.
15. Wikipedia. List of U.S. states and territories by income. https://en.wikipedia.org/wiki/List_of_U.S._states_and_territories_by_income. Accessed January 1, 2019.
16. Egger G, Swinburn B, Amirul Islam FM. Economic growth and obesity: an interesting relationship with world-wide implications. *Econ Hum Biol*. 2012;10:147–153.
17. Prasada DVP. Economic origins of dietary diseases: is obesity becoming a middle income problem? *Proced Food Sci*. 2016;6:113–116.
18. Statistical Consultants Ltd. Life expectancy at birth versus GDP per capita (PPP). <http://www.statisticalconsultants.co.nz/blog/life-expectancy-at-birth-versus-gdp-per-capita-ppp.html>. Accessed January 1, 2019.
19. Henry Kaiser Family Foundation. Health care expenditures per capita by state of residence. <https://www.kff.org/other/state-indicator/health-spending-per-capita/?activeTab=map¤tTimeframe=0&selectedDistributions=health-spending-per-capita&sortModel=%7B%22collId%22:%22Location%22,%22sort%22:%22asc%22%7D>. Accessed January 1, 2019.
20. Xu JQ, Murphy SL, Kochanek KD, et al. Deaths: final data for 2013. *Natl Vital Stat Rep*. 2016;64:1–119.
21. Roger VL, Go AS, Lloyd-Jones DM, et al. Heart disease and stroke statistics—2012 update: a report from the American Heart Association. *Circulation*. 2012;125:e2–e220.
22. Centers for Disease Control and Prevention, Division for Heart Disease and Stroke Prevention. Interactive atlas of heart disease and stroke. <https://www.cdc.gov/dhdsp/maps/atlas/index.htm>. Accessed January 4, 2019.