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Life Expectancy for White, Black and Hispanic Race/Ethnicity in US States: Trends and Disparities 1990-2019

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Abstract

Background: Life expectancy (LE) differences within and between states by race/ethnicity have not been examined.

Objective: To estimate LE for selected race/ethnicity groups in states from 1990 to 2019

Design: Cross-sectional time-series analysis

Setting: United States

Participants: Deidentified death records and Census data were used to construct regression models with smoothed time-series of mortality from 1990 to 2019.

Main Outcome and Measures: LE at birth, by sex and year, for subgroups of people reporting Hispanic, Black non-Hispanic, or White non-Hispanic race/ethnicity.

Results: Disparity in LE across states was 8.0 years for women and 12.2 for men in 1990 and 7.9 for women and 7.8 for men in 2019. When accounting for race/ethnicity groups, disparities across states were 20.7 for women and 24.5 for men in 1990, decreasing to 18.5 for women and 23.7 for men in 2019. Disparities across states increased within each race/ethnicity group between 1990 and 2019, with the largest increase for White non-Hispanic men and the smallest for Hispanic women. The disparity between race/ethnicity groups within states decreased for most of the 23 states with all three groups estimated, but increased for women in 7 states and men in 5 states

Limitations: LE was not estimated for 37 state subgroups due to small sample size

Conclusion and Relevance: Disparity in LE across states was greater when considering race/ethnicity groups. Disparities across state-race/ethnicity groups in general has decreased over the

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past three decades. For each race/ethnic group, disparities across states have increased. While race/ethnic disparities decreased within most of the 23 states estimated, they increased for women in 7 states and men in 5 states.

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Keywords

population health; health disparities; life expectancy

Background

Life expectancy is no longer increasing in the United States after several decades of gradual improvements.⁽¹⁾ This national trend masks larger disparities in health outcomes among states, between men and women, and between race/ethnicity groups. For example, national average life expectancy decreased for women between 2016 and 2017 while remaining unchanged for men. Also, national age-adjusted death rates differed by race/ethnicity and by state, but trends in LE for race/ethnicity groups within states have not been systematically examined or reported.^(1,2) There remains a gap in the tracking of health inequities in the United States for states, where health policies are often set.^(3,4)

At the national level, large differences in life expectancy have been observed between race/ethnicity groups.⁽⁵⁾ To better understand long-term trends in health at the state level, we estimated LE for the three largest race/ethnicity groups for each US state and the District of Columbia from 1990 to 2019 separately by sex.⁽⁶⁾

Methods

Death certificate and census data were combined to create smoothed time-series for each race/ethnicity group in each state. Methods are described below and with additional details in the supplementary methods. The Guidelines for Accurate and Transparent Health Estimates Reporting checklist is included as eTable 1. A flowchart of the estimation process is included as eFigure 1. Details of data sources are included as eTable 2. A file of all LE estimates is provided as a supplement. All analyses were performed using R 4.05 and Python 3.8.8.^(7,8)

Statistical Race/Ethnicity Categories

Race and ethnicity are socially derived categories defined by individual self-reporting. Statistical race/ethnicity categories are constructed by the design of census and survey questions and reported by government and other institutions, usually for the purpose of achieving social or policy goals.⁽⁹⁾ We report on the largest mutually exclusive and collectively exhaustive statistical race/ethnicity groups as defined by the US Office of Management and Budget: 1) Hispanic and any race; 2) Non-Hispanic and Black; 3) Non-Hispanic and White. Estimates for Non-Hispanic people reporting other races, which include people who reported more than one race, are provided in the Supplement.

Adjustment for Misclassification of Race/ethnicity on death certificates

Misclassification in the recording of race and ethnicity for vital registration has been reported based on analyses of data sets of linked surveys, where race/ethnicity was self-reported, and death certificates, where it was assigned by the certifier.⁽¹⁰⁾ We multiplied age-sex-specific death rates by race/ethnicity-specific correction ratios to adjust estimates of all-cause mortality to account for this small degree of misclassification of race/ethnicity on death certificates.

Statistical Analysis

Population and All-cause mortality—We used bridged race/ethnicity data from the United States Census (https://www.cdc.gov/nchs/nvss/bridged_race.htm) to construct a time series by age, sex, and state-race/ethnicity group from 1990 to 2019. To generate estimates of all-cause mortality, we used death certificate data from the National Vital Statistics System. To generate a complete time series from 1990 to 2019, we modeled counts of deaths using a structured linear regression with a multi-dimensional Gaussian smoother to borrow strength across multiple dimensions (age and time), informed by observed residuals and their uncertainty.⁽¹¹⁾ To carry the uncertainty from the models through the rest of the process, we took 1000 draws from the posterior distribution of the model.⁽¹²⁻¹⁵⁾

Life Expectancy Calculation—To generate estimates of life expectancy at birth, we constructed bridged period life tables, using the draws of all-cause mortality rates described above as input data.⁽¹⁶⁾ This approach generated 1000 draws of life expectancy for each age, sex, year, and state-race/ethnicity group. For each group, point estimates were generated by taking the mean of the draws and the bounds of the 95% uncertainty intervals were determined by taking the 2.5th and 97.5th percentiles of the draws. Supported changes in LE were interpreted as a 95% UI for percentage change that did not cross zero. In order to capture differences between leading and lagging locations, absolute disparities in LE between state-race/ethnicity groups were calculated as the difference between the range.⁽¹⁷⁾ For some state-race/ethnicity groups in some years, we observed extremely low numbers of deaths, most notably for the oldest age groups among smaller populations. We excluded those state-race/ethnicity location-groups when the average number of deaths for either sex in any decade was less than 10 for the terminal age group of 85 years or older.

Role of the Funding Source

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Results

Figure 1, eFigure 2 and eFigure 3 show LE over time for each location and the trend for states where LE was least, greatest, and closest to the median in 1990. Trends in the 5th percentile, mean, and 95th percentile of the distribution of LE are also shown. Tables 1A and 1B show the corresponding values of LE for these trends in 1990, 2000, 2010 and 2019

as well as the minimum and maximum estimated LE. LE from age 25 and 65 are provided as supplemental files. In presenting results, the term “disparity” may refer to differences in LE between states, or between racial/ethnic groups. In the first section, we present results for trends over time for women and men separately, first across all states, then by specific racial/ethnic groups across states. In the second section we present trends within individual states..

Trends in Life Expectancy across states among women

Trends across states—In 1990, the disparity across states in LE for women was 8.0 years between women in the District of Columbia (74.1 years [95% CI 73.5-74.6]) and women in Hawaii (82.1 years [95% CI 81.6-82.5]). By 2019, the disparity across states had fallen to 7.9 years between women in Mississippi (77.9 years [95% CI 77.5-78.3]) and women in Hawaii (85.8 years [95% CI 85.1-86.4]). Over the same period of time, the mean LE across states for women increased from 79.3 years (95% CI 79.2-79.4) in 1990 to 81.3 years (95% CI 81.3-81.4) in 2019, an increase of 2.0 years (a percent change of 2.6% [95% CI 2.5-2.7]).

Trends across states accounting for race/ethnicity groups—When accounting for race/ethnicity groups, the disparities across states was 20.7 years (Black non-Hispanic women in the District of Columbia [71.4 years (95% CI 70.7-72.0)] to Hispanic women in Ohio [92 years (95% CI 87.4-99.6)]) for women in 1990, decreasing to 18.5 years (Black non-Hispanic women in the District of Columbia [76.2 years (95% CI 75.4-77.2)] to Hispanic women in Georgia [94.7 years (95% CI 93.1-96.5)]) for women in 2019. Examination of trends over time for each race/ethnicity group show further distinct patterns. Non-Hispanic Black women had the lowest mean LE across states in 1990 (74.2 years [95% CI 74.0-74.4]), but had the greatest improvement on average by 2019 (6.9% [95% CI 6.5-7.3]). Hispanic and non-Hispanic White women had higher mean LE across states in 1990 (84.8 years [95% CI 84.2-85.6] and 79.9 years [95% CI 79.8-80.0] respectively), with an increase of 4.0% (95% CI 3.0-4.7) and 1.9% (95% CI 1.8-2.0), respectively, by 2019. In 2019, despite improvement over time, non-Hispanic Black women still had lower mean life expectancy across states than non-Hispanic white and Hispanic women, with a range across states of 76.2 years in the District of Columbia (CI 75.4-77.2) to 87.1 years in Rhode Island (CI 84.7-90.3). The life expectancy for Non-Hispanic White women and Hispanic women in 2019 overlapped the range for non-Hispanic Black women, ranging from 78.0 years in West Virginia (CI 77.5-78.5) to 88.7 years in the District of Columbia (CI 87.5-90.1) and from 80.8 years in Hawaii (CI 79.9-81.9) to 94.7 years in Georgia (CI 93.1-96.5), respectively.

Trends across states by race/ethnicity groups—Disparities in LE across states increased for women within each of the three race/ethnicity groups between 1990 and 2019, but increased most for non-Hispanic White women and non-Hispanic Black women (6.6 and 5.8 years, respectively) and least for Hispanic women (1.5 years). In 1990, the disparity in LE for non-Hispanic Black women across states was 5.1 years (71.4 [95% CI 70.7-72.0] in the District of Columbia to 76.4 years [95% CI 74.0-79.6] in New Mexico). By 2019, the disparity had increased to 10.9 years (76.2 years [95% CI 75.4-77.2] in the District of Columbia to 87.1 years [95% CI 84.7-90.3] in Rhode Island). The least change

occurred among non-Hispanic Black women in 2 states (Louisiana [3%, CI -0.9-4.9] and West Virginia [2.9%, CI -0.2-6]), whereas LE for non-Hispanic Black women improved the most in Rhode Island (21.1%, CI 15.9-26.9), followed by New York (11.7%, CI 11.0-12.3), Connecticut (11.2%, CI 9.2-13.1%), and Massachusetts (11.1%, CI 9.0-13.2). In 1990, the disparity in LE for non-Hispanic White women was 4.0 years (78.0 [95% CI 77.5-78.4] in Nevada to 82.0 years [95% CI 81.5-82.5] in North Dakota). By 2019, the disparity had increased to 10.7 years (78.0 years [95% CI 77.5-78.5] in West Virginia to 88.7 years [95% CI 87.5-90.1] in the District of Columbia). LE for White non-Hispanic women decreased in 2 states (Mississippi [-0.9%, CI -1.7 to -0.2] and Tennessee [-0.7%, CI -1.1 to -0.2]), whereas LE improved the most for non-Hispanic White women in the District of Columbia (10.4%, CI 8.4-12.4) and Alaska (5.6%, CI 4.0-7.0). Disparities in LE for Hispanic women increased the least (1.5 years). In 1990, the disparity in LE for Hispanic women was 12.3 years (79.7 [95% CI 78.8-80.7] in New Mexico to 92.0 [95% CI 87.4-99.6] in Ohio). By 2019, the disparity increased to 13.9 years (80.8 [95% CI 79.9-81.9] in Hawaii to 94.7 [95% CI 93.1-96.5] in Georgia). The greatest increase in LE among Hispanic women occurred in Missouri (16.2%, CI 11.6-21.1), followed by Virginia (9.7%, CI 5.6-12.8) and Pennsylvania (8.7%, CI 4.6-11.8).

Trends in Life Expectancy among men

Trends across states—In 1990, the disparity in LE across states for men was 12.2 years between men in the District of Columbia (63.9 years [95% CI 63.2-64.5]) and men in Hawaii (76.1 years [95% CI 75.5-76.6]). This disparity between states decreased to 7.8 years in 2019 between men in Mississippi (71.7 years [95% CI 71.3-72.0]) and men in Hawaii (79.5 years [95% CI 78.9-80.1]). The mean LE across states for men also increased from 72.6 years (95% CI 72.6-72.7) in 1990 to 76.3 years (95% CI 76.2-76.3) in 2019, an increase of 3.7 years (5.0% [95% CI 4.9-5.2]).

Trends across states accounting for race/ethnicity groups—When accounting for race/ethnicity groups, the disparity across states was 24.5 years (Black non-Hispanic men in the District of Columbia [59.4 years (95% CI 58.6-60.1)] to Hispanic men in Georgia [83.8 years (95% CI 81.1-87.4)]) for men in 1990. By 2019, this disparity decreased to 23.7 years (Black non-Hispanic men in the District of Columbia [66.9 years (95% CI 66.0-67.8)] to Hispanic men in Virginia [90.7 years (95% CI 89.2-92.4)]). Examining such trends within each race/ethnicity group reveal Hispanic and non-Hispanic White men had mean LE across states in 1990 of 77.2 years (95% CI 76.8-77.8) and 73.5 years (95% CI 73.4-73.6), respectively. Both groups experienced an increase in LE of 7.2% (95% CI 6.4-7.9) and 4.2% (95% CI 4.1-4.4), respectively, by 2019. Non-Hispanic Black men had the lowest mean LE across states in 1990 (65.7 [95% CI 65.5-65.9]), but had the greatest improvement on average by 2019 (10.9% [95% CI 10.5-11.3]). Despite this improvement, non-Hispanic Black men still had lower mean life expectancy across states than non-Hispanic white and Hispanic men in 2019, with a range across states of 66.9 years in the District of Columbia (95% CI 66.0-67.8) to 81.1 years in Rhode Island (95% CI 78.6-84.5). The life expectancy in 2019 for Non-Hispanic White men and Hispanic men ranged from 72.7 years in Mississippi (CI 72.3-73.1) to 85.9 years in the District of Columbia (CI 84.9-86.9).

and from 75.5 years in Hawaii (CI 74.6-76.4) to 90.7 years in Virginia (CI 89.2-92.4), respectively.

Trends across states by race/ethnicity groups—Between 1990 and 2019, disparities in LE across states increased for men within each of the three race/ethnicity groups. The difference in disparities across states increased by only 3.5 years and 3.9 years for Hispanic men and Black non-Hispanic men, respectively. However, for White non-Hispanic men, the difference in disparities across states between 1990 and 2019 increased by 8.0 years. In 1990, the disparity in LE for non-Hispanic Black men across states was 10.2 years (59.4 years [95% CI 58.6-60.1] in the District of Columbia to 69.6 years [95% CI 67.9-71.5] in Colorado). This disparity increased to 14.2 years by 2019 (66.9 years [95% CI 66.0-67.8] in the District of Columbia to 81.1 years [95% CI 78.6-84.5] in Rhode Island). Non-Hispanic Black men experienced large increases in LE from 1990 to 2019, with the largest improvements in Rhode Island (27.2% [95% CI 20.8-34]), followed by New York (18.7% [17.9-19.5]), Minnesota (17.0% [95% CI 12.0-21.4]), and Connecticut (16.5% [95% CI 14.4-18.7]). For non-Hispanic White men, the disparities in LE across states in 1990 was 5.2 years (71.1 years [95% CI 70.6-71.5] in West Virginia to 76.2 years [95% CI 75.2-77.4] in Hawaii). By 2019, the disparities across states had increased to 13.2 years (72.7 years [95% CI 72.3-73.1] in Mississippi to 85.9 years [95% CI 84.9-86.9] in the District of Columbia). LE improved the most for non-Hispanic White men in the District of Columbia (17.6%, CI 15.7-19.7) and Alaska (9.5%, CI 7.9-11.0). Disparities in LE across states for Hispanic men increased the least (3.5 years) but remained higher than the other race/ethnicity groups. In 1990, the disparity in LE for Hispanic men was 11.7 years (72.1 years [95% CI 70.2-74.4] in Pennsylvania to 83.8 years [95% CI 81.1-87.4] in Georgia). This disparity increased to 15.2 years by 2019 (75.5 years [95% CI 74.6-76.4] in Hawaii to 90.7 years [95% CI 89.2-92.4] in Virginia). The greatest increase in LE among Hispanic men occurred in Missouri (21.0%, CI 16.0-26.7), followed by Virginia (16.5%, CI 12.9-19.9) and Pennsylvania (13.2%, CI 9.8-16.5).

Trends in Disparities Within States

For the 23 states where LE of all three race/ethnicity groups were estimated, most states experienced a decrease in racial/ethnic disparities since 1990 (Figure 2, eFigure 4, and eFigure 5). However, racial/ethnic disparities increased in 7 states for women and 5 states for men, with the largest increase in Missouri, where it increased by 9 years for women and 10.8 for men. The gap narrowed in 16 states for women and 18 states for men, with the largest decrease in Massachusetts, Connecticut, and Oregon, where it decreased more than 5 years for both women and men.

For women in 1990, the greatest racial/ethnic disparity was in Ohio, with a difference in LE between Non-Hispanic Black women and Hispanic women of 17.5 years. By 2019, the greatest racial/ethnic disparity was between Non-Hispanic Black women and Hispanic women in Missouri (16.3 years). For men in 1990, this disparity was greatest between non-Hispanic Black men and Hispanic men in Georgia (18.8 years). By 2019, the greatest difference in LE was between non-Hispanic Black men and Hispanic men in Missouri (19.6 years).

Discussion

While mean LE in the United States increased from 1990 to 2010, the trend has remained flat since 2010. This national trend masks growing differences across race/ethnicity subgroups between and within states. Disparity in LE across states are substantially greater when considering race/ethnicity groups rather than the average for an entire state. While disparities across states as a whole have decreased, for each of the three race/ethnic groups studied, disparities across states within each race/ethnicity group have increased over the past three decades. Over the same period of time, the racial/ethnic disparities in LE decreased for most of the 23 states studied, but increased for women in 7 states and men in 5 states. Life expectancy has improved but remains lowest for non-Hispanic black people for almost every state.

Our analysis shows LE varies widely by race/ethnicity groups and by state. While there have been substantial improvements for many of these groups in some states, improvements have stagnated for a number of locations. LE for Black men remained generally lower than other subgroups but had the largest improvement since 1990, with increases of up to 16% in some states. The disparities in LE across all states was 7.9 years for women and 7.8 years for men in 2019 but was over twice that amount, 18.5 years for women and 23.7 years for men, when accounting for race/ethnicity groups across states. Geographic variation in LE within race/ethnicity groups helps to quantify the way other less readily observed social determinants effect health. As a result, the differences between locations with the lowest LE among one group and highest among another is narrowing as those with the lowest LE improves more quickly. Over the same period, within each race/ethnicity group, improvements for the highest LE locations have outpaced improvements among the lowest. Our results suggest that state-level analysis which includes race/ethnicity is an important component for measuring health inequity that could be added to the standard reporting of national average trends.(1)

Our analysis is not intended to explain the observed differences in LE. Socioeconomic status, race/ethnicity, environmental, behavioral, and metabolic risk factors are all known to play a role in disparities in LE.(17-19) These risks can be influenced by more proximate social determinants of health that reflect the complex interplay of economic, cultural, and political factors. Racism and its consequences may be a further driver affecting life expectancy through a multitude of mechanisms.(20)

Lower mortality and resulting longer LE among people reporting Hispanic ethnicity compared to people reporting White non-Hispanic race/ethnicity in the United States has been attributed to a range of factors, including lower rates of tobacco smoking and the possibility of underestimation of mortality due to misclassification or individuals leaving the US prior to death. Consistent with prior studies, our analysis shows greater life expectancy among Hispanic people. We extend this observation to the state level going back three decades and show that it persists even after our adjustment for the small mismatch between race/ethnicity as it appears on death certificates rather than when self-reported. The wider disparities in LE for Hispanic people compared with other race/ethnicity groups suggest that health for this population in particular may be driven by factors that vary markedly by

location, such as early life course exposures that vary by country of origin. An important and persistent challenge is that Hispanic ethnicity, as defined for statistical purposes in the US, remains an artificial and heterogeneous aggregation of ancestry and national origin with varying average mortality for each included subgroup.(21)

Our analysis focused on LE from birth. Calculation of LE from other ages may also prove useful when considering Medicare or other age-related national or state health policies. We have also included life expectancy calculated from ages 25 and 65 (Supplement). Increases in LE from age 65 since 1990 have been even greater than LE at birth for almost every location-group, reflecting greater improvements in mortality rates above that age.

While our analysis produced estimates of LE for race/ethnicity groups in the state where death occurred, future studies could attempt to categorize estimates by other relevant characteristics recorded on death certificates. Research might examine LE by decedents income, education, degree of rurality at the location of death, or location of birth (including for immigrant populations). Additional analysis is required to better understand the quality of these less frequently used data. These kinds of novel analyses would lead to measures of LE that may better reflect the risk exposures accrued throughout the life course regardless of the location of death.

Limitations

For 37 state-race/ethnicity groups, we observed extremely low numbers of deaths among the oldest adults for earlier years in the time series. We excluded state-race/ethnicity location-groups when the average number of deaths for either sex in any decade was less than 10 for the terminal age group of 85 years or older, and thus could only estimate within-state disparity across race/ethnic groups for 23 states. (22) The uncertainty intervals include measurement uncertainty as reflected in the input data for models but may not contain all uncertainties involved in the modelling process. Additionally, the Gaussian Kalman smoothing approach may under-estimate uncertainty for death count data, especially for cases where mortality rates are very low. Detailed vital registration data for years since 2019 have not yet been released by NCHS. As suggested by the 2016 NIH Workshop on the Use of Race and Ethnicity in Genomics and Biomedical Research, future analyses must address the limitations of current Office of Management and Budget race/ethnicity categories.(23)

Conclusion

The disparity in LE across states, 7.9 years for women and 7.8 years for men in 2019, was greater when considering race/ethnicity groups within those states, which increased the disparity to 18.5 years for women and 23.7 years for men in 2019. This disparity, as measured in years of LE, has decreased over the past three decades but differences in LE across states within each race/ethnicity group have increased. Within the 23 states where all three race/ethnicity groups were estimated, disparity between these groups increased for women in 7 states and men in 5 states.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Reference

1. Woolf SH, Schoomaker H. Life Expectancy and Mortality Rates in the United States, 1959–2017. *JAMA*. 2019 Nov 26;322(20):1996. [PubMed: 31769830]
2. Murphy SL, Xu J, Kochanek KD, Arias E. Mortality in the United States, 2017. *NCHS Data Brief*. 2018 Nov;(328):1–8.
3. Bailey ZD, Feldman JM, Bassett MT. How Structural Racism Works — Racist Policies as a Root Cause of U.S. Racial Health Inequities. *New England Journal of Medicine*. 2020 Dec 16;0(0):null.
4. Adler NE, Glymour MM, Fielding J. Addressing Social Determinants of Health and Health Inequalities. *JAMA*. 2016 Oct 25;316(16):1641–2. [PubMed: 27669456]
5. Braveman PA, Cubbin C, Egerter S, Williams DR, Pamuk E. Socioeconomic Disparities in Health in the United States: What the Patterns Tell Us. *Am J Public Health*. 2010 Apr 1;100(S1):S186–96. [PubMed: 20147693]
6. Murray CJL, Aravkin AY, Zheng P, Abbafati C, Abbas KM, Abbasi-Kangevari M, et al. Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*. 2020 Oct 17;396(10258):1223–49.
7. R Core Team. R: A Language and Environment for Statistical Computing [Internet]. 2020 [cited 2021 Apr 29]. Available from: <https://www.r-project.org/>
8. Van Rossum G, Drake FL. *Python 3 Reference Manual*. 2009;
9. Prewitt K. What Is “Your” Race?: The Census and Our Flawed Efforts to Classify Americans. Reprint edition. Princeton University Press; 2016. 288 p.
10. Arias E, Heron M, Hakes J. The validity of race and Hispanic-origin reporting on death certificates in the United States: An update [Internet]. National Center for Health Statistics; p. 29. Report No.: Vital Health Stat 2(172). 2016. Available from: https://www.cdc.gov/nchs/data/series/sr_02/sr02_172.pdf
11. Aravkin A, Burke JV, Ljung L, Lozano A, Pillonetto G. Generalized Kalman smoothing: Modeling and algorithms. *Automatica*. 2017 Dec;86:63–86.
12. Dwyer-Lindgren L, Bertozzi-Villa A, Stubbs RW, Morozoff C, Mackenbach JP, van Lenthe FJ, et al. Inequalities in Life Expectancy Among US Counties, 1980 to 2014: Temporal Trends and Key Drivers. *JAMA Intern Med*. 2017 Jul 1;177(7):1003. [PubMed: 28492829]
13. Wang H, Dwyer-Lindgren L, Lofgren KT, Rajaratnam JK, Marcus JR, Levin-Rector A, et al. Age-specific and sex-specific mortality in 187 countries, 1970–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet*. 2012 Dec;380(9859):2071–94.
14. Kulkarni SC, Levin-Rector A, Ezzati M, Murray CJ. Falling behind: life expectancy in US counties from 2000 to 2007 in an international context. *Popul Health Metrics*. 2011 Dec;9(1):16.
15. Ezzati M, Friedman AB, Kulkarni SC, Murray CJL. The Reversal of Fortunes: Trends in County Mortality and Cross-County Mortality Disparities in the United States. Novotny T, editor. *PLoS Med*. 2008 Apr 22;5(4):e66. [PubMed: 18433290]
16. Preston S, Heuveline P, Guillot M. *Demography: Measuring and Modeling Population Processes*. 1st edition. Malden, MA: Wiley-Blackwell; 2000. 308 p.
17. Dwyer-Lindgren L, Bertozzi-Villa A, Stubbs RW, Morozoff C, Mackenbach JP, van Lenthe FJ, et al. Inequalities in Life Expectancy Among US Counties, 1980 to 2014: Temporal Trends and Key Drivers. *JAMA Intern Med*. 2017 Jul 1;177(7):1003–11. [PubMed: 28492829]
18. Cullen MR, Cummins C, Fuchs VR. Geographic and racial variation in premature mortality in the U.S.: analyzing the disparities. *PLoS ONE*. 2012;7(4):e32930. [PubMed: 22529892]
19. Davids BO, Hutchins SS, Jones CP, Hood JR. Disparities in Life Expectancy Across US Counties Linked to County Social Factors, 2009 Community Health Status Indicators (CHSI). *J Racial and Ethnic Health Disparities*. 2014 Mar 1;1(1):2–11.

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20. On Racism: A New Standard For Publishing On Racial Health Inequities | Health Affairs Forefront [Internet]. [cited 2022 Feb 16]. Available from: <https://www.healthaffairs.org/doi/10.1377/forefront.20200630.939347/full/>

21. Rodriguez Fatima, Hastings Katherine G., Hu Jiaqi, Lopez Lenny, Cullen Mark, Harrington Robert A., et al. Nativity Status and Cardiovascular Disease Mortality Among Hispanic Adults. Journal of the American Heart Association. 2020 Aug 31;6(12):e007207.

22. McKenna L. Research and Methodology Directorate: A History of the U.S. Census Bureau's Disclosure Review Board [Internet]. 2019. Available from: <https://www2.census.gov/adrm/CED/Papers/FY20/2019-04-McKenna-DRB.pdf>

23. National Human Genome Research Institute. Workshop on the Use of Race and Ethnicity in Genomics and Biomedical Research [Internet]. 2016 Oct 24 [cited 2021 Jan 25]; Bethesda, MD. Available from: https://www.genome.gov/Pages/About/IRMinorities/2016_Oct_Workshop_Summary_and_Themes.pdf

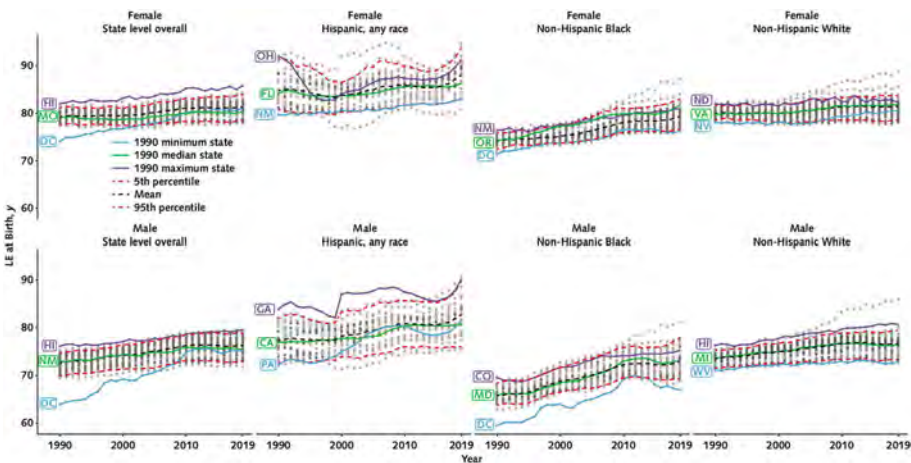


Figure 1: State-level estimates of life expectancy at birth between 1990 and 2019, total population and Hispanic, Black, and White race/ethnicity groups.

Figure shows LE at the state-level and for each race/ethnicity group for each year from 1990 to 2019 for women and men. Each dot represents a location or race/ethnicity group within that location. The state with minimum, median and maximum LE in 1990 is tracked through all years with a colored line as described in the legend. The LE mean, 5th, and 95th percentile of the distribution for each year is also shown plotted as dashed lines as described in the legend. The location with the minimum LE in 1990 was the District of Columbia (DC) at the overall state-level for women, New Mexico (NM) for Hispanic women of any race, the District of Columbia (DC) for non-Hispanic Black women, Nevada (NV) for non-Hispanic White women, the District of Columbia (DC) at the overall state-level for men, Pennsylvania (PA) for Hispanic men, the District of Columbia (DC) for non-Hispanic Black men, and West Virginia (WV) for non-Hispanic White men. In 1990, the state with the median LE value, or the lower of the two states with LE values closest to the median if there was an even number of states reported, was Missouri (MO) at the overall state-level for women, Florida (FL) for Hispanic women, Oregon (OR) for non-Hispanic Black women, Virginia (VA) for non-Hispanic White women, New Mexico (NM) at the overall state-level for men, California (CA) for Hispanic men, Maryland (MD) for non-Hispanic Black men, and Michigan (MI) for non-Hispanic White men. The state with the maximum LE in 1990 was Hawaii (HI) at the overall state-level for women, Ohio (OH) for Hispanic women, New Mexico (NM) for non-Hispanic Black women, North Dakota (ND) for non-Hispanic White women, Hawaii (HI) at the overall state-level for men, Georgia (GA) for Hispanic men, Colorado (CO) for non-Hispanic Black men, and Hawaii (HI) for non-Hispanic White men. CA = California, CO = Colorado, DC = District of Columbia, FL = Florida, GA = Georgia, HI = Hawaii, MD = Maryland, MI = Michigan, MO = Missouri, ND = North Dakota, NM = New Mexico, NV = Nevada, OH = Ohio, OR = Oregon, PA = Pennsylvania, VA = Virginia, WV = West Virginia.

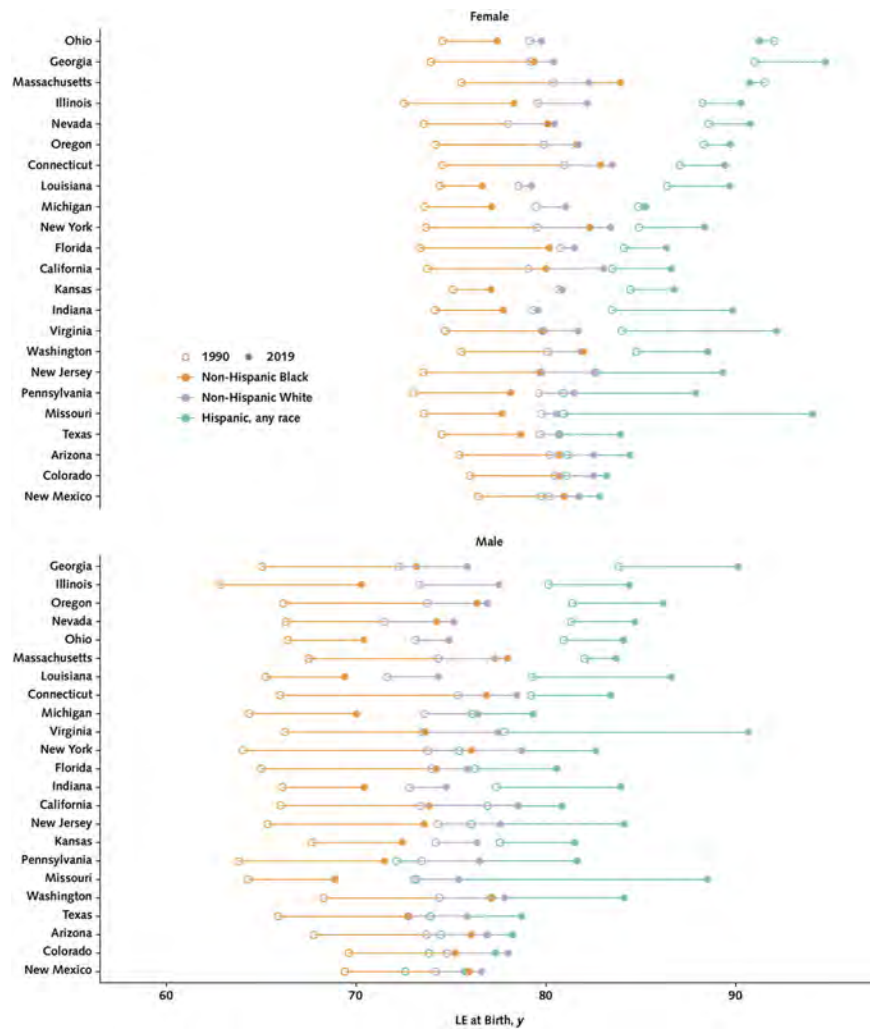


Figure 2: Life expectancy gaps in states with estimates for all 3 race/ethnicity groups in 1990 and 2019

Figure shows locations where all three largest race/ethnicity groups were large enough to be estimated in both 1990 and 2019. Locations are ordered from greatest to smallest gap between the lowest and highest race/ethnicity group for LE in 1990. LE values for each race/ethnicity group in 1990 and 2019 are connected by lines as described in the legend, showing where these ranges overlap between groups and across states.

Trends in Life Expectancy for Females Across State by Race/Ethnicity Group in 1990, 2000, 2010, and 2019

Table 1A:

	Race/Ethnicity Group	1990	2000	2010	2019
Minimum	State-level Overall	74.1 (73.5 to 74.6)	76.7 (76.1 to 77.3)	77.7 (77.3 to 78.1)	77.9 (77.5 to 78.3)
	Hispanic, any race	79.7 (78.8 to 80.7)	76.9 (75.3 to 78.9)	80.9 (79.6 to 82.5)	80.8 (79.9 to 81.9)
	Non-Hispanic, Black	71.4 (70.7 to 72)	73.3 (72.8 to 73.7)	75.7 (74.2 to 77.3)	76.2 (75.4 to 77.2)
	Non-Hispanic, White	78 (77.5 to 78.4)	77.7 (77.3 to 78.1)	78.2 (77.7 to 78.7)	78 (77.5 to 78.5)
5th Percentile	State-level Overall	77.6 (77.4 to 77.8)	77.4 (77.2 to 77.6)	78.3 (78.1 to 78.5)	78.5 (78.3 to 78.7)
	Hispanic, any race	80.1 (79.3 to 80.8)	80 (79.3 to 80.6)	81.8 (81.3 to 82.2)	82.9 (82.4 to 83.3)
	Non-Hispanic, Black	72.4 (71.6 to 72.9)	73.5 (73.2 to 73.8)	75.9 (75.4 to 76.2)	76.6 (76.2 to 76.9)
	Non-Hispanic, White	78.6 (78.3 to 78.8)	78.1 (77.9 to 78.3)	78.5 (78.3 to 78.7)	78.5 (78.4 to 78.8)
Mean	State-level Overall	79.3 (79.2 to 79.4)	79.5 (79.4 to 79.6)	81 (81 to 81.1)	81.3 (81.3 to 81.4)
	Hispanic, any race	84.8 (84.2 to 85.6)	83.8 (83.3 to 84.4)	85.8 (85.5 to 86.2)	88.1 (87.9 to 88.4)
	Non-Hispanic, Black	74.2 (74 to 74.4)	75.2 (75 to 75.4)	78 (77.9 to 78.2)	79.3 (79.1 to 79.4)
	Non-Hispanic, White	79.9 (79.8 to 80)	80 (79.9 to 80)	81.3 (81.3 to 81.4)	81.4 (81.4 to 81.5)
95th Percentile	State-level Overall	81.2 (81 to 81.5)	81.1 (80.9 to 81.3)	83.1 (82.9 to 83.2)	83.9 (83.6 to 84.1)
	Hispanic, any race	91.5 (88.9 to 95.5)	88.4 (86.3 to 91.4)	90.1 (88.6 to 92.1)	93.4 (92 to 94.9)
	Non-Hispanic, Black	76.1 (75.5 to 77.1)	77.6 (77.1 to 78.4)	81.3 (80.6 to 82.1)	83.1 (82.5 to 83.9)
	Non-Hispanic, White	81.5 (81.3 to 81.8)	81.6 (81.4 to 81.8)	83.3 (83.1 to 83.6)	83.7 (83.4 to 84.1)
Maximum	State-level Overall	82.1 (81.6 to 82.5)	83.2 (82.7 to 83.7)	85.2 (84.7 to 85.8)	85.8 (85.1 to 86.4)
	Hispanic, any race	92 (87.4 to 99.6)	91.9 (87.7 to 99.6)	91.9 (89.4 to 95.5)	94.7 (93.1 to 96.5)
	Non-Hispanic, Black	76.4 (74 to 79.6)	77.8 (75.7 to 80.3)	82.4 (80.3 to 85.2)	87.1 (84.7 to 90.3)
	Non-Hispanic, White	82 (81.5 to 82.5)	82.6 (81.9 to 83.5)	86.5 (85.3 to 87.8)	88.7 (87.5 to 90.1)

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Table 1B:

Trends in Life Expectancy for Males Across State by Race/Ethnicity Group in 1990, 2000, 2010, and 2019

	Race/Ethnicity Group	1990	2000	2010	2019
Minimum	State-level Overall	63.9 (63.2 to 64.5)	69.2 (68.5 to 69.8)	72.2 (71.8 to 72.5)	71.7 (71.3 to 72)
	Hispanic, any race	72.1 (70.2 to 74.4)	71.2 (69.3 to 73.1)	75 (73.8 to 76.2)	75.5 (74.6 to 76.4)
	Non-Hispanic, Black	59.4 (58.6 to 60.1)	63.9 (63.2 to 64.7)	69.1 (68.2 to 69.9)	66.9 (66 to 67.8)
	Non-Hispanic, White	71.1 (70.6 to 71.5)	72 (71.7 to 72.4)	72.9 (72.5 to 73.4)	72.7 (72.3 to 73.1)
5th Percentile	State-level Overall	70 (69.8 to 70.2)	71.3 (71.1 to 71.5)	73.1 (72.8 to 73.3)	73 (72.8 to 73.2)
	Hispanic, any race	72.7 (71.7 to 73.6)	73.9 (73.3 to 74.4)	76 (75.5 to 76.6)	76.1 (75.7 to 76.6)
	Non-Hispanic, Black	63.4 (62.6 to 63.9)	66.4 (66.1 to 66.7)	69.4 (69 to 69.7)	69.2 (68.8 to 69.5)