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Disparities in cancer mortality in Los Angeles County, 1999 – 2013: An analysis comparing trends in under-resourced and affluent regions

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Abstract

Purpose—While cancer mortality has declined by 27% between 1991 and 2016 in the United States, there are large disparities in cancer mortality by racial/ethnic groups, socio-economic status and access to care. The purpose of this analysis is to compare trends in cancer mortality among regions (Service Planning Areas, SPAs) in Los Angeles (LA) County that vary with respect to racial/ethnic distribution and social determinants of health, including poverty, education and access to care.

Methods—We estimated age- and race/ethnicity-standardized mortality for lung, colorectal (CRC) and breast cancer for eight SPAs from 1999 to 2013. We calculated three recommended measures of disparities that reflect absolute, relative and between-group disparities.

Results—In all of LA County, statistically significant declines in age- and race/ethnicity-standardized mortality ranged from 30% for lung cancer to 20% for CRC to 15% for breast cancer. Despite some of the largest declines in the most under-resourced SPAs (South LA, East LA, South Bay), disparities between the lowest and highest mortality by SPA did not significantly change from 1999 to 2013.

Conclusions—Despite significant declines in cancer mortality in LA County from 1999 to 2013, and in racial/ethnic groups, there was little progress towards reducing disparities among SPAs. Highest mortalities for the three cancers were observed in Antelope Valley, San Fernando Valley, San Gabriel Valley, South LA and East LA. Findings demonstrate the importance of examining regional differences in cancer mortality to identify areas with highest needs for interventions and policies to reduce cancer disparities.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Ethics approval was not required for this analysis because it utilized publicly available de-identified vital statistics data.

Keywords

age- and race/ethnicity-standardized cancer mortality; cancer mortality trends; determinants of health; absolute disparities; relative disparities; between-group disparities

Introduction

In the US and in California, cancer is the 2nd leading cause of death after heart disease (1). While cancer mortality has declined by 27% between 1991 and 2016, mainly because of reductions in smoking and improvements in early detection and treatment (1), there are large disparities in cancer mortality by racial/ethnic groups, socio-economic status and access to care (2, 3). A recent analysis that compared mortalities for 29 cancers in U.S. counties with lowest versus highest mortalities found large disparities in mortalities among counties. Lung cancer had the largest absolute disparities in mortality, followed by colorectal (CRC) and breast cancer (4).

California is the most populous state in the United States with close to 40 million people. Los Angeles (LA) County is the most populous county in the United States with more than 10 million residents as well as one of the most diverse counties. Due to the large size of LA County (4,300 square miles), it has been divided into eight geographic Service Planning Areas (SPAs). The LA County Department of Public Health issues reports on key indicators of health with statistics on demographics, death and disease, access to care, health behaviors and measures of the social and physical environment that impact health for all of LA County and for each SPA (5, 6). It has also reported lung, CRC and breast cancer mortality by SPA since 1999 (7).

There are vast differences across SPAs in demographics and in key indicators of health. For example, in 2015, the racial/ethnic distribution varied widely among SPAs, from 2% White in SPA 6 (South LA) to 64% White in SPA 5 (West LA). While the racial/ethnic distribution in all of LA County and in West LA has remained relatively stable over the past 20 years, South LA had a 32% decrease of African Americans (from 40% to 27%) and a 24% increase of Hispanics (from 55% to 68%) between 1997 and 2015. SPA 1 (Antelope Valley) had a 79% increase of Hispanics, a 131% increase of African Americans and a 44% decrease of Whites (see Table 1). Based on social determinants of health (e.g., poverty, education) and access to health care, SPA 6 (South LA) is the most under-resourced SPA. At the other end of the spectrum is SPA 5 (West LA), the most affluent SPA. Of 111 key indicators of health, SPA 6 has the largest number of indicators (47) in which it fares significantly worse than the other 7 SPAs. SPA 5 has the largest number of indicators (48) in which it fares significantly better than the other 7 SPAs, based on statistical comparisons (5, 6, 8).

The purpose of this analysis is to compare trends in cancer mortality among SPAs in LA County from 1999 to 2013. Because the racial/ethnic composition is dramatically different among SPAs and changed over time within SPAs (5, 6, 8) and because cancer mortalities are different for different racial/ethnic groups (9), we standardized mortality rates for each SPA by age and race/ethnic distribution. The analysis answers the following question: Given the

overall decline in cancer mortality in the US and in LA County, did disparities in lung, CRC and breast cancer mortality among SPAs decrease?

Methods

County-wide mortality rates

Although the main objective of the analysis was to characterize trends and disparities in cancer mortality among the eight SPAs in LA County, to provide context, we first characterized and compared trends in cancer mortality by race/ethnic group in LA County overall. Estimates for age-standardized lung, CRC and breast cancer (female only) mortality in LA County for the years 1999 through 2013 with 95% confidence intervals (CIs) were obtained from the California Cancer Registry (9). These rates are provided by the registry standardized to the 2000 U.S. standard population. For each cancer type, trends in mortality for each race/ethnic group (non-Hispanic white, non-Hispanic Black/African American, Hispanic and non-Hispanic Asian/Pacific Islander) were analyzed using Joinpoint Regression Analysis software (https://surveillance.cancer.gov/joinpoint/). A joinpoint regression model uses a segmented linear function to model the trend in an incidence or mortality rate. The slopes of the segments estimate the average annual change in the rate over the corresponding time interval. The time points at which the slopes change are called joinpoints. The software uses a grid-search method to find the best-fitting joinpoint model for a particular data set (10).

SPA-based mortality rates

For each SPA, we obtained age-standardized lung, CRC and breast cancer (female only) mortality for 1999, 2006 and 2013 by linking LA County Department of Public Health data with the 1999, 2006 and 2013 Death Statistical Master File. Race/ethnicity distributions for each SPA were available for the years 1997, 2006 and 2015 (5, 6, 8); linear interpolation was used to estimate the race/ethnic distributions in each SPA in 1999 and 2013. Because the racial/ethnic composition was different among SPAs and changed over time within SPAs, we sought to obtain age- and race/ethnicity-standardized mortality rates for each SPA for 1999, 2006 and 2013. Since such rates were not available from the cancer registry (personal communication), we estimated them by assuming that the relative risks (RRs) for lung, CRC and breast cancer mortality among the four race/ethnic groups within each SPA in 1999, 2006 and 2013 were the same as the RRs at the county level. Rates were then standardized to the 2015 racial/ethnic distribution in LA County. For each SPA, percent change in age-standardized and age- and r/e-standardized rates from 1999 to 2013 was computed and a 95% CI for the percent change was computed by using the mathematical identity

$$\textit{percent change from } 1999 \textit{ to } 2013 = \frac{2013\ \textit{rate} - 1999\ \textit{rate}}{1999\ \textit{rate}} = \frac{2013\ \textit{rate}}{1999\ \textit{rate}} - 1$$

and obtaining a 95% CI for the rate ratio (2013 rate)/(1999 rate) using a deterministic bootstrap method (11, 12) implemented using the R package epitools (13, 14).

Disparity measures

Based on recommended methods for measuring cancer disparities (15), three different measures of disparities were computed for lung cancer, CRC and breast cancer mortality, 1999 and 2013, among four racial ethnic groups and among SPAs: *Greatest absolute disparity* (arithmetic difference per 100,000 between the highest and lowest mortality); *greatest relative disparity* (rate ratio between the highest and lowest mortality); and the *between-group disparity* (standard deviation of the rates). While the first two measures only consider the two extreme groups with highest and lowest mortality, the between-group disparity captures the overall variability in rates and is sensitive to the magnitude of large deviations of any of the comparison groups from the average. Confidence intervals (95%) were calculated for greatest absolute disparity using methods for risk differences, CIs for relative disparities were calculated using the rate ratio method, and CIs for the between-group disparity were obtained using Bonett's method for confidence intervals for the standard deviation of nonnormal data (16).

Results

County-wide trends by race/ethnicity

Age-standardized average annual mortality for lung, CRC and breast cancer for four racial/ethnic groups in LA County are plotted in Figure 1 and average annual change in age-standardized rate per 100,000 from 1999 to 2013 with 95% confidence intervals are shown in the legend. For all three cancers and for both 1999 and 2013, age-standardized mortalities were highest among African Americans. Mortalities were lowest among Hispanics (lung cancer) and Asian/PIs (CRC and breast cancer). Between 1999 and 2013, African Americans had the largest average annual decline in lung cancer mortality, significantly larger than Whites. Whites had significantly larger declines than both Hispanics and Asian/PIs. The average annual decline in CRC mortality was similar among African Americans and Whites, and significantly larger in these groups than among Hispanics and Asian/PIs. There were small average annual declines in breast cancer mortality with no significant differences among the four racial/ethnic groups.

Age-standardized cancer mortality for lung, CRC and breast cancer in 1999 and 2013 and disparities among racial/ethnic groups in LA County are shown in Table 2. Mortality for lung and CRC decreased significantly in all four racial/ethnic groups and mortality for breast cancer decreased significantly in African American and Hispanic women. Disparities among racial/ethnic groups decreased substantially, based on all three measures of disparity.

Trends by SPA and in all of LA County

Both age-standardized and age- and r/e-standardized annual mortalities for lung, CRC and breast cancer are shown for each SPA and for LA County overall in Table 3 and trends are shown in Figure 2. For all three cancers, there were statistically significant declines in mortality in all of LA County from 1999 to 2013. Differences between percent change from 1999 to 2013 that were calculated from age-standardized versus age- and r/e-standardized rates are small in most SPAs and in LA County overall. There are larger differences in SPA 1 and SPA 6 reflecting the large shifts in demographics in these SPAs. We focus on reporting

age- and r/e-standardized annual mortalities and their declines from 1999 to 2013. In all of LA County, declines ranged from 30% for lung cancer to 20% for CRC to 15% for breast cancer.

Lung cancer mortality

In SPA 6 (South LA), a 51% decline in age-standardized lung cancer mortality between 1999 and 2013 coincided with a decline in its African American population (from 40% to 27.4%), which has the highest lung cancer mortality, and an increase in its Hispanic population (from 55% to 68.2%), which has the lowest lung cancer mortality (see Figure 1). After r/e-standardization, the decline in lung cancer mortality was 44%. SPAs 6 and 7 had the highest lung cancer mortalities in 1999 and the largest declines during the 15-year period (44% and 47%), significantly exceeding the 30% decline in all of LA County ($p<.05$). SPA 5 had the lowest lung cancer mortality in both 1999 and 2013, and a decline of 37%. SPA 1 (Antelope Valley) experienced the smallest decline of 16% and had the highest r/e-standardized mortality in 2013. All SPAs except SPA 1 experienced a statistically significant reduction in age- and race/ethnicity-standardized lung cancer mortality.

CRC mortality

With respect to age- and r/e-standardized CRC mortality, SPAs 1, 6, 7 and 8 had the highest mortalities in 1999. In these SPAs, mortality declined between 23% and 39%. The 39% decline in SPA 8 significantly exceeds the 20% decline in mortality in all of LA County ($p<.05$). West LA (SPA 5) had the lowest mortality in both 1999 and 2013 and a large decline of 38%. Age and r/e-standardized declines were smallest in SPA 3 (14%) and SPA 2 (17%) and largest in SPA 5 (38%) and SPA 8 (39%). All SPAs, except SPA 1 and 3, experienced a statistically significant reduction in age- and r/e-standardized CRC mortality.

Breast cancer mortality

With respect to age- and r/e-standardized breast cancer mortality, SPAs 1, 2 and 7 had the highest mortalities in 1999 and SPA 5 (West LA) had the lowest mortality. Changes from 1999 to 2013 ranged from 13% in SPA 3 to 22% in SPA 4 and 23% in SPA 8 (South Bay). In 2013, breast cancer mortalities were lowest in SPAs 4 and 5 and highest in SPA 7. SPAs 5 (West LA) and SPA 6 (South LA) experienced a 15% decline, same as all of LA County. However, SPA 6 (South LA) had a higher mortality than SPA 5 (West LA) in 1999 (25.1 versus 20.9), and therefore SPA 6 had more room for improvement. There were no significant differences in declines among SPAs and compared to all of LA County. Only two of the SPAs, SPA 2 and 8, experienced a statistically significant reduction in age- and r/e-standardized breast cancer mortality.

Disparities among SPAs

Table 4 shows three measures of disparities in age- and r/e-standardized mortalities for lung, CRC and breast cancer in 1999 and 2013 among LA County SPAs and percent change in the disparity measures from 1999 to 2013. Absolute and relative disparities among SPAs with the lowest and highest mortality for lung, CRC and breast cancer did not change significantly from 1999 to 2013. In 2013, the absolute disparity between SPAs with the

highest and lowest mortality was substantially larger for lung cancer (19 per 100,000) than for CRC and breast cancer (both 7 per 100,000). Ratios of highest versus lowest mortality increased from 1999 to 2013 for all three cancer sites. The ratio was highest for lung cancer (1.9), with mortality in SPA 1 almost twice the mortality in SPA 5. For CRC, the mortality ratio between SPA 1 (highest mortality) and SPA 5 (lowest mortality) was 1.8 and for breast cancer, the mortality ratio between SPA 7 (highest mortality) and SPA 4 (lowest mortality) was 1.4. The between-group disparity among all SPAs as measured by the SD of the rates declined 29% for lung cancer and remained similar (+5%) for CRC and breast cancer.

Discussion

Our analysis examines cancer mortality for three major cancer sites (lung, CRC, breast) during a 15-year time period in eight LA County SPAs that differ considerably in racial/ethnic and socio-demographic characteristics and community resources. In the county as a whole, there were statistically significant declines in mortality between 1999 and 2013 for lung cancer (30% decline), CRC (20% decline) and breast cancer (15% decline). There were also statistically significant declines in mortality in all four racial/ethnic groups for lung and CRC, and African American and Hispanic women experienced significant declines in breast cancer. However, there was no progress towards reducing disparities among under-resourced and affluent regions: Disparities between the lowest and highest SPA-specific mortalities for these cancers were similar in 1999 and in 2013.

Our comparison of cancer disparities among LA County SPAs found larger absolute disparities for lung cancer mortality than for CRC and breast cancer mortality, consistent with Mokdad and colleagues (4), who examined disparities in cancer mortality among US counties. If we use absolute comparisons (arithmetic difference in rates), disparities among LA County SPAs tended to decline for lung cancer, remained similar for CRC and tended to increase for breast cancer. A relative comparison between SPAs with the lowest and highest rates (rate ratio) shows a relative increase in disparities for all three cancer sites. The ratios we computed for highest versus lowest mortality by LA County SPA for lung, CRC and breast cancer are also similar to those reported by Mokdad and colleagues (4). The measure of between-group disparities provides a summary across all SPAs and suggests a decline in disparities for lung cancer mortality but not for CRC and breast cancer.

The absolute comparison reflects a population health perspective by considering the number of cancer death that could be avoided or the number of excess death in one SPA compared to another. However, both absolute and relative measures complement each other and help to illuminate trends in cancer disparities among SPAs. For example, the fact that the greatest relative disparity for CRC mortality tends to increase draws attention to the SPA with the highest and lowest mortality (SPAs 1 and 5).

Other studies that have examined Black-White disparities for cancer mortality (17, 18) and trends in general health (19) also concluded that disparities persist at the national and local level. While mortality is usually age-standardized, our approach of age *and* r/e-standardization controls for demographic shifts over time and differences in race-ethnic distributions among SPAs. Several papers have discussed the importance of race as a

biological versus a social construct (20–22). In addition to biological differences in tumor characteristics and responses to treatment, there are inequalities in access to care, screening and treatment, all of which are substantially influenced by individual-level and area-level socioeconomic factors (2, 3). These factors also influence inequalities in cancer risk factors. For example, obesity is a major risk factor for breast and CRC, implicated in 15–20% of total cancer-related mortality (23), and African Americans and Hispanics have a higher prevalence of obesity than whites and Asian Americans (24).

A combination of biology, genomics, health care delivery pattern and other social/environmental factors influence health outcomes (3, 25, 26). Our analysis shows that after controlling for racial/ethnic differences in the eight SPAs, large disparities in mortality remain for all three cancer sites. The SPAs with the highest mortalities are among those with the lowest household income and level of education, and the SPAs with the lowest mortality are among those with the highest household income and level of education. The substantial geographic variation in cancer mortality among LA County SPAs, even after controlling for r/e, confirms findings in other studies (27, 28) and points to the contribution of social and structural factors, including structural racism, which refers to the ways in which mutually reinforcing systems of housing, education, employment, earnings, benefits, credit, media, health care and criminal justices are root causes of health disparities (29).

Given the complexity of factors that influence cancer mortality, many of which are themselves influenced by social determinants of health such as poverty, education and income, interventions that only address cancer-related issues among individuals, providers or health care systems are probably insufficient to reduce cancer disparities. Interventions focused on upstream social determinants of health, including those focused on education and early childhood development, urban planning and community development, housing, income enhancements and employment show promise for reducing health disparities (29, 30). Two LA regions have been identified as Promise Zone Communities; they are located in Hollywood and Pico-Union/Westlake (SPA 4, identified in 2014) and in South LA (SPA 6, identified in 2016). The Promise Zone program will provide ten years of substantial federal support for local leaders in high-poverty communities to create jobs, increase access to affordable housing, improve educational outcomes and increase economic activity, among other priorities (https://www.hudexchange.info/onecpd/assets/File/Promise-Zone-Fact-Sheet.pdf, accessed 8/15/2019). While this program will bring much needed support to underserved communities in LA County, changes in cancer and other health disparities may not materialize for many years and may be hard to attribute to a specific program, given the complexity of factors that influence cancer mortality. In the meantime, continuous monitoring of health disparities such as the trends described in this paper will be crucial to provide local data to identify community needs and priorities for health departments and health care providers. However, more detailed and more recent race/ethnicity disaggregated data will be needed by SPA or by similar geographic units to calculate age-, race/ethnicity-specific mortality rates for sub-county regions to examine geographic disparities and to move the field forward.

Limitations

The most recent SPA-specific mortality rates that are available are based on data linkages with the 2013 Death Statistical Master File for LA County Residents. Death registration and causes of death, population counts and other data reported in Table 1 may be subject to error. We lacked yearly data and analyses cannot account for causality. Standardization was based on LA County-wide relative mortality rates for the four racial/ethnic groups since SPA-specific mortality rates for the race/ethnic groups were not available. It is possible that relative mortality rates were different in affluent versus under-served SPAs. Applying the LA County-wide relative mortality instead of SPA-specific mortality most likely provided an underestimate (more conservative estimate) of disparities.

Conclusion

From 1999 to 2013, age- and r/e-standardized mortality in LA County significantly declined for lung cancer (30% decline), CRC (20% decline) and breast cancer (15% decline). Despite significant declines in racial/ethnic groups, there was no statistically significant progress towards reducing disparities among SPAs in LA County, even after adjusting for differences in age- and race/ethnicity among SPAs. In 2013, the ratios for the highest versus lowest age- and r/e-standardized mortality by SPA ranged from 1.9 for lung cancer to 1.8 for CRC to 1.4 for breast cancer. Highest mortalities for these three cancers were observed in SPAs 1 (Antelope Valley), 2 (San Fernando Valley), 3 (San Gabriel Valley), 6 (South LA) and 7 (East LA). These areas should be prioritized for interventions and policies to reduce cancer disparities.

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References

1. American Cancer Society. (2019) Cancer Facts & Figures 2019 Atlanta, GA: American Cancer Society.
2. Singh GK, Jemal A. (2017) Socioeconomic and Racial/Ethnic Disparities in Cancer Mortality, Incidence, and Survival in the United States, 1950–2014: Over Six Decades of Changing Patterns and Widening Inequalities. J Environ Public Health. 2017: 2819372. [PubMed: 28408935]
3. Daly B, Olopade OI. (2015) A perfect storm: How tumor biology, genomics, and health care delivery patterns collide to create a racial survival disparity in breast cancer and proposed interventions for change CA: a cancer journal for clinicians 65: 221–38.
4. Mokdad AH, Dwyer-Lindgren L, Fitzmaurice C, et al. (2017) Trends and Patterns of Disparities in Cancer Mortality Among US Counties, 1980–2014. JAMA. 317: 388–406. [PubMed: 28118455]
5. Los Angeles County Department of Public Health. (2017) Key Indicators of Health by Service Planning Area
6. Los Angeles County Department of Public Health. (2009) Key Indicators of Health by Service Planning Area.
7. Los Angeles County Department of Public Health Services. (2006) Mortality in Los Angeles County 2002.
8. Haider S, Reville R, Pepley AR (1998) Geographic variation of social services in Los Angeles County on the eve of welfare reform.
9. California Cancer Registry. California Cancer Registry data on mortality in California.

10. Kim HJ, Fay MP, Feuer EJ, Midthune DN. (2000) Permutation tests for joinpoint regression with applications to cancer rates. Stat Med. 19: 335–51 (correction: 2001;20:655). [PubMed: 10649300]
11. Wang D, Hutson AD. (2014) A Smooth Bootstrap Procedure towards Deriving Confidence Intervals for the Relative Risk. Commun Stat Theory Methods. 43: 1979–90. [PubMed: 26997746]
12. Carter RE, Lin Y, Lipsitz SR, Newcombe RG, Hermayer KL. (2010) Relative risk estimated from the ratio of two median unbiased estimates. J R Stat Soc Ser C Appl Stat. 59: 657–71.
13. R Development Core Team. (2010) R: A language and environment for statistical computing http://www.R-project.org: R Foundation for Statistical Computing.
14. Aragon TJ. (2017) epitools: Epidemiology Tools. https://CRAN.R-project.org/package=epitools.
15. Harper S and Lynch J. (2005) Methods for Measuring Cancer Disparities: Using Data Relevant to Healthy People 2010 Cancer-Related Objectives NCI Cancer Surveillance Monograph Series, Number 6. Bethesda, MD: National Cancer Institute.
16. Bonett DG. (2004) Approximate confidence interval for standard deviation of nonnormal distributions. Computational Statistics & Data Analysis. 50: 775–82.
17. Orsi JM, Margellos-Anast H, Whitman S. (2010) Black-White health disparities in the United States and Chicago: a 15-year progress analysis. American journal of public health. 100: 349–56. [PubMed: 20019299]
18. Rust G, Zhang S, Malhotra K, et al. (2015) Paths to health equity: Local area variation in progress toward eliminating breast cancer mortality disparities, 1990–2009. Cancer. 121: 2765–74. [PubMed: 25906833]
19. Zimmerman FJ, Anderson NW. (2019) Trends in Health Equity in the United States by Race/Ethnicity, Sex, and Income, 1993–2017. JAMA Netw Open. 2: e196386. [PubMed: 31251377]
20. Paller CJ, Wang L, Brawley OW. (2019) Racial Inequality in Prostate Cancer Outcomes-Socioeconomics, Not Biology. JAMA Oncol. 5: 983–4. [PubMed: 31120499]
21. Gravlee CC. (2009) How race becomes biology: embodiment of social inequality. Am J Phys Anthropol. 139: 47–57. [PubMed: 19226645]
22. Smedley A, Smedley BD. (2005) Race as biology is fiction, racism as a social problem is real: Anthropological and historical perspectives on the social construction of race. Am Psychol. 60: 16–26. [PubMed: 15641918]
23. Ligibel JA, Alfano CM, Courneya KS, et al. (2014) American Society of Clinical Oncology position statement on obesity and cancer. J Clin Oncol. 32: 3568–74. [PubMed: 25273035]
24. Hales CM, Carroll MD, Fryar CD, Ogden CL. (2017) Prevalence of Obesity Among Adults and Youth: United States, 2015–2016. NCHS Data Brief. 1–8.
25. Gehlert S, Sohmer D, Sacks T, Mininger C, McClintock M, Olopade O. (2008) Targeting health disparities: a model linking upstream determinants to downstream interventions. Health Aff (Millwood). 27: 339–49. [PubMed: 18332488]
26. Pruitt SL, Lee SJ, Tiro JA, Xuan L, Ruiz JM, Inrig S. (2015) Residential racial segregation and mortality among black, white, and Hispanic urban breast cancer patients in Texas, 1995 to 2009. Cancer. 121: 1845–55. [PubMed: 25678448]
27. DeSantis CE, Ma J, Goding Sauer A, Newman LA, Jemal A. (2017) Breast cancer statistics, 2017, racial disparity in mortality by state CA: a cancer journal for clinicians 67: 439–48.
28. Ellis L, Canchola AJ, Spiegel D, Ladabaum U, Haile R, Gomez SL. (2018) Racial and Ethnic Disparities in Cancer Survival: The Contribution of Tumor, Sociodemographic, Institutional, and Neighborhood Characteristics. J Clin Oncol. 36: 25–33. [PubMed: 29035642]
29. Bailey ZD, Krieger N, Agenor M, Graves J, Linos N, Bassett MT. (2017) Structural racism and health inequities in the USA: evidence and interventions. Lancet. 389: 1453–63. [PubMed: 28402827]
30. Thornton RL, Glover CM, Cene CW, Glik DC, Henderson JA, Williams DR. (2016) Evaluating Strategies For Reducing Health Disparities By Addressing The Social Determinants Of Health. Health Aff (Millwood). 35: 1416–23. [PubMed: 27503966]

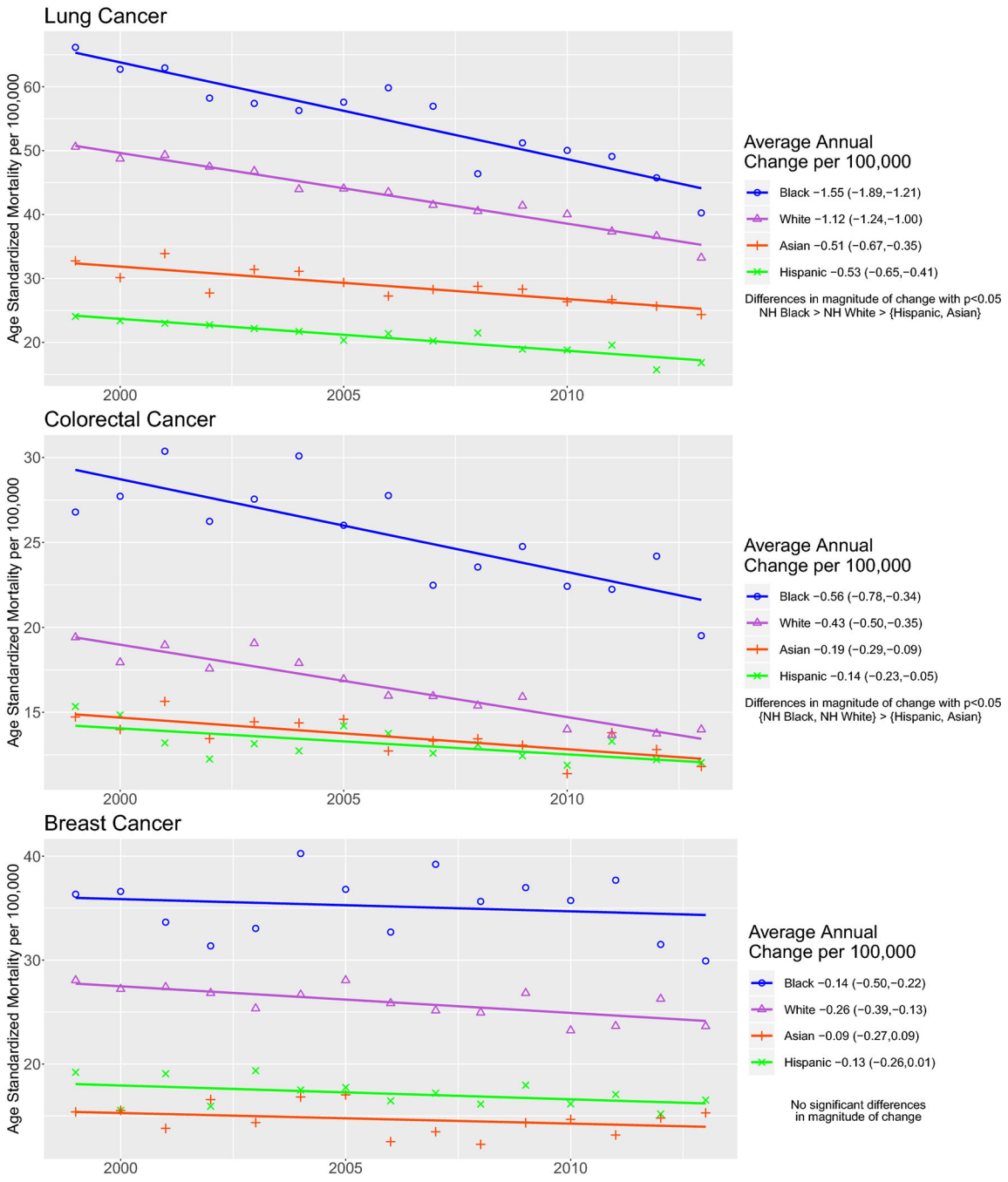

Figure 1:
Lung, colorectal, and breast cancer mortality per 100,000 in Los Angeles County by race/ethnicity, 1999 – 2013

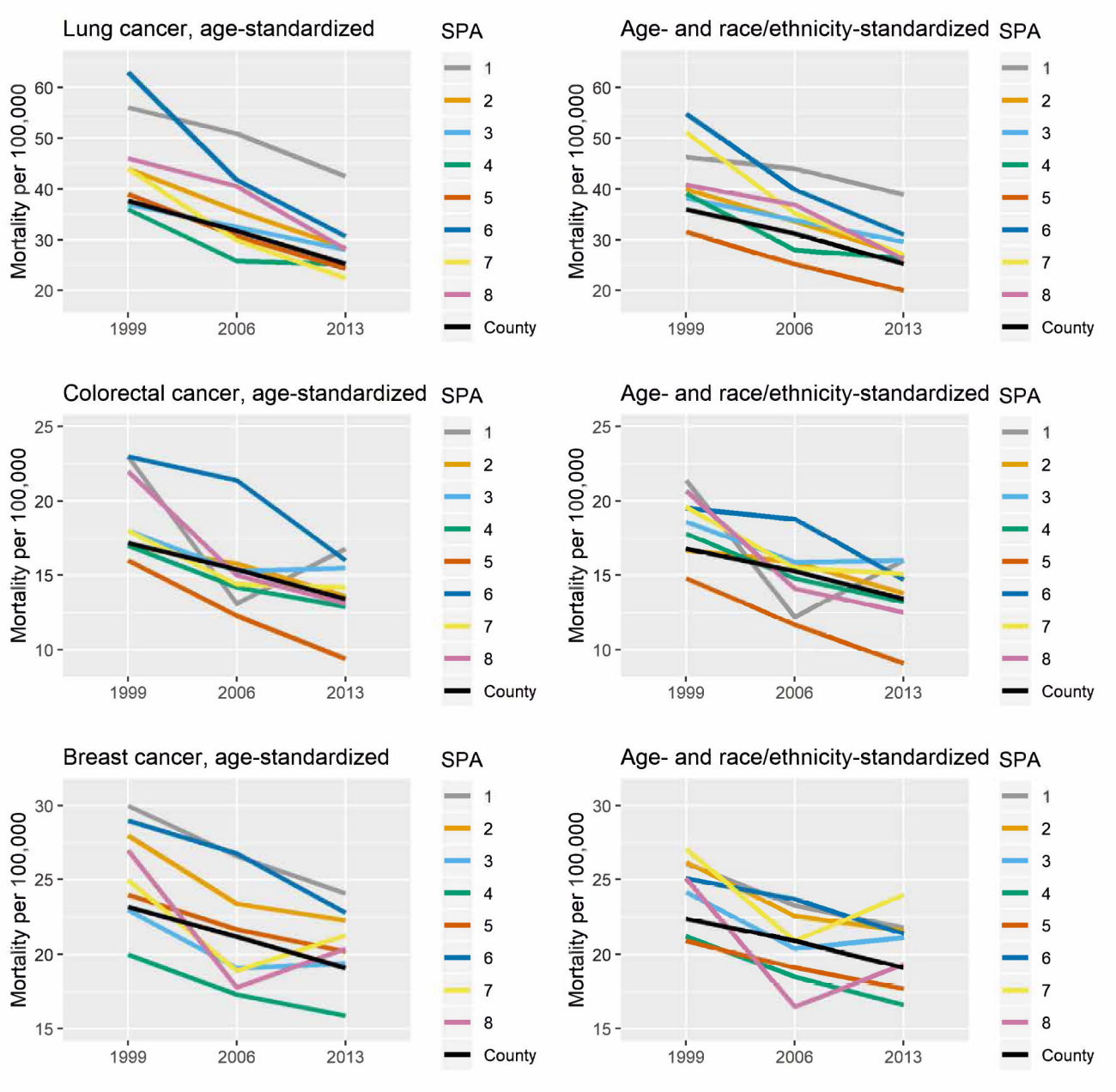

Figure 2:

Lung, colorectal and breast cancer mortality per 100,000 in Los Angeles County and by Service Planning Area (SPA), 1999, 2006 and 2013; age-standardized (left panel) and age- and race/ethnicity-standardized (right panel)

Table 1:

Selected demographic characteristics, access to health care and number of health indicators in which LA County Service Planning Areas (SPAs) fare significantly better or worse than the other 7 SPAs (5, 8)

	SPA 1 Antelope Valley	SPA 2 San Fernando Valley	SPA 3 San Gabriel Valley	SPA 4 Metro	SPA 5 West	SPA 6 South	SPA 7 East	SPA 8 South Bay	LA County
	%	%	%	%	%	%	%	%	%
1997 Statistics									
NH White	62.0	51.0	28.0	22.0	64.0	3.0	22.0	37.0	34.0
NH Black	7.0	3.0	5.0	6.0	6.0	40.0	2.0	14.0	9.0
Hispanic	25.0	36.0	43.0	55.0	18.0	55.0	67.0	33.0	44.0
NH Asian/Pacific Islander	5.0	10.0	23.0	16.0	12.0	2.0	8.0	15.0	13.0
2015 Statistics									
NH White	34.6	44.6	21.2	24.8	64.0	2.4	14.0	28.4	28.3
NH Black	16.2	3.5	3.7	5.2	5.7	27.4	3.0	14.8	8.5
Hispanic	44.8	40.2	46.3	51.8	16.8	68.2	73.5	40.4	48.4
NH Asian/Pacific Islander	4.0	11.5	28.6	17.9	14.1	1.9	9.0	16.3	14.6
Household income < 100% FPL *	21.4	14.9	13.3	24.3	11.9	33.6	17.3	17.4	18.4
Adults with < high school education	20.7	16.8	23.6	27.3	6.4	41.6	28.9	16.1	22.4
Access to health care									
Adults who reported difficulty accessing medical care	28.0	21.6	25.5	28.6	13.1	32.5	22.9	19.1	23.6
Health indicators (N=111)	**n**	**n**	**n**	**n**	**n**	**n**	**n**	**n**	-
Health indicators better than the other 7 SPAs **	5	27	26	7	48	3	14	12	-
Health indicators worse than the other 7 SPAs **	36	5	6	19	3	47	7	10	-

* FPL = Federal poverty level

** based on statistical comparisons with the other 7 SPAs; total exceeds 111 because for some health indicators, more than one SPA fared significantly better or worse than the other 7 SPAs.

Table 2:

Disparities in age-standardized cancer mortality per 100,000 for lung, colorectal and breast cancer in 1999 and 2013 among racial/ethnic groups in LA County

	Age-adjusted cancer mortality per 100,000 (95% CI)				Greatest absolute disparity: difference per 100,000 (95% CI)	Greatest relative disparity: rate ratio (95% CI)	Between group disparities: SD of rates (95% CI)
Cancer site	**NH White**	**NH Black**	**Hispanic**	**NH Asian/PI**			
Lung							
1999	50.6 (48.4, 52.9)	66.2 (60.37, 72.33)	24.1 (21.56, 26.71)	32.8 (29.17, 36.66)	42.1 (Black-Hisp) (36.7, 47.6)	2.8 (2.5, 3.0)	18.8 (7.5, 91.7)
2013	33.2 (31.49, 35.07)	40.3 (36.18, 44.67)	16.8 (15.30, 18.46)	24.4 (22.06, 26.81)	23.4 (Black-Hisp) (19.0, 27.8)	2.4 (2.1, 2.7)	10.2 (4.0, 51.3)
Pct change 1999–2013 (95% CI)	−34% (−39%, −29%)	−39% (−47%, −31%)	−30% (−36%, −23%)	−26% (−36%, −14%)	−44%	−13%	−46%
Colorectal							
1999	19.4 (18.08, 20.81)	26.8 (23.10, 30.88)	15.3 (13.32, 17.55)	14.7 (12.37, 17.41)	12.0 (Black-Asian) (8.1, 16.0)	1.8 (1.5, 2.2)	5.6 (1.9, 32.7)
2013	14.0 (12.86, 15.21)	19.5 (16.71, 22.65)	12.0 (10.79, 13.38)	11.8 (10.25, 13.56)	7.7 (Black-Asian) (4.3, 11.2)	1.7 (1.3, 2.0)	3.6 (1.1, 22.8)
Pct change 1999–2013 (95% CI)	−28% (−37%, −18%)	−27% (−40%, −11%)	−22% (−30%, −12%)	−20% (−35%, −1%)	−36%	−9%	−35%
Breast							
1999	28.1 (25.85, 30.43)	36.3 (30.95, 42.37)	19.2 (16.56, 22.11)	15.4 (12.36, 18.95)	21.0 (Black-Asian) (14.9, 27.1)	2.4 (1.9, 3.0)	9.4 (3.7, 46.1)
2013	23.6 (21.53, 25.89)	29.9 (25.32, 35.13)	16.5 (14.68, 18.55)	15.3 (12.93, 18.02)	14.6 (Black-Asian) (8.9, 20.3)	2.0 (1.5, 2.5)	6.8 (2.7, 33.3)
Pct change 1999–2013 (95% CI)	−16% (−27%, 3%)	−18% (−34%, −2%)	−14% (−25%, −1%)	0% (−24%, +31%)	−30%	−17%	−28%

Note: Percent change was calculated before rounding of the 1999 and 2013 values.

Table 3:

Age-standardized and age- and race/ethnicity (r/e)-standardized annual mortality per 100,000 for lung, colorectal and breast cancer in 1999, 2006, 2013 by Los Angeles County Service Planning Area (SPA)

	SPA 1 Antelope Valley	**SPA 2 San Fernando Valley**	**SPA 3 San Gabriel Valley**	**SPA 4 Metro**	**SPA 5 West**	**SPA 6 South**	**SPA 7 East**	**SPA 8 South Bay**	**Los Angeles County**
Population totals									
1999	259,740	1,957,975	1,874,883	1,161,377	633,099	969,391	1,351,776	1,533,446	9,437,290
2006	347,823	2,146,515	1,868,116	1,260,196	636,309	1,041,685	1,379,540	1,605,621	9,737,955
2013	391,442	2,182,701	1,775,665	1,143,680	648,605	1,029,142	1,393,098	1,625,915	10,015,436
Lung, age-standardized									
1999	56.0	44.0	37.0	36.0	39.0	63.0	44.0	46.0	44.0
2006	50.9	35.7	32.5	25.8	30.7	41.8	29.9	40.5	34.6
2013	42.5	28.4	28.0	25.2	24.3	30.7	22.4	28.1	27.5
Percent change, 1999 to 2013 (95% CI)	**−24% (−39%, −5%)**	**−35% (−42%, −29%)**	**−24% (−33%, −15%)**	**−30% (−40%, −19%)**	**−38% (−49%, −24%)**	**−51%+ (−58%, −44%)**	**−49%+ (−56%, −42%)**	**−39% (−46%, −31%)**	**−37% (−40%, −34%)**
Lung, age- and r/e-standardized									
1999	46.3	40.0	38.2	39.1	31.6	54.8	51.2	40.9	36.0
2006	44.0	33.6	33.9	28.0	25.2	39.9	35.2	36.9	31.2
2013	38.9	27.0	29.6	26.4	20.0	31.0	27.1	26.2	25.3
Percent change, 1999 to 2013 (95% CI)	**−16% (−34%, 7%)**	**−32% (−39%, −25%)**	**−22% (−30%, −13%)**	**−32% (−42%, −22%)**	**−37% (−49%, −21%)**	**−44%+ (−51%, −35%)**	**−47%+ (−53%, −40%)**	**−36% (−44%, −28%)**	**−30% (−33%, −26%)**
Colorectal, age-standardized									
1999	23.0	17.0	18.0	17.0	16.0	23.0	18.0	22.0	19.0
2006	13.1	15.8	15.3	14.2	12.3	21.4	14.4	15.0	15.3
2013	16.8	13.6	15.5	12.9	9.4	16.0	14.2	13.1	13.8
Percent change, 1999 to 2013 (95% CI)	**−27% (−49%, 5%)**	**−20% (−32%, −6%)**	**−14% (−26%, 1%)**	**−24% (−38%, −5%)**	**−41% (−58%, −19%)**	**−30% (−43%, −15%)**	**−21% (−35%, −5%)**	**−40% (−50%, −29%)**	**−27% (−32%, −22%)**

	SPA 1 Antelope Valley	SPA 2 San Fernando Valley	SPA 3 San Gabriel Valley	SPA 4 Metro	SPA 5 West	SPA 6 South	SPA 7 East	SPA 8 South Bay	Los Angeles County
Colorectal, age- and r/e-standardized									
1999	21.4	16.7	18.6	17.8	14.8	19.5	19.6	20.7	16.8
2006	12.2	15.9	15.9	14.8	11.7	18.8	15.5	14.1	15.3
2013	16.0	13.8	16.0	13.2	9.1	14.7	15.1	12.5	13.4
Percent change, 1999 to 2013 (95% CI)	**−25% (−48%, 8%)**	**−17% (−29%, −3%)**	**−14% (−27%, 1%)**	**−26% (−40%, −8%)**	**−38% (−56%, −14%)**	**−25% (−40%, −7%)**	**−23% (−36%, −7%)**	**−39%+ (−49%, −28%)**	**−20% (−26%, −14%)**
Breast (female), age-standardized									
1999	30.0	28.0	23.0	20.0	24.0	29.0	25.0	27.0	25.0
2006	26.6	23.4	19.1	17.3	21.7	26.8	18.9	17.8	20.7
2013	24.1	22.3	19.4	15.9	20.2	22.8	21.3	20.4	20.5
Percent change, 1999 to 2013 (95% CI)	**−20% (−47%, 22%)**	**−20% (−33%, −6%)**	**−16% (−31%, 2%)**	**−20% (−39%, 5%)**	**−15% (−39%, 18%)**	**−22% (−39%, 0%)**	**−15% (−32%, 6%)**	**−24% (−38%, −8%)**	**−19% (−26%, −13%)**
Breast, age- and r/e-standardized									
2006	23.3	22.6	20.4	18.5	19.1	23.7	20.9	16.5	20.9
2013	21.8	21.6	21.1	16.6	17.7	21.4	24.0	19.3	19.1
Percent change, 1999 to 2013 (95% CI)	**−17% (−48%, 30%)**	**−17% (−30%, −1%)**	**−13% (−28%, 6%)**	**−22% (−40%, 2%)**	**−15% (−41%, 20%)**	**−14% (−34%, 11%)**	**−11% (−28%, 10%)**	**−23% (−38%, −5%)**	**−15% (−23%, −6%)**

+ significantly different from all of Los Angeles County at $p<0.05$ by non-overlap of 95% confidence intervals

Age-standardized rates are compiled from the following sources: Mortality in Los Angeles County, 2002, LACDPH, Appendix 3,7,10; 2009 Los Angeles County Key Indicators of Health Report, based on 2006 death data; 2017 Los Angeles County Key Indicators of Health Report, based on 2013 death data.

Age and race/ethnicity (r/e)-standardized rates are standardized to the 2015 Los Angeles County racial/ethnic distribution.

Table 4:

Disparities in age- and r/e-adjusted cancer mortality per 100,000 for lung, colorectal and breast cancer in 1999 and 2013 among LA County Service Planning Areas (SPAs)

Annual age- and r/e-adjusted mortality per 100,000	Lowest mortality SPA	Highest mortality SPA	Greatest absolute disparity, per 100,000 (95% CI)	Greatest relative disparity: rate ratio (95% CI)	Between group disparities: SD of rates (95% CI)
Lung					
1999	5	6	23.2 (16.9, 29.7)	1.7 (1.5, 2.1)	7.5 (4.4, 17.0)
2013	5	1	18.8 (11.7, 25.9)	1.9 (1.5, 2.5)	5.4 (2.5, 15.1)
Pct change			−19%	+12%	−29%
Colorectal					
1999	5	1	6.6 (0.5, 13.3)	1.5 (1.1, 2.0)	2.2 (1.2, 5.0)
2013	5	1	6.9 (2.4, 11.6)	1.8 (1.3, 2.5)	2.3 (1.0, 6.7)
Pct change			+ 5%	+21%	+5%
Breast (female)					
1999	5	7	6.2 (0.7, 12.6)	1.3 (1.0, 1.7)	2.3 (1.2, 6.0)
2013	4	7	7.4 (2.5, 12.2)	1.4 (1.1, 1.9)	2.4 (1.4, 5.5)
Pct change			+19%	+11%	+5%

Note: Percent change was calculated before rounding of the 1999 and 2013 values.