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Current Trends in Mortality Attributable to Racial or Ethnic Disparities in Post-Surgical Population in The United States

A Population-Based Study

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Background: No study has contextualized the excess mortality attributable to racial and ethnic disparities in surgical outcomes. Further, not much effort has been made to quantify the effort needed to eliminate these disparities.
Objective: We examined the current trends in mortality attributable to racial or ethnic disparities in the US postsurgical population. We then identified the target for mortality reduction that would be necessary to eliminate these disparities by 2030.
Methods: We performed a population-based study of 1,512,974 high-risk surgical procedures among adults (18–64 years) performed across US hospitals between 2000 and 2020.
Results: Between 2000 and 2020, the risk-adjusted mortality rates declined for all groups. Nonetheless, Black patients were more likely to die following surgery (adjusted relative risk 1.42; 95% CI, 1.39–1.46) driven by higher Black mortality in the northeast (1.60; 95% CI, 1.52–1.68), as well as the West (1.53; 95% CI, 1.43–1.62). Similarly, mortality risk remained consistently higher for Hispanics compared with White patients (1.21; 95% CI, 1.19–1.24), driven by higher mortality in the West (1.26; 95% CI, 1.21–1.31). Overall, 8364 fewer deaths are required for Black patients to experience mortality on the same scale as White patients. Similar figures for Hispanic patients are 4388. To eliminate the disparity between Black and White patients by 2030, we need a 2.7% annualized reduction in the projected mortality among Black patients. For Hispanics, the annualized reduction needed is 0.8%.
Conclusions: Our data provides a framework for incorporating population and health systems measures for eliminating disparity in surgical mortality within the next decade.

Keywords: surgical mortality, racial, ethnic, disparities

INTRODUCTION

In the United States, postsurgical mortality rates vary across subpopulations defined by race and ethnicity, with racial and ethnic minorities bearing the highest mortality burden.[1] Numerous studies have shown that postoperative mortality rates are higher among Black patients compared with White patients, and among Hispanic patients compared with White patients.[2–5] These persisting disparities raise the question of whether recent advances in perioperative care, including the national political will to confront health disparities, can address the needs of an increasingly diverse US population.[6,7]

Not much effort has been made to contextualize the effort needed to eliminate the disparities in health outcomes between different races and ethnicities.[8] Shifting focus from simply identifying problems to exploring solutions is needed to inform adjustments in prevailing public policies, priorities for health research, and fiscal investments.[8] Since the past is immutable, it is crucial to examine future scenarios that may arise if we maintain the status quo. Of additional importance is to determine the expected impact of specific scenarios for mortality reductions across racial and ethnic groups.

Currently, there is limited data available regarding the current trends in postoperative mortality rates in the United States. A recent study examined these trends up to 2014 but did not include Hispanic patients, who are a rapidly growing segment of the US population.[9,10] Furthermore, these investigators only examined a small set of surgical procedures, leaving substantial gaps in our knowledge of variation in postoperative mortality difference by race or ethnicity across a wide range of procedures and surgical specialties. It is, therefore, timely to investigate whether differential mortality trends have begun to narrow more recently and to contextualize the excess mortality attributable to disparities.

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Additionally, although prior reports have identified disparities in surgical outcomes,[2–5] the mortality burden attributable to these disparities has received less attention. To date, there have been no previous attempts to contextualize the excess mortality attributable to disparities in surgical outcomes in the United States. This approach conveys the scale of racial inequities to policymakers, clinicians, and the public at large.[11] To address this knowledge gap, we carried out a population-based analysis of major inpatient surgical procedures performed between 2000 and 2020 in the United States.

Our objectives were to explore the temporal trends and differences in postoperative mortality according to race or ethnicity and to estimate the scale of these disparities between Black, White, and Hispanic patients. In addition, we explored the target for mortality reduction that would be necessary to eliminate current racial and ethnic disparities in surgical mortality by the end of 2030. We also estimated the impact of potential policy changes on mortality, targeting a modest 2% reduction in the excess risk of mortality attributable to the disparity.

METHODS

Study Design and Data Source

We used the National Inpatient Sample (NIS), the largest all-payer database for inpatient hospital encounters, which comprises a nationally representative weighted probability sample of more than 35 million hospitalizations across the United States. The NIS, developed by the Healthcare Cost and Utilization Project (HCUP) and the Agency for Healthcare Research and Quality, includes individual-level sociodemographic characteristics, payer information, and Clinical Modification (versions 9 and 10) diagnostic and procedural codes. By 2018, the NIS collected data from 47 states plus the District of Columbia, covering 97% of the US population. The NIS is a publicly available, deidentified dataset and analysis of NIS data does not constitute human subject research. We adhered to the Strengthening the Reporting of Observational Studies in Epidemiology reporting guidelines for cohort studies during the conduct and reporting of this study.

Study Population

We used a previously validated method to identify patients 18–64 years old who underwent high-risk inpatient surgical procedures. Briefly, using NIS, Schwarze et al.[12] developed a list of 154 unique procedure codes used for surgeries identified as high-risk when performed in patients of different age categories. Patients aged 65 years and older were not included in our study because they have a distinct risk profile for postoperative mortality. We included in the supplemental table the list of surgical procedures for our study population.

Patients' race and ethnicity were defined according to the HCUP data element, based on the categories defined by a 1977 Office of Management and Budget directive (Non-Hispanic White (hereafter referred to as White), non-Hispanic Black (hereafter referred to as Black), Hispanic, Asian, Pacific Islander, American Indian, and Alaska Native. We did not include patients categorized as Asian, Pacific Islander, American Indian, or Alaska Native due to the heterogeneity among these groups and a lack of sufficient data regarding mortality events to perform a rigorous trend analysis. Although there is heterogeneity among all racial and ethnic groups, some specific groups, such as Asian, Native Hawaiian/Pacific Islanders, and Native American populations, encompass substantial internal diversity, with variations in cultural practices, health behaviors, and socioeconomic backgrounds. Addressing this heterogeneity adequately in our analysis would require considerably larger and more representative sample sizes for each subgroup, which may not be feasible within the scope of our current study.

We excluded patients with missing race or ethnicity data because they were deemed unlikely to alter our findings. We also excluded patients who were transferred to a different healthcare institution because their primary outcome could not be observed during the hospital encounter.[13]

Study Outcome

Our primary outcome was the risk-adjusted postoperative mortality compared across subgroups defined by race or ethnicity. We achieved risk adjustment by controlling the analyses for the following patient- and hospital-level characteristics: age, sex (male vs female), procedural group (cardiac surgery, general surgery, neurosurgery, thoracic surgery, transplant, urology surgery, and vascular surgery), household income for ZIP code (in quartile), health insurance status (private, public, or other), hospital region (Northeast, Midwest, South, or West), hospital teaching status (yes vs no), and Elixhauser multimorbidity index (none, mild-moderate, or high). Patient multimorbidity burden was ascertained with the Elixhauser method, which considers 31 specific medical conditions, as previously described.[14] We categorized patients into 3 mutually exclusive groups: none (0–1 conditions), mild–moderate (2–4 conditions), or high (≥5 conditions).[15]

Statistical Analyses

We first estimated the annual risk-adjusted surgical mortality rates for each racial or ethnic group using multivariable binomial regression analysis with interaction terms between *race/ethnicity* and *year*, while accounting for clustering. Results are presented as adjusted relative risk (aRR) and 95% confidence intervals (95% CI). To identify drivers of higher surgical mortality in minoritized patients, we performed interaction tests exploring effect modification by regionality, teaching status, and hospital volume.

Our second objective was to estimate the number of excess deaths attributable to racial and ethnic inequities during the study period. To this end, we computed the expected number of postsurgical deaths by applying the observed weighted mortality rate for the reference group (non-Hispanic White) to the observed weighted surgery count in the index groups (Black and Hispanic). The excess mortality rate attributable to racial/ethnic disparities was calculated as the difference between the observed and expected mortality rates.[11]

Finally, we identified the overall and annual percent changes in mortality required for the mortality rates of each group affected by racial/ethnic disparities to match the reference group by 2030. For this purpose, we projected age- and year-specific postoperative mortality counts and excess deaths attributable to racial and ethnic disparities for 2021–2030, using age-period-cohort (APC) forecasting.[16] We calculated the average ratio between the mortality rates of the affected group and the reference group (weighted by the number of surgeries per age group) for 2030 and divided this value by 10 to obtain the average annual reduction needed for the period from 2021 to 2030.

RESULTS

Patient Characteristics

We identified 1,512,974 (weighted to 7,355,980) high-risk surgical procedures performed across 7,740 US hospitals during the 21-year study period (Table 1). Seventy-five percent of patients in the study were White, 14.4% were Hispanic, and 11% were Black. At baseline (2000), fewer Black and Hispanic patients

TABLE 1.

Characteristics of Adult Patients Who Underwent Inpatient, High-risk Surgery Across 7,740 US Hospitals Between January 1, 2000, Through December 31, 2020

	2001			2020		
Characteristics	Non-Hispanic White	Non-Hispanic Black	Hispanic	Non-Hispanic White	Non-Hispanic Black	Hispanic
Study population, weighted N	206015	35350	35710	325615	74110	88910
Male sex	60.4	51.9	61.8	56.9	51.6	57.4
Age in years	51 (11)	47 (12)	47 (13)	51 (11)	47 (12)	47 (12)
Highest quartile, income for ZIP	40.0	19.0	33.2	26.2	12.8	22.9
Insurance status						
Public	16.2	39.0	27.7	19.5	38.0	28.4
Private	65.8	34.7	42.6	57.3	32.9	43.7
Other	17.9	26.3	29.7	23.2	29.1	27.9
Hospital region						
Northeast	21.5	22.4	21.2	18.9	17.6	18.0
Midwest	21.3	10.5	5.1	20.4	16.6	10.4
South	40.4	55.4	36.3	38.2	54.6	32.9
West	16.8	11.7	37.5	22.5	11.1	38.7
Hospital size						
Small	8.1	6.4	7.8	10.2	8.1	11.6
Medium	20.4	24.4	23.5	20.7	24.6	18.2
Large	71.5	69.1	68.7	69.1	67.3	70.2
Location/Teaching status	52.7	64.7	62.5	55.7	69.0	63.6
Multimorbidity						
None (0–1)	59.9	46.3	59.9	43.3	35.4	45.9
Mild-moderate (2–4)	37.8	47.4	36.4	50.0	53.8	47.5
High (≥5)	2.3	6.3	3.8	6.6	10.8	6.6
Procedural group						
Cardiac surgery	34.2	20.4	27.7	28.2	21.6	24.7
General surgery	42.9	43.2	41.5	49.2	51.0	49.4
Urology surgery	0.4	0.9	0.7	0.4	1.2	0.8
Neurosurgery	10.2	9.2	13.7	10.4	8.6	12.7
Transplant	2.7	2.7	2.7	3.5	2.9	3.2
Vascular surgery	9.5	23.6	13.6	8.3	14.7	9.3

had private insurance than White patients. Additionally, Black and Hispanic patients were more likely to belong to the lowest income quartile than White patients. Most patients underwent surgery at a teaching hospital, but more White patients were treated in non-teaching hospitals. Despite being older, the multimorbidity burden was lower among White patients than among Black and Hispanic patients.

Race/Ethnic-Specific Mortality Trends

Between 2000 and 2020, there was an annual decrease in the risk-adjusted mortality for all racial and ethnic groups (annualized RR reduction: Black, 1.44%; Hispanic, 1.36%; White, 1.27% Figs 1 and 2). Despite the overall decline of postsurgical mortality, the risk-adjusted mortality rates trended consistently higher for Black and Hispanic patients than for White patients, with no evidence of narrowing of the disparity gap (*P* value for the interaction term: between Black race and year, 0.37; between Hispanic ethnicity and year, 0.64 Fig. 1). Overall, postoperative mortality rates for Black patients lagged the rate for their White peers by 4–8 years (Fig. 1). After adjustment, Black patients compared with White patients were 42% more likely to die following surgery (aRR,1.42; 95% CI,1.39–1.46; $P < 0.001$, Fig 2). Similarly, the adjusted risk of postoperative mortality remained consistently higher for Hispanic patients compared with White patients (aRR,1.21; 95% CI, 1.19–1.24; $P < 0.001$).

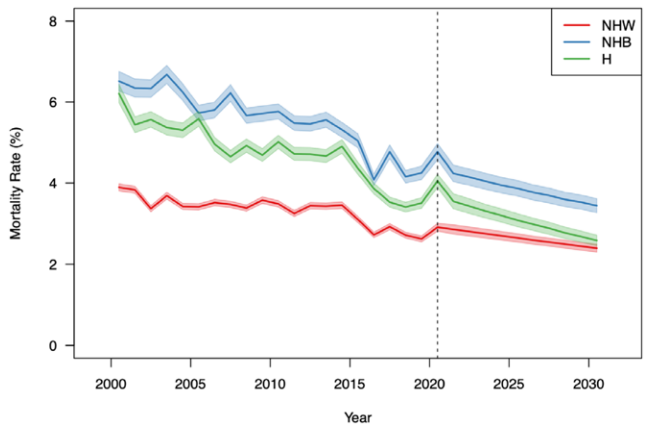

FIGURE 1. Temporal trends (fitted 2000–2020 and projected 2020–2030) in postoperative mortality rates across racial and ethnic groups in the United States. All patients underwent inpatient, high-risk surgery across 7,740 US hospitals between January 1, 2000, through December 31, 2020. H indicates Hispanic; NHB, non-Hispanic Black; NHW, non-Hispanic White.

Excess Mortality Attributed to Racial and Ethnic Disparities

Overall, about 12,702 (8364 Black and 4338 Hispanic) excess postsurgical deaths occurred among Black and Hispanic patients

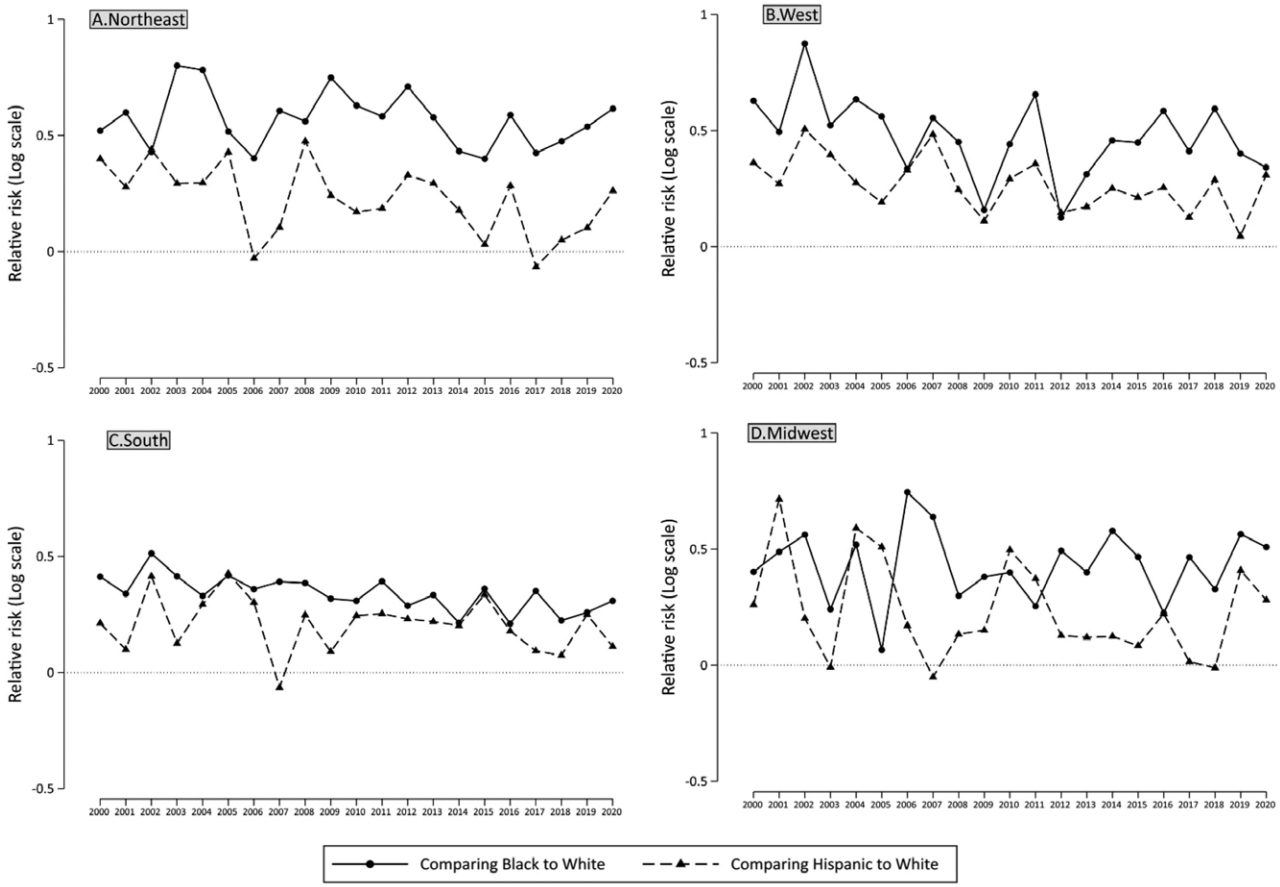

FIGURE 2. Crude and risk-adjusted relative risk of postoperative mortality in adults (18–64 years) undergoing high-risk, surgery by geographical area and teaching hospital status. Multivariable analyses were controlled for age, sex, procedural group, median annual household income for ZIP code, health insurance status, hospital region, hospital teaching status, and Elixhauser multimorbidity index. CI indicates confidence interval.

because of health disparities during the study period. This translates to roughly 605 total excess deaths per year (398 Black and 207 Hispanic).

Projected Postsurgical Mortality by Race/Ethnicity

We project that overall postoperative mortality will be decreasing for all race and ethnic groups during 2020–2030 (Fig. 1). Nonetheless, our trend-based projections indicate that postsurgical disparities between Black and White patients will persist till 2030. Similar projections were observed for Hispanic patients. To eliminate the disparity in postoperative mortality between Black and White patients by 2030, we need a 2.7% annualized reduction in the projected mortality rates among Black patients. For Hispanic patients, the annualized reduction needed is 0.8%. A policy change achieving a modest 2% per year reduction in excess postoperative mortality among Black patients would prevent approximately 3055 postsurgical deaths in adult Black patients in the next decade.

Racial/Ethnic Disparity by Geographic Region or Teaching Hospital Status

We found evidence of an interaction between race or ethnicity and regionality ($P < 0.001$). The largest RR of postoperative mortality, comparing Black to White patients, was observed in the northeast (aRR, 1.60; 95% CI, 1.52–1.68; $P < 0.001$), as well as in the west (aRR, 1.53; 95% CI, 1.43–1.62; $P < 0.001$). The disparity gap between Hispanic and White patients was largest in the West (aRR, 1.26; 95% CI, 1.21–1.31; $P < 0.001$). We found no evidence that the disparity gap between Black and White patients varied between teaching and nonteaching hospitals ($aRR_{black\ vs.\ white}$ for teaching hospitals 1.43; 95% CI, 1.39–1.47; $P < 0.001$; for nonteaching hospitals 1.39; 95% CI, 1.33–1.45; $P < 0.001$, Fig. 3). Similarly, the higher mortality risk among Hispanic patients did not vary by whether they received surgery at teaching or nonteaching hospitals (interaction $P = 0.894$; $aRR_{Hispanic\ vs.\ White}$ for teaching hospitals 1.26; 95% CI, 1.22–1.29; $P < 0.001$; for nonteaching hospitals 1.23; 95% CI, 1.18–1.29; $P < 0.001$, Fig. 4). Finally, we found no evidence that the disparity gap between Black and White patients varied across subgroups defined by hospital volume ($P = 0.178$).

DISCUSSION

Against the backdrop decline in overall mortality, recent advances in surgical care have yet to translate into equitable outcomes for everyone. During the past 2 decades, about 12,702 (an average of 605 per year) excess postsurgical deaths occurred among minoritized patients, which could have been avoidable had the disparities been eliminated. Even the worst recorded mortality rate among White patients was still lower than the mortality rates reported for Black patients a decade later. Achieving a modest 2% per year reduction in excess postoperative mortality among Black patients would prevent approximately 3055 postsurgical deaths within the next decade.

Our study departs from other disparity research by exploring the solution and not just the problem. We provided the minimum mandatory mortality reduction that would be necessary to eliminate current racial and ethnic disparities in postoperative mortality by the end of 2030. This offers a framework to

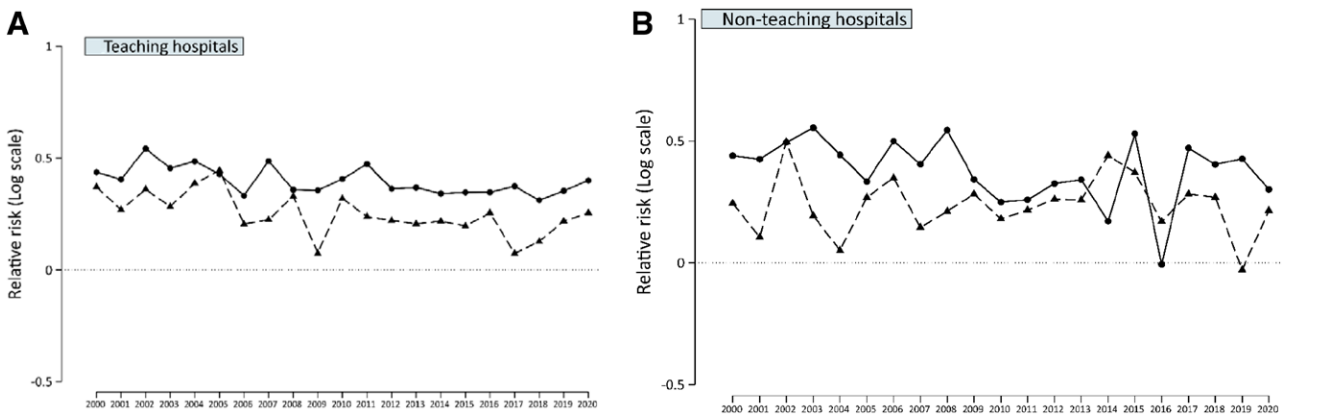

FIGURE 3. Temporal trends in the log-relative risk of postoperative mortality comparing Black to White patients (solid line) and Hispanic to White patients (dashed line), by hospital region. A y-axis value greater than 0 indicates a higher mortality in the index group (Black or Hispanic) relative to the referent group (White).

	Univariable analysis		Multivariable analysis	
	Relative risk (95% CI)	P-value	Relative risk (95% CI)	P-value
Overall				
Non-Hispanic White	Reference	--	Reference	--
Non-Hispanic Black	1.50(1.47—1.54)	<0.001	1.42(1.39—1.46)	<0.001
Hispanic	1.27(1.25—1.30)	<0.001	1.21(1.19—1.24)	<0.001
Northeast				
Non-Hispanic White	Reference	--	Reference	--
Non-Hispanic Black	1.77(1.69—1.86)	<0.001	1.60(1.52—1.68)	<0.001
Hispanic	1.22(1.16—1.28)	<0.001	1.15(1.09—1.21)	<0.001
West				
Non-Hispanic White	Reference	--	Reference	--
Non-Hispanic Black	1.61(1.51—1.71)	<0.001	1.53(1.43—1.62)	<0.001
Hispanic	1.29(1.24—1.33)	<0.001	1.26(1.21—1.31)	<0.001
South				
Non-Hispanic White	Reference	--	Reference	--
Non-Hispanic Black	1.39(1.35—1.43)	<0.001	1.36(1.32—1.40)	<0.001
Hispanic	1.21(1.17—1.26)	<0.001	1.21(1.17—1.25)	<0.001
Midwest				
Non-Hispanic White	Reference	--	Reference	--
Non-Hispanic Black	1.54(1.46—1.62)	<0.001	1.39(1.32—1.47)	<0.001
Hispanic	1.25(1.16—1.35)	<0.001	1.23(1.15—1.33)	<0.001
Teaching hospitals				
Non-Hispanic White	Reference	--	Reference	--
Non-Hispanic Black	1.48(1.44—1.51)	<0.001	1.43(1.39—1.47)	<0.001
Hispanic	1.26(1.23—1.29)	<0.001	1.26(1.22—1.29)	<0.001
Non-teaching hospitals				
Non-Hispanic White	Reference	--	Reference	--
Non-Hispanic Black	1.47(1.40—1.53)	<0.001	1.39(1.33—1.45)	<0.001
Hispanic	1.26(1.21—1.31)	<0.001	1.23(1.18—1.29)	<0.001

FIGURE 4. Temporal trends in the log-relative risk of postoperative mortality comparing Black to White patients (solid line) and Hispanic to White patients (dashed line), by hospital teaching status. A y-axis value greater than 0 indicates a higher mortality in the index group (Black or Hispanic) relative to the referent group (White).

include population and health system measures in the next 10 years, with the aim of removing inequities in postoperative mortality rates from our healthcare system. In addition, our study constitutes a significant addition to the literature by quantifying the mortality burden attributable to these disparities. Most studies have reported the multiplicative or additive differences in mortality risk to convey the magnitude of racial/ethnic inequities.[4] However, these approaches do not measure the excess mortality attributable to disparities, which better conveys the scale of these racial disparities to policymakers, clinicians, and the public at large.

Our findings are consistent with those of Mehtsun et al[9] among persons 65 years and older. These investigators estimated the postoperative mortality rates following selected surgical procedures performed on Black and White patients receiving Medicare and concluded that there was a narrowing of the disparity gap between Black and White patients but only for low-risk surgeries. Consistent with Mehtsun et al[9] findings, the authors found no evidence of narrowing of the mortality gap following high-risk surgeries. However, the study by Mehtsun et al[9] only included patients treated through 2014; hence, our study was needed to determine whether the differential trends in mortality have begun to narrow more recently. We also extended the findings of Mehtsun et al[9] by examining postsurgical mortality trends and differences between White and Hispanic surgical patients.

Although regional heterogeneity in disease prevalence and outcome are well described,[17–19] there are limited data on regional variation in postoperative mortality rates across race or ethnicity in the United States[9] We found substantial geographic variation in postoperative mortality across race and ethnicity, with the widest disparity between Black and White patients observed in the northeastern and western part of the United States. A similar disparity was observed between Hispanic and White patients. Examining geographic variations in surgical mortality is important because such data may not only reveal regions of the country that require targeted quality improvement initiatives, but they may also underscore the impacts of systematic underinvestment in public health, unequal access to primary healthcare services, and distrust in the healthcare industry created by historical and enduring structural racism and medical mistreatment of minoritized groups.[20,21]

We should also emphasize that finding disparity in some regions of the country and not in others does not mean that surgical care in the former is inferior to the latter. These regional variations may reflect population health, socioeconomic factors, and baseline risk of surgical mortality. Additionally, not observing disparity in some regions does not mean there is no room for improvement but may simply mean that the covariates we examined were better able to explain most of the variation in these regions. Future investigators should recognize the value of an ongoing examination of regional variation in surgical outcomes. Such data will allow us to identify best-performing regions or states better so that they can provide best practice guidelines for other regions to emulate. Identifying vulnerable populations will enable us to allocate resources judiciously towards preventative and educational initiatives where they are most required.

Our findings underscore the effort needed to narrow disparities based on race and ethnicity. While further research is needed to identify specific strategies and policies, existing literature suggests several promising action steps toward achieving equitable surgical outcomes for all patients. These include increasing access to healthcare, enhancing cultural competency training for healthcare professionals, promoting diversity in the healthcare workforce, addressing socioeconomic factors such as insurance coverage and social support, fostering research and data collection on healthcare disparities, and implementing regular quality improvement initiatives designed to address racial and ethnic disparities in surgical outcomes.[4,22] To effectively address these disparities, comprehensive and multidimensional approaches are necessary, involving collaboration among policymakers, healthcare organizations, professional societies, patient advocacy groups, and communities. By implementing these action steps, we can work towards ensuring equitable surgical outcomes for patients of all races and ethnicities. Furthermore, a one-size-fits-all approach to reducing postsurgical morbidity and mortality is unlikely to adequately correct racial and ethnic disparities because of the complex interplay of factors that operate on the postsurgical mortality pathway. A targeted, nationwide focus is necessary to ensure the implementation of effective, equitable prevention strategies and the allocation of resources to communities and healthcare settings (especially those serving areas with predominantly minoritized populations) to reduce postsurgical mortality rates for patients of all races and ethnicities.

It is important to acknowledge that race is a social construct and that social determinants of health also play a significant role in driving disparate health states preoperatively, which can contribute to postoperative mortality disparities. The impact of social determinants of health on surgical outcomes is well-documented, and these factors disproportionately affect racial and ethnic minority populations. Furthermore, it is important to acknowledge that racism, rather than race itself, is the primary agent contributing to the disparate treatment of minority populations within the healthcare system. Therefore, achieving equitable surgical outcomes requires a comprehensive approach that recognizes and addresses the social determinants of health driving disparate health outcomes. This includes targeting systemic barriers to care, addressing socioeconomic disadvantages, and actively combating racism within the healthcare system.

Limitations

Some limitations of the present report must be acknowledged. First, the retrospective design prevents us from having granular patient-level data that may drive these postoperative mortality differences. Second, hospital factors, including programs that ensure comprehensive care coordination, prehabilitation, follow-up processes, and deployment of technologies, could influence postoperative outcomes. Third, we only considered postoperative mortality rather than morbidity, which may underestimate the scope of disparities in surgical health. Postoperative complications are more frequent than mortalities and can result in long-term disability[23] and potentially increase the future population of adults with high preoperative comorbidity loads, further increasing the risks of later surgical mortality.[23] Future investigations that explore composite and specific postoperative complications remain necessary. Postoperative complications are also associated with enduring fiscal implications for the healthcare system, and future studies should explore the epidemiology of postoperative complications and projected incidence rates.

Additionally, the present analysis did not include some racial and ethnic groups. While we recognize the importance of inclusivity in research, it is essential to carefully consider the practical constraints and research objectives when determining the scope of our study. Thus, we acknowledge that future studies with a dedicated focus on Asian, Native Hawaiian/Pacific Islanders, and Native American populations are warranted to address the gaps in knowledge and provide a more comprehensive understanding of health disparities across diverse racial and ethnic backgrounds.

Finally, the impending demographic shift in the United States (ie, increasing Hispanic and Black populations with a decreasing White population) could further accentuate these disparities if differences in mortality rates remain unchanged. In addition to the critical humanistic argument for concerted efforts to address these disparities in postoperative mortality, previous studies

have shown higher costs of care and longer hospital stays for hospitalizations leading to death compared with hospitalizations leading to successful discharge when providing care for diseases, such as ischemic stroke.[24,25] Similar patterns may be true for postoperative mortality.

Conclusion

Using nationally representative data collected over 2 decades, we showed that minoritized race and ethnicity continue to die on a substantially larger scale than White peers following surgery. An average of 605 excess postsurgical deaths per year occurred among Black and Hispanic patients, due to disparities. We provided a framework for incorporating population and health systems measures for eliminating the disparity in postoperative mortality into the next decade. Multifaceted interventions are needed to reduce racial and ethnic differences in adult postoperative mortality in the next decade.

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