JAMA Internal Medicine | Original Investigation | PHYSICIAN WORK ENVIRONMENT AND WELL-BEING

Mortality Among US Physicians and Other Health Care Workers

Vishal R. Patel, MD, MPH; Michael Liu, MPhil; Christopher M. Worsham, MD, MPH; Fatima Cody Stanford, MD, MPH, MPA, MBA; Ishani Ganguli, MD, MPH; Anupam B. Jena, MD, PhD

IMPORTANCE National estimates of mortality among physicians and other health care workers are lacking. It is also unknown if distinct patterns exist across sex, race, and ethnicity.

OBJECTIVE To compare all-cause and cause-specific mortality rates among physicians, health care workers, and non–health care workers by sex, race, and ethnicity.

DESIGN, SETTING, AND PARTICIPANTS The National Vital Statistics System, a population-based registry of US death certificates, was used to obtain data on deaths among adults aged 25 to 74 years from January 2020 to December 2022 by usual occupation. Data were analyzed from January 2024 to December 2024.

EXPOSURES Usual occupation, sex, race, and ethnicity.

MAIN OUTCOMES AND MEASURES Overall and cause-specific mortality rates were calculated for each occupation, as well as sex, race, and ethnicity subgroups, and compared using mortality rate ratios. Mortality estimates were age-adjusted and sex-adjusted, and health care occupations were compared with non–health care occupations with similar income levels (categorized as low income, medium income, and high income based on US Census income terciles).

RESULTS Most health care workers had lower age-adjusted and sex-adjusted annual mortality rates per 100 000 population than non–health care workers (eg, physicians [269.3], high-income non–health care workers [499.2], and non–health care workers overall [730.6]). While female individuals had lower mortality than male individuals in non–health care occupations overall (female to male ratio, 0.55; 95% CI, 0.55-0.55) and high-income non–health care occupations specifically (0.60; 95% CI, 0.60-0.60), this advantage was absent for several health care occupations, including physicians (0.97; 95% CI, 0.93-1.01). In particular, female physicians experienced higher mortality than male physicians of neoplasms and chronic lower respiratory diseases, despite lower mortality of these causes among female individuals in high-income non–health care occupations. Black workers had higher mortality than White workers across all occupations, although the Black to White mortality ratio was largest for physicians (2.13; 95% CI, 1.99-2.29), with the largest differences due to neoplasms, heart disease, and COVID-19. Black female physicians had higher mortality rates than all other physician subgroups and White female individuals in non–health care occupations. While Hispanic workers had lower mortality than White workers in non–health care occupations overall (Hispanic to White ratio, 0.83; 95% CI, 0.83-0.83) and high-income non–health care occupations specifically (0.90; 95% CI, 0.90-0.91), this pattern was reversed for several health care occupations, including physicians (1.18; 95% CI, 1.09-1.27).

CONCLUSIONS AND RELEVANCE The results of this cross-sectional study suggest that although physicians and most health care workers experienced lower mortality rates compared with the general population, this benefit did not fully extend to female individuals or racial and ethnic minority groups. Renewed efforts are needed to address health inequities within the health care workforce.

JAMA Intern Med. doi:10.1001/jamainternmed.2024.8432
Published online February 24, 2025.

Supplemental content

Author Affiliations: Harvard Medical School, Boston, Massachusetts (Patel, Liu, Worsham, Stanford, Ganguli, Jena); Brigham and Women's Hospital, Boston, Massachusetts (Patel, Ganguli); Massachusetts General Hospital, Boston (Worsham, Stanford, Jena); Associate Editor, *JAMA Internal Medicine* (Ganguli); National Bureau of Economic Research, Cambridge, Massachusetts (Jena).

Corresponding Author: Anupam B. Jena, MD, PhD, Department of Health Care Policy, Harvard Medical School, 180 Longwood Ave, Boston, MA 02115 (jena@hcp.med.harvard.edu).

Physicians and other health care workers comprise a growing share of the US workforce, and their well-being is critical to the sustainability of the health system. While prior studies have suggested that physicians have longer lifespans than their peers,[1-8] these studies largely predated the 21st century and had several limitations, including analyses restricted to men or single causes of death, use of subnational or obituary-based data, unavailability of reliable population denominators for calculating occupation-level mortality rates, and a lack of insight into the roughly 95% of health care workers who are not physicians.[9] In addition, the health care field has undergone substantial transformations in recent decades, characterized by intensified patient-care demands, record levels of stress and burnout, and unprecedented strains imposed by the COVID-19 pandemic.[10-16] Collectively, these factors may be associated with the health of physicians and other health care workers, warranting an updated, large-scale evaluation of their mortality.

Given well-documented experiences of sexism and racism among health care workers,[17-21] there may also be substantial differences in patterns of mortality by sex, race, and ethnicity that remain unexplored. Such disparities, which are widespread in society, may persist even among physicians despite their substantial health care knowledge, access, and resources. Yet, to our knowledge, most prior studies have not examined patterns of mortality among physicians and other health care workers across sex, race, and ethnicity subgroups.

Understanding patterns of mortality among physicians and other health care workers is critical, as the health of this workforce has direct implications for the delivery of high-quality care. Beginning in 2020, the US Centers for Disease Control and Prevention began providing comprehensive national mortality data linked to occupational roles in the US.[22] We leveraged these newly available data to evaluate national rates and leading causes of death among physicians and other health care workers by sex, race, and ethnicity.

Key Points

Question How do mortality rates differ by sex, race, and ethnicity among physicians and other health care workers in the US?

Findings In this population-based cross-sectional study of 3 606 791 US workers aged 25 to 74 years, age-adjusted and sex-adjusted mortality rates per 100 000 were lower for most health care workers compared with non–health care workers. While female individuals had lower mortality rates compared with male workers in non–health care occupations (male-to-female rate ratio, 0.55), this advantage was not present for several health care occupations, including among physicians, and while Black workers had the highest mortality rates across all occupations, the largest disparity between Black and White workers was observed among physicians (Black to White rate ratio, 2.13).

Meaning The study results suggest that although most health care occupations experience low mortality rates, significant disparities based on sex, race, and ethnicity exist among health care workers, particularly physicians; these findings underscore the need for targeted interventions to address health inequities within the health care workforce.

Methods

Data Sources

Because data were deidentified and derived only from individuals who were deceased, this study was deemed exempt from review by the Harvard Medical School institutional review board and consent was waived. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for cross-sectional studies. Mortality data were obtained from the National Vital Statistics System, a registry of all deaths in the US.[23] These data are based on death certificates, which include the underlying cause of death, which is coded according to the *International Classification of Diseases, Tenth Revision* (*ICD-10*), and decedent demographic information (eg, age group, sex, race, and ethnicity). Additionally, death certificates include a field for usual occupation (the occupation in which the decedent spent most of their working life), which is generally completed by a funeral director with help from the decedent's informant. Starting in 2020, occupation narratives from death certificates were coded to standardized US Census Bureau occupation codes in collaboration with the National Institute for Occupational Safety and Health.[22] These data on usual occupation were available for 46 states in 2020 (all except Iowa, Arizona, North Carolina, and Rhode Island), 49 states in 2021 (all except Rhode Island), and 50 states and Washington, DC in 2022, covering approximately 98% of the US population from 2020 to 2022. To calculate population denominators for mortality rate analyses, we obtained population counts for these jurisdictions from the 2020 to 2022 US Census Bureau's American Community Survey by occupation, age, sex, race, and ethnicity subgroups.[24] Median annual income was also obtained for each occupation group from the American Community Survey.

Study Population

We restricted the study population to adults who died between the ages of 25 and 74 years from 2020 to 2022. Based on prior definitions,[8] health care workers were identified as those with the following occupations: dentists, health services managers, other practitioners (eg, nurses, nurse practitioners, optometrists, and chiropractors), pharmacists, physician assistants, physicians, registered nurses, and health care support workers (eg, home health aides, medical assistants, and dental assistants) (see eTable 1 in Supplement 1 for occupation codes).[25]

We presented mortality data for all non–health care occupations in the general population, which were grouped into low-income, middle-income, and high-income categories based on income terciles. Additionally, we included lawyers, engineers, and scientists as a comparison group for physicians due to their similar education and income levels and their use as comparison groups in prior studies.[26-29] We excluded

decedents who did not have a paid usual occupation (eg, students, people who were incarcerated, and homemakers; 14.3% of decedents) and those with unknown information about their occupation (4.8% of decedents).

Statistical Analyses

We aimed to measure mortality rates across health care occupations, with a particular focus on physicians. We analyzed mortality overall and for leading causes of death among physicians and other health care workers and assessed patterns of mortality across sex, race, and ethnicity subgroups.

Mortality rates by occupation (and sex, race, and ethnicity subgroups within occupations) were calculated by combining data on deaths from the National Vital Statistics System with population counts (ie, denominators) for each occupational subgroup obtained from the American Community Survey. For each occupation, we calculated overall mortality rates as the annual deaths per 100 000 population as reported by the American Community Survey (eg, the number of physician deaths per 100 000 physicians). We also computed cause-specific mortality rates for each of the 52 selected causes of death used by the National Center for Health Statistics to rank causes of death nationally[30] and focused on the 15 causes of death with the highest mortality rates among physicians. Mortality rates were age-adjusted and sex-adjusted to the 2000 US standard population using direct standardization with 10-year age groups, consistent with established protocols.[31]

We then stratified analyses by sex, race, and ethnicity using the deaths reported in the National Vital Statistics System as the numerator and relevant populations reported in the American Community Survey as the denominator (eg, the number of female physician deaths per 100 000 female physicians). To evaluate occupation-specific differences in mortality across sexes, we calculated ratios of mortality rates between female and male workers within each occupation. To assess differences in mortality across race and ethnicity groups (non-Hispanic Asian, non-Hispanic Black, Hispanic, and non-Hispanic White), we calculated pairwise ratios of mortality rates between each racial and ethnic minority group and non-Hispanic White workers within each occupation. Differences in mortality for American Indian or Alaska Native, Native Hawaiian or other Pacific Islander, and other racial groups were not assessed because these groups comprised very small proportions (<0.5%) of most occupations. Finally, we calculated cause-specific mortality rate ratios to evaluate sex-based, race-based, and ethnicity-based differences in mortality for each of the 15 leading causes of death among physicians. Ratios were chosen vs absolute differences to provide a standardized measure for comparing disparities in mortality across sex, race, and ethnicity subgroups within occupations. This approach ensured that disparities in mortality rates were assessed consistently across subgroups, allowing for meaningful comparisons of disparities between occupations that may vary substantially in size and baseline mortality rates.

Calculation of mortality rates by specific occupation, sex, race, and ethnicity groups requires reliable population denominators. To verify the reliability of the population denominators, we compared the sex, race, and ethnicity distributions of physicians in the American Community Survey with those in the American Medical Association Physician Masterfile, a population-based census of physicians in the US (100% samples were not available for other health care occupations). Population denominators and demographic compositions were highly comparable between both sources for physicians (eTable 2 in Supplement 1). Lastly, we repeated analyses by restricting the sample to adults aged 35 to 64 years to exclude most retired or nonworking decedents.

We set 2-tailed α levels at .05 (.025 in each tail) and used a Bonferroni-corrected α of .0004 based on the number of maximum comparisons (15 causes of death across 8 occupation) as the threshold for significance in all analyses. Statistical analyses were conducted using MATLAB, 2024b (Mathworks).

Results

The study population included 3 606 791 decedents, of whom 10 189 (0.3%) were physicians and 305 871 (8.5%) were other health care workers (eTable 3 in Supplement 1). Among all health care workers, physicians had the lowest age-adjusted and sex-adjusted mortality (269.3 deaths per 100 000 population; 95% CI, 263.2-275.5), while support workers had the highest (909.6; 95% CI, 901-918.2) (**Table**). Physicians had significantly lower mortality rates for all causes of death compared with high-income non-health care workers, except for Parkinson disease and suicide (**Figure 1**). By contrast, support workers experienced significantly elevated mortality for several causes of death compared with low-income non-health care workers, including chronic lower respiratory disease (standardized mortality ratio [SMR], 1.20; 95% CI, 1.17-1.24), kidney disease (SMR, 1.34; 95% CI, 1.27-1.41), diabetes (SMR, 1.33; 95% CI, 1.29-1.37), stroke (SMR, 1.12; 95% CI, 1.08-1.16), and COVID-19 (SMR, 1.17; 95% CI, 1.15-1.20) (eTable 4 in Supplement 1).

Mortality Rates Within Occupations by Sex

When comparing differences by sex within each occupation, female workers in most occupations had lower mortality compared with their male counterparts, including among lawyers, engineers, and scientists (female to male mortality rate ratio [MRR], 0.59; 95% CI, 0.58-0.60), all high-income non-health care workers (MRR, 0.60; 95% CI, 0.60-0.60), and non-health care workers overall (MRR, 0.55; 95% CI, 0.55-0.55) (**Figure 2**). However, this pattern (the mortality benefit associated with being female) was absent among physicians (MRR, 0.97; 95% CI, 0.93-1.01) and physician assistants (MRR, 1.02; 95% CI, 0.91-1.14) and reversed among health care support workers (MRR, 1.16; 95% CI, 1.14-1.18) (eTable 5 in Supplement 1). Mortality patterns across sex were similar when analyses were restricted to working-aged adults aged 35 to 64 years (eFigure 1 in Supplement 1).

Mortality Rates Within Occupations by Race and Ethnicity

Across race and ethnicity within each occupation, Black workers had the highest mortality rates for all occupations

Table. Deaths Among Workers Aged 25 to 74 Years in the US by Occupation From 2020 to 2022[a]

Usual occupation	Deaths, No.	Deaths per 100 000 (95% CI)	Mortality rate ratio (95% CI)
Health care occupations			
Dentists[b]	2322	277.0 (260.9-294.1)	0.55 (0.53-0.58)
Health services managers[b]	12 854	555.5 (544.8-566.4)	1.11 (1.09-1.13)
Pharmacists[b]	3553	352.8 (340.4-365.7)	0.71 (0.68-0.73)
Physician assistants[b]	1137	416.1 (390.7-443)	0.83 (0.79-0.88)
Physicians[b]	10 189	269.3 (263.2-275.5)	0.54 (0.53-0.55)
Registered nurses[b]	65 759	550.9 (544.1-557.8)	1.10 (1.09-1.11)
Other practitioners[c]	127 433	568.0 (564.7-571.4)	0.68 (0.68-0.69)
Support workers[d]	92 813	909.6 (901.0-918.2)	1.04 (1.04-1.05)
Non–health care occupations			
High income	771 889	499.2 (498.0-500.5)	1 [Reference]
Middle income	884 063	830.9 (829.0-832.7)	1 [Reference]
Low income	1 634 779	872.7 (871.3-874)	1 [Reference]
All workers	3 290 731	730.6 (729.8-731.5)	NA

Abbreviation: NA, not applicable.

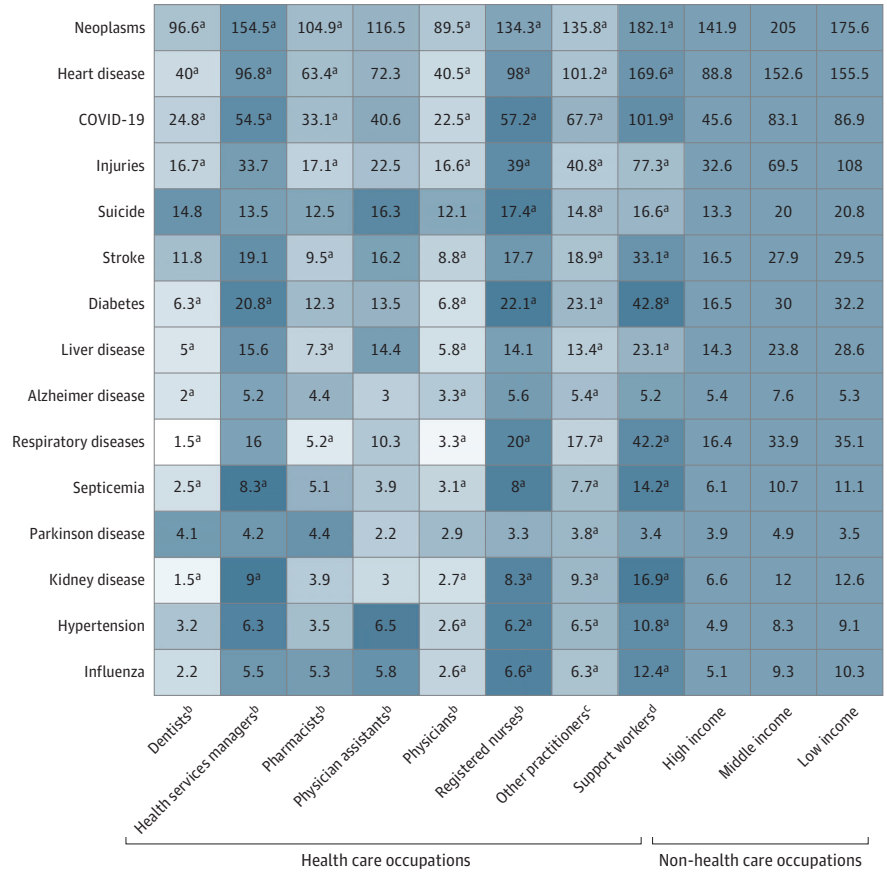
[a] Rates were age-adjusted and sex-adjusted to the 2000 US population. Non–health care occupations were categorized into low-income, middle-income, and high-income groups based on terciles of median annual income. Mortality rate ratios compared the mortality of each health care occupation with income-matched non–health care workers. All *P* values for these comparisons were less than the Bonferroni-corrected threshold of .0004.

[b] High-income occupation.

[c] Middle-income occupation.

[d] Low-income occupation.

Figure 1. Mortality Rates for 15 Leading Causes of Death Among Workers Aged 25 to 74 Years by Occupation



The 15 causes of death with the highest mortality rates among physicians are shown. Rates were age-adjusted and sex-adjusted to the 2000 US population and labeled as deaths per 100 000 person-years. Non–health care occupations were categorized into low-income, middle-income, and high-income groups based on the terciles of median annual income. The color of the cells represents the mortality rate ratio for each occupation compared with the income-matched workers in non–health care occupations, such that the darkest cells represent occupations with the highest mortality for each cause of death.

[a] *P* value for mortality rate ratio is less than Bonferroni corrected α of .0004.

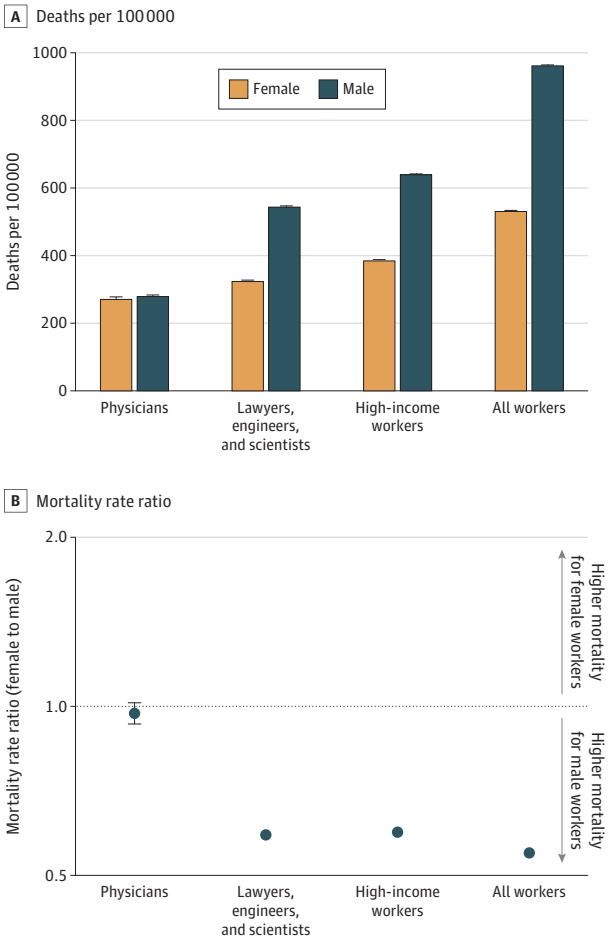
[b] High-income occupation.

[c] Middle-income occupation.

[d] Low-income occupation.

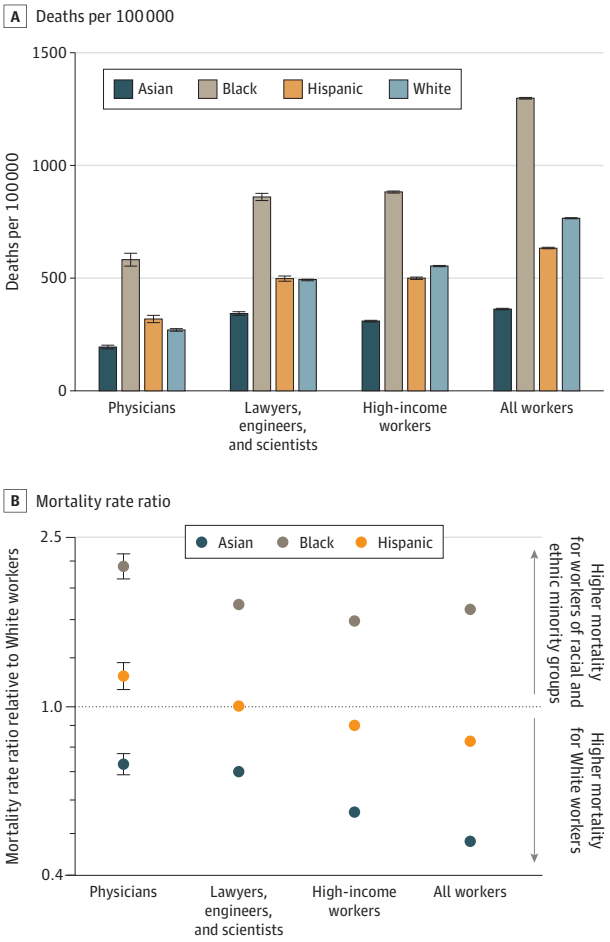
studied. However, the Black to White mortality rate ratio was higher for physicians (2.13; 95% CI, 1.99-2.29) than any other occupation group, including lawyers, engineers, and scientists (1.74; 95% CI, 1.69-1.78), high-income non-health care workers (1.59; 95% CI, 1.58-1.60), and non-health care workers overall (1.69; 95% CI, 1.68-1.69) (**Figure 3**; eTable 6 in Supplement 1). The larger Black to White MRR was also more pronounced for female physicians (2.23; 95% CI, 2.00-2.50]) than male physicians (2.08; 95% CI, 1.90-2.27). Black female physicians had a higher mortality rate (616.1 deaths per 100 000 population; 95% CI, 550.6-687.7) than White female individuals in the general population of non-health care workers (537.4; 95% CI, 536.1-538.7) (eFigure 2 in Supplement 1). For Hispanic health care workers, there was

Figure 2. Mortality Rates Among Physicians and Other Workers Aged 25 to 74 Years by Sex



Rates were age-adjusted to the 2000 US population. High-income workers were defined as those with incomes in the top tercile of non–health care occupations based on median annual income. Lawyers, engineers, and scientists were included for comparison with physicians, as they are considered non–health care occupations with high incomes and high education. Error bars represent 95% CIs.

Figure 3. Mortality Rates Among Physicians and Other Workers Aged 25 to 74 Years by Race and Ethnicity



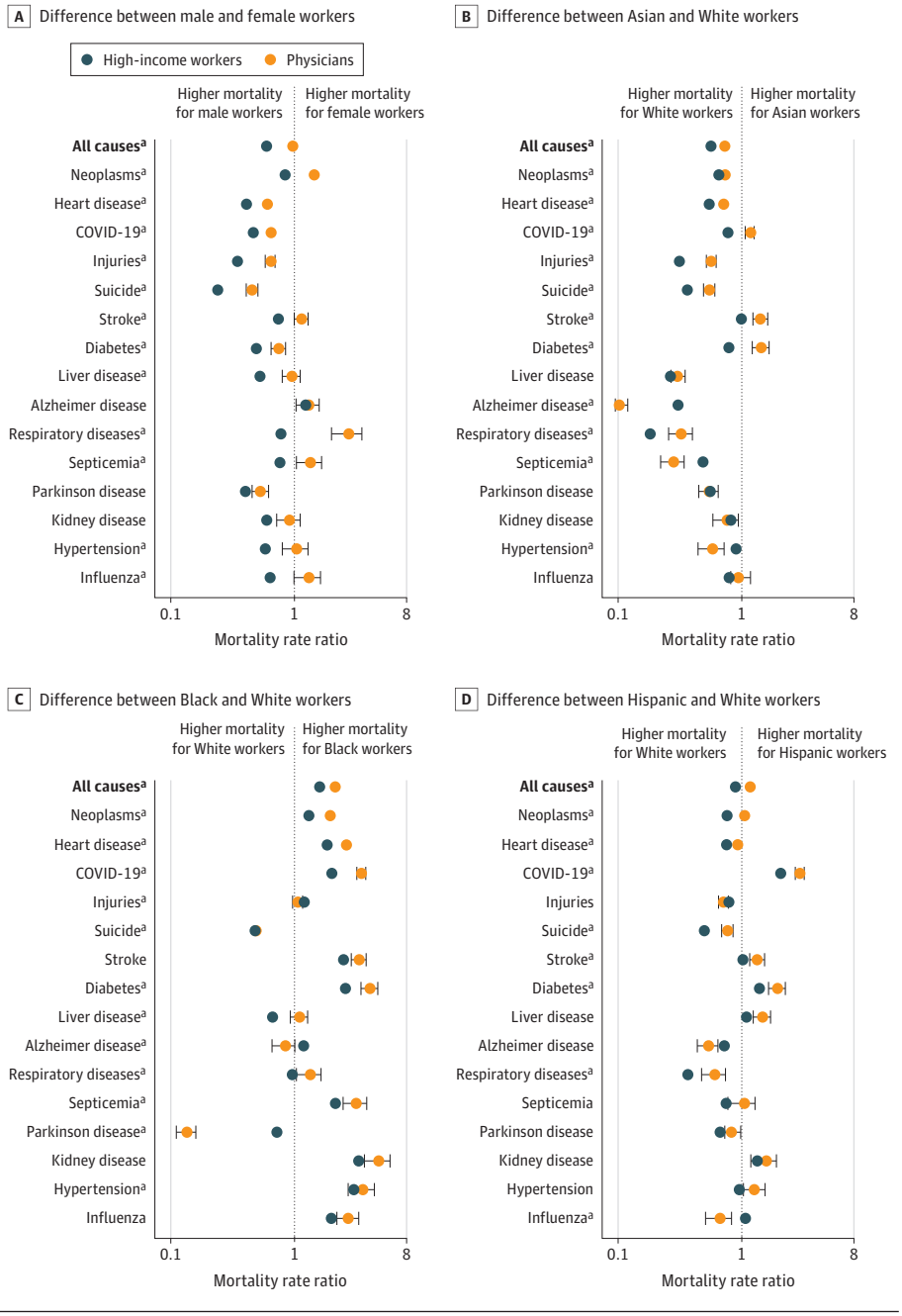
Rates were age-adjusted to the 2000 US population. High-income workers were defined as those in the top tercile of non–health care occupations based on median annual income. Lawyers, engineers, and scientists were included for comparison with physicians as they are considered non–health care occupations with high incomes and high education. Error bars represent 95% CIs.

substantial variation in mortality by occupation group, although the Hispanic to White MRR was also higher for physicians (1.18; 95% CI, 1.09-1.27) than for lawyers, engineers, and scientists (1.01; 95% CI, 0.98-1.04), high-income non–health care workers (0.90; 95% CI, 0.90-0.91), and non–health care workers overall (0.83; 95% CI, 0.83-0.83). Put differently, while Hispanic workers had lower mortality than White workers in non–health care occupations overall and high-income non–health care occupations specifically, this pattern was reversed for physicians, such that Hispanic physicians had higher mortality than White physicians. Asian workers had lower mortality rates compared with White workers across all occupation groups. Mortality patterns across race and ethnicity were similar when analyses were restricted to working-aged adults aged 35 to 64 years (eFigure 3 in Supplement 1).

Cause-Specific Mortality Rates Between Occupations by Sex, Race, and Ethnicity

When examining demographic differences for specific causes of death, female to male MRRs were higher among physicians compared with high-income non–health care workers for 13 of 15 leading causes (**Figure 4**). In particular, female physicians had higher mortality than male physicians of neoplasms (female to male MRR, 1.45; 95% CI, 1.36-1.54) and chronic lower respiratory diseases (MRR, 2.75; 95% CI, 1.67-3.84); in contrast, female high-income non–health care workers died less frequently of these 2 causes than their male counterparts (MRR, 0.85 [95% CI, 0.84-0.85] and 0.79 [95% CI, 0.77-0.80], respectively). Black to White MRRs were higher for physicians than for high-income non–health care workers for death caused by neoplasms, heart disease, COVID-19, and liver disease. Hispanic to White MRRs were also higher for physicians than for high-income non–health care workers for death

Figure 4. Sex-Based, Race-Based, and Ethnicity-Based Differences in Mortality Among Physicians and Other High-Income Workers for 15 Leading Causes of Death



Mortality rate ratios quantified differences in mortality across sex (with male individuals as the reference group) and across race and ethnicity groups (with White adults as the reference group) for physicians (orange circles) and high-income non–health care workers (blue circles). For example, the female to male mortality rate ratio for neoplasms was 1.45 for physicians, indicating that female physicians had a 45% higher mortality rate of neoplasms compared with male physicians. Error bars represent 95% CIs.

[a]*P* value for difference in mortality rate ratios between physicians and high-income non–health care workers is less than Bonferroni corrected α of .0004.

caused by neoplasms, heart disease, COVID-19, suicide, diabetes, and liver disease. Sex-based, race-based, and ethnicity-based differences in cause-specific mortality for each occupation group are shown in eTables 7 to 10 in Supplement 1.

Discussion

In this cross-sectional study, based on national death certificate data newly linked to information on the occupation of decedents, we analyzed patterns of mortality among physicians and other health care workers. Physicians and workers in most other health care occupations in the US experience lower mortality rates than non-health care workers. While this finding may be reassuring for health care professionals, it overlies concerning inequities across sex, race, and ethnicity.

These results build on centuries of efforts to understand physician mortality.[32] Before the present study, the most recent investigations were conducted more than 2 decades ago

and excluded female individuals, racial and ethnic minority groups, and other health care occupations. Using a novel data linkage, our study provides what is to our knowledge the first comprehensive national estimates of mortality rates among physicians and other health care workers. These estimates offer context, specifically that health care workers experience lower rates of mortality and generally die of the same causes as the general population. For instance, much of the literature surrounding physician mortality has centered around their elevated suicide risk.[8,33,34] While our results confirm that suicide disproportionately affects physicians, these deaths accounted for less than 5% of physician deaths and were similar in magnitude to those experienced by other workers in high-income occupations. This suggests that the issue of suicide, although significant, is 1 piece of a larger picture surrounding the health issues affecting physicians across the lifespan. Nonetheless, our primary findings suggest that physicians generally maintain healthy lifestyles and enjoy longer lifespans than the general population.[1,5]

However, what is more concerning is that despite lower overall mortality rates than the general population and other high-income, high-education occupations, physicians experienced some of the largest disparities in mortality by sex, race, and ethnicity. For example, although female workers had lower mortality rates than male workers in the general population, among lawyers, engineers, and scientists, and among high-income, high-education groups overall, we found that the mortality advantage associated with being female was absent among physicians and several other health care occupations. Similarly, although mortality rates for Black workers exceeded those of White workers in the general population, health care workers overall, and among high-income non–health care workers, one might posit that the health care knowledge, resources, and access that come with being a physician could theoretically narrow these differences among this group. However, we found that the relative mortality disadvantage associated with being Black (compared with being White) was largest among physicians. The intersection of sex and race further compounded these disparities. Black female physicians experienced higher mortality rates than physicians of any other sex, race, or ethnicity group, and their mortality exceeded that of White women in the general population. In other words, among female workers, being White conferred a greater mortality benefit than being a Black physician.

We also found that some of the largest occupation-specific gaps in mortality between Black, Hispanic, and White individuals were among physicians, with many of these disparities attributable to common causes of death, such as neoplasms, heart disease, and COVID-19. Occupation is a modifiable factor that can be associated with improved health and health inequities because those most likely to benefit from wage increases are historically marginalized groups who have been disproportionately represented among lower-earning occupations.[35] The presence of such pronounced health disparities among physicians, whose health care knowledge, financial resources, and access to medical care, on average, exceeds that of the general population, contradicts this expectation and warrants further attention.

The underlying reasons for these inequities are likely multifaceted. One associated factor may be the disproportionate health effects of the medical profession on female practitioners. Workplace stress and exposure have been implicated as reasons for higher cancer incidence,[36] poor birth outcomes,[28] and depression[37] among female physicians. Increased domestic workload (the so-called “second shift”) and associated career-related challenges among physician mothers may also contribute to the observed health differences.[38,39] Although disparities in mortality are often attributed to health-related social determinants, such as lack of education and limited economic opportunity, these explanations are arguably less applicable to physicians and many other health care occupations. Instead, our findings suggest that other factors, perhaps associated with demanding work hours (including more time in direct and indirect patient care despite lower pay for this work), policies of exclusion, and systemic biases, could produce health inequities among health care workers.[40-42] The lives of physicians and other health care workers are determined only partly by what happens in their occupations.[43-45] Our findings highlight the broader effect of structural racism and sexism in society at large. That among women being White confers a greater mortality benefit than being a Black physician is striking given that the mortality of physicians overall was significantly lower than that of the general population.

Another concerning finding is that mortality rates for several nonphysician health care occupations, including nurses and support workers, were more than twice that of physicians. Although health care support workers had only slightly higher mortality rates compared with comparable low-income workers in non–health care occupations, they had significantly higher rates for female workers, again demonstrating a reversal of the well-known mortality benefit associated with being female in the general population.[46] While a previous cohort study identified high suicide risk among health care support workers,[8] the results of the present study suggest that this elevated risk may extend to several other causes of mortality and may disproportionately affect female workers. This may be associated with factors such as greater stress levels, job insecurity, wage differences, and physical risks associated with work roles.[47-50] For example, an estimated 1.7 million female health care workers had incomes less than the poverty line in 2017, with 34.9% earning less than $15 per hour and 7% lacking health insurance coverage of their own.[46]

Other female health care workers, including physician assistants and nurses, also experienced significant sex-based disparities in mortality. Black and Hispanic dentists, social workers, and nurses also had substantially elevated mortality rates compared with their White counterparts. As the US population ages, the demand for nonphysician health care workers will rise. Our results underscore the importance of protecting the health of these populations, especially as these groups disproportionately provide care to undeserved patient populations.[51-54]

Limitations

This study had several limitations. First, death certificates record usual rather than current occupation. However, usual

occupation has been shown to be a reliable proxy for current occupation.[55,56] Second, given the cross-sectional nature of the data, the observed associations between occupation and mortality rates may be driven by the characteristics of individuals who select such roles rather than occupation-specific exposures. For this reason, we used several comparison groups, including lawyers, engineers, and scientists (as a benchmark specifically for physicians), as well as occupational groups categorized by income, to help mitigate unmeasured confounders. Moreover, comparisons within occupations (eg, mortality comparisons between male and female physicians) should be less affected by sociodemographic factors, including education and income, that differ across occupations. Third, data based on *ICD-10* codes may result in misclassification of specific causes of death, such as suicide, which are known to be underreported among health care professionals. Fourth, population-based denominators for each occupation were not available and instead were estimated using a 1% probability sample. However, this is the same data source of population denominators that is used by the National Center for Healthcare Statistics to report national mortality rates.[57] Additionally, we cross-validated physician population estimates obtained from the US Census Bureau with those from the American Medical Association Physician Masterfile, a comprehensive population-based sample of physicians, and observed a high degree of concordance. Fifth, the mortality data lacked information on demographic characteristics, such as marital status, income,[58] or country of birth,[59] factors that might interact with sex, race, and ethnicity to affect mortality. Immigrants comprise a large share of physicians, nurses, health aides, and other health care workers; exposures and stressors faced before and after coming to the US are likely associated with life expectancy.[60,61] As such, our study could not evaluate how these characteristics contribute to mortality differences between groups.

Conclusions

The results of this cross-sectional study suggest that most health care workers experience lower overall mortality rates than non–health care workers in the general population. However, several health care occupations, especially physicians, experience considerable inequities in mortality based on sex, race, and ethnicity that warrant attention.

ARTICLE INFORMATION

Accepted for Publication: December 22, 2024.

Published Online: February 24, 2025. doi:10.1001/jamainternmed.2024.8432

Author Contributions: Dr Patel had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Concept and design: Patel, Liu, Worsham, Jena.
Acquisition, analysis, or interpretation of data: All authors.
Drafting of the manuscript: Patel, Liu, Worsham, Stanford, Jena.
Critical review of the manuscript for important intellectual content: Liu, Worsham, Stanford, Ganguli, Jena.
Statistical analysis: Patel, Liu, Worsham, Jena.
Administrative, technical, or material support: Stanford.
Supervision: Worsham, Stanford, Jena.

Conflict of Interest Disclosures: Dr Worsham reported grants from the Agency for Healthcare Research and Quality during the conduct of the study as well as consulting fees from Alosa Health, Analysis Group, Atheneum, Berkshire Hathaway Home Companies, Chronius, FVC Health, GLG, Guidepoint, NuvoAir, Ogilvy, Philips, Simbo, and Tell Health and authorship income from Doubleday Books, Substack, the *New York Times*, and the *Wall Street Journal* outside the submitted work. Dr Stanford reported personal fees from Eli Lilly, Novo Nordisk, Amgen, Currax, MelliCell, Vida Health, Life Force, Doximity, GoodRx, MelliCell, Vida Health, Ilant Health, Calibrate, and Empros Pharma outside the submitted work. Dr Ganguli reported personal fees from FPrime outside the submitted work. Dr Jena reported personal fees from Analysis Group, Freakonomics MD, Doubleday Books, the *New York Times*, *Los Angeles Times*, *Wall Street Journal*, Harry Walker Agency, and AAE outside the submitted work. No other disclosures were reported.

Funding/Support: Dr Worsham is supported by the Agency for Healthcare Research and Quality (grant K08HS029197). Dr Ganguli is supported by the National Institute on Aging (grant K23AG068240). Dr Stanford is supported by the National Institutes of Health (grants NIDDK P30 DK04056, UE5 DK137285 [FCS], and U24 DK132733 [FCS]).

Role of the Funder/Sponsor: The funding organizations had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Data Sharing Statement: See Supplement 2.

Disclaimer: Dr Ganguli is an associate editor of *JAMA Internal Medicine* but was not involved in any of the decisions regarding review of the manuscript or its acceptance.

REFERENCES

1. Frank E, Biola H, Burnett CA. Mortality rates and causes among U.S. physicians. *Am J Prev Med*. 2000;19(3):155-159. doi:10.1016/S0749-3797(00)00201-4

2. Emerson H, Hughes HE. Death rates of male White physicians in the United States, by age and cause. *Am J Public Health (N Y)*. 1926;16(11):1088-1093. doi:10.2105/AJPH.16.11.1088

3. Dickinson FG, Welker EL. The leading causes of death among physicians. *JAMA*. 1949;139(17):1129-1131. doi:10.1001/jama.1949.02900340005002

4. Dickinson FG, Martin LW. Physician mortality, 1949-1951. *JAMA*. 1956;162(16):1462-1468. doi:10.1001/jama.1956.72970330004008

5. Williams SV, Munford RS, Colton T, Murphy DA, Poskanzer DC. Mortality among physicians: a cohort study. *J Chronic Dis*. 1971;24(6):393-401. doi:10.1016/0021-9681(71)90139-1

6. Ullmann D, Phillips RL, Beeson WL, et al. Cause-specific mortality among physicians with differing life-styles. *JAMA*. 1991;265(18):2352-2359. doi:10.1001/jama.1991.03460180058033

7. Samkoff JS, Hockenberry S, Simon LJ, Jones RL. Mortality of young physicians in the United States, 1980-1988. *Acad Med*. 1995;70(3):242-244. doi:10.1097/00001888-199503000-00018

8. Olfson M, Cosgrove CM, Wall MM, Blanco C. Suicide risks of health care workers in the US. *JAMA*. 2023;330(12):1161-1166. doi:10.1001/jama.2023.15787

9. US Census Bureau. 22 Million employed in health care fight against COVID-19. Accessed February 25, 2024. https://www.census.gov/library/stories/2021/04/who-are-our-health-care-workers.html

10. Wallace JE, Lemaire JB, Ghali WA. Physician wellness: a missing quality indicator. *Lancet*. 2009;374(9702):1714-1721. doi:10.1016/S0140-6736(09)61424-0

11. Hartzband P, Groopman J. Physician burnout, interrupted. *N Engl J Med*. 2020;382(26):2485-2487. doi:10.1056/NEJMp2003149

12. Ortega MV, Hidrue MK, Lehrhoff SR, et al. Patterns in physician burnout in a stable-linked cohort. *JAMA Netw Open*. 2023;6(10):e2336745. doi:10.1001/jamanetworkopen.2023.36745

13. Abbasi J. Pushed to their limits, 1 in 5 physicians intends to leave practice. *JAMA*. 2022;327(15):1435-1437. doi:10.1001/jama.2022.5074

14. Sexton JB, Adair KC, Proulx J, et al. Emotional exhaustion among US health care workers before and during the COVID-19 pandemic, 2019-2021. *JAMA Netw Open*. 2022;5(9):e2232748. doi:10.1001/jamanetworkopen.2022.32748

15. Khullar D. Burnout, professionalism, and the quality of US health care. *JAMA Health Forum*. 2023;4(3):e230024. doi:10.1001/jamahealthforum.2023.0024

16. Kiang MV, Carlasare LE, Thadaney Israni S, Norcini JJ, Zaman JAB, Bibbins-Domingo K. Excess mortality among US physicians during the COVID-19 pandemic. *JAMA Intern Med*. 2023;183(4):374-376. doi:10.1001/jamainternmed.2022.6308

17. Ly DP, Seabury SA, Jena AB. Differences in incomes of physicians in the United States by race

and sex: observational study. *BMJ*. 2016;353:i2923. doi:10.1136/bmj.i2923

18. Richter KP, Clark L, Wick JA, et al. Women physicians and promotion in academic medicine. *N Engl J Med*. 2020;383(22):2148-2157. doi:10.1056/NEJMsa1916935

19. Frank E, Zhao Z, Fang Y, Rotenstein LS, Sen S, Guille C. Experiences of work-family conflict and mental health symptoms by gender among physician parents during the COVID-19 pandemic. *JAMA Netw Open*. 2021;4(11):e2134315. doi:10.1001/jamanetworkopen.2021.34315

20. Goldman AL, Barnett ML. Changes in physician work hours and implications for workforce capacity and work-life balance, 2001-2021. *JAMA Intern Med*. 2023;183(2):106-114. doi:10.1001/jamainternmed.2022.5792

21. Kennedy-Moulton K, Miller S, Persson P, Rossin-Slater M, Wherry L, Aldana G. *Maternal and Infant Health Inequality: New Evidence From Linked Administrative Data*. National Bureau of Economic Research; 2022. doi:10.3386/w30693

22. Steege AL, Billock R, Minino A. Industry and occupation data as applicable to mortality vital statistics. Accessed January 27, 2025. https://www.cdc.gov/nchs/data/dvs/industry-and-occupation-data-mortality-2020.pdf

23. US Centers for Disease Control and Prevention. National vital statistics system. Accessed September 28, 2022. https://www.cdc.gov/nchs/nvss/index.htm

24. US Census Bureau. American Community Survey. Accessed. https://www.census.gov/programs-surveys/acs

25. United States Bureau of Labor Statistics. 2010 Standard occupational classification (SOC) users guide. Accessed January 1, 2024. https://www.bls.gov/soc/2010/2010_major_groups.htm

26. Weeks WB, Wallace AE, Wallace MM, Welch HG. A comparison of the educational costs and incomes of physicians and other professionals. *N Engl J Med*. 1994;330(18):1280-1286. doi:10.1056/NEJM199405053301807

27. Ly DP, Seabury SA, Jena AB. Divorce among physicians and other healthcare professionals in the United States: analysis of census survey data. *BMJ*. 2015;350:h706. doi:10.1136/bmj.h706

28. Jena A, Slusky D, Springer L. *Occupational Hazard? An Analysis of Birth Outcomes among Physician Mothers*. National Bureau of Economic Research; 2023. doi:10.3386/w31955

29. Gottlieb JD, Polyakova M, Rinz K, Shiplett H, Udalova V. Who values human capitalists' human capital? the earnings and labor supply of US physicians. Accessed January 27, 2025. https://www.nber.org/system/files/working_papers/w31469/w31469.pdf

30. Curtin SC, Tejada-Vera B, Bastian BA. Deaths: leading causes for 2020. *Natl Vital Stat Rep*. 2023;72(13):1-115.

31. US Centers for Disease Control and Prevention. Age adjustment—health, United States. Accessed January 27, 2025. https://www.cdc.gov/nchs/hus/sources-definitions/age-adjustment.htm

32. Ogle W. Statistics of mortality in the medical profession. *Med Chir Trans*. 1886;69:217-237. doi:10.1177/095952878606900112

33. Dutheil F, Aubert C, Pereira B, et al. Suicide among physicians and health-care workers: a systematic review and meta-analysis. *PLoS One*. 2019;14(12):e0226361. doi:10.1371/journal.pone.0226361

34. Schernhammer ES, Colditz GA. Suicide rates among physicians: a quantitative and gender assessment (meta-analysis). *Am J Psychiatry*. 2004;161(12):2295-2302. doi:10.1176/appi.ajp.161.12.2295

35. Kezios KL, Lu P, Calonico S, Al Hazzouri AZ. History of low hourly wage and all-cause mortality among middle-aged workers. *JAMA*. 2023;329(7):561-573. doi:10.1001/jama.2023.0367

36. Lin SY, Lin CL, Hsu WH, et al. A comparison of cancer incidence among physician specialists and the general population: a Taiwanese cohort study. *J Occup Health*. 2013;55(3):158-166. doi:10.1539/joh.12-0263-OA

37. Gallery ME, Whitley TW, Klonis LK, Anzinger RK, Revicki DA. A study of occupational stress and depression among emergency physicians. *Ann Emerg Med*. 1992;21(1):58-64. doi:10.1016/S0196-0644(05)82238-3

38. Lyu HG, Davids JS, Scully RE, Melnitchouk N. Association of domestic responsibilities with career satisfaction for physician mothers in procedural vs nonprocedural fields. *JAMA Surg*. 2019;154(8):689-695. doi:10.1001/jamasurg.2019.0529

39. Jolly S, Griffith KA, DeCastro R, Stewart A, Ubel P, Jagsi R. Gender differences in time spent on parenting and domestic responsibilities by high-achieving young physician-researchers. *Ann Intern Med*. 2014;160(5):344-353. doi:10.7326/M13-0974

40. Ganguli I, Sheridan B, Gray J, Chernew M, Rosenthal MB, Neprash H. Physician work hours and the gender pay gap—evidence from primary care. *N Engl J Med*. 2020;383(14):1349-1357. doi:10.1056/NEJMsa2013804

41. Whaley CM, Koo T, Arora VM, Ganguli I, Gross N, Jena AB. Female physicians earn an estimated $2 million less than male physicians over a simulated 40-year career. *Health Aff (Millwood)*. 2021;40(12):1856-1864. doi:10.1377/hlthaff.2021.00461

42. Rotenstein LS, Fong AS, Jeffery MM, et al. Gender differences in time spent on documentation and the electronic health record in a large ambulatory network. *JAMA Netw Open*. 2022;5(3):e223935. doi:10.1001/jamanetworkopen.2022.3935

43. Gupta K, Murray SG, Sarkar U, Mourad M, Adler-Milstein J. Differences in ambulatory EHR use patterns for male vs. female physicians. *NEJM Catalyst*. 2019;5(6):1. doi:10.1056/CAT.19.0690

44. Rittenberg E, Liebman JB, Rexrode KM. Primary care physician gender and electronic health record workload. *J Gen Intern Med*. 2022;37(13):3295-3301. doi:10.1007/s11606-021-07298-z

45. Bajaj SS, Tu L, Stanford FC. Superhuman, but never enough: Black women in medicine. *Lancet*. 2021;398(10309):1398-1399. doi:10.1016/S0140-6736(21)02217-0

46. Himmelstein KEW, Venkataramani AS. Economic vulnerability among US female health care workers: potential impact of a $15-per-hour minimum wage. *Am J Public Health*. 2019;109(2):198-205. doi:10.2105/AJPH.2018.304801

47. Sterling MR, Tseng E, Poon A, et al. Experiences of home health care workers in New York City during the coronavirus disease 2019 pandemic: a qualitative analysis. *JAMA Intern Med*. 2020;180(11):1453-1459. doi:10.1001/jamainternmed.2020.3930

48. Jun J, Tubbs-Cooley HL, Davis MA. Health care support worker status, health behaviors, mental health, and preventive health care use. *JAMA Netw Open*. 2023;6(12):e2348578. doi:10.1001/jamanetworkopen.2023.48578

49. Sterling MR, Li J, Cho J, Ringel JB, Silver SR. Prevalence and predictors of home health care workers' general, physical, and mental health: findings from the 2014-2018 behavioral risk factor surveillance system. *Am J Public Health*. 2021;111(12):2239-2250. doi:10.2105/AJPH.2021.306512

50. Spetz J, Stone RI, Chapman SA, Bryant N. Home and community-based workforce for patients with serious illness requires support to meet growing needs. *Health Aff (Millwood)*. 2019;38(6):902-909. doi:10.1377/hlthaff.2019.00021

51. Komaromy M, Grumbach K, Drake M, et al. The role of black and Hispanic physicians in providing health care for underserved populations. *N Engl J Med*. 1996;334(20):1305-1310. doi:10.1056/NEJM199605163342006

52. Marrast LM, Zallman L, Woolhandler S, Bor DH, McCormick D. Minority physicians' role in the care of underserved patients: diversifying the physician workforce may be key in addressing health disparities. *JAMA Intern Med*. 2014;174(2):289-291. doi:10.1001/jamainternmed.2013.12756

53. Frakes MD, Gruber J. *Racial Concordance and the Quality of Medical Care: Evidence From the Military*. National Bureau of Economic Research; 2022. doi:10.3386/w30767

54. Takeshita J, Wang S, Loren AW, et al. Association of racial/ethnic and gender concordance between patients and physicians with patient experience ratings. *JAMA Netw Open*. 2020;3(11):e2024583. doi:10.1001/jamanetworkopen.2020.24583

55. Luckhaupt SE, Cohen MA, Calvert GM. Concordance between current job and usual job in occupational and industry groupings: assessment of the 2010 national health interview survey. *J Occup Environ Med*. 2013;55(9):1074-1090. doi:10.1097/JOM.0b013e318297321d

56. Vichare A, Bodas M, Jetty A, Luo QE, Bazemore A. A few doctors will see some of you: the critical role of underrepresented in medicine (URiM) family physicians in the care of Medicaid beneficiaries. *Ann Fam Med*. 2024;22(5):383-391. doi:10.1370/afm.3140

57. US Centers for Disease Control and Prevention. U.S. Census populations with bridged race categories. National Accessed May 20, 2024. https://www.cdc.gov/nchs/nvss/bridged_race.htm

58. Chetty R, Stepner M, Abraham S, et al. The association between income and life expectancy in the United States, 2001-2014. *JAMA*. 2016;315(16):1750-1766. doi:10.1001/jama.2016.4226

59. Hamilton TG, Hummer RA. Immigration and the health of U.S. Black adults: does country of origin matter? *Soc Sci Med*. 2011;73(10):1551-1560. doi:10.1016/j.socscimed.2011.07.026

60. Oikelome F, Broward J, Hongwu D. Immigrant health care workers from developing countries in the US: antecedents, consequences and institutional responses. *Equal Divers Incl*. 2022;41(2):157-185. doi:10.1108/EDI-04-2021-0093

61. New American Economy Research Fund. Immigrants on the healthcare frontlines: a look at local data. Accessed May 23, 2024. https://research.newamericaneconomy.org/report/immigrants-healthcare-metros/