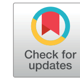
Mortality among law enforcement officers in the United States: a population-wide analysis of the National Occupational Mortality Surveillance data, 2020–2023



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Summary

Background Law enforcement officers (LEOs) face unique occupational hazards that can influence both timing and causes of death. Our objective was to deliver the most comprehensive, population-based portrait of mortality among LEOS in the U.S.—capturing when, why, and among whom deaths occur. By integrating multiple national data sources, we provide a detailed account of mortality patterns that can inform prevention efforts and guide policy.

Methods Using the National Occupational Mortality Surveillance (NOMS) data for 2020–2023, we estimated all-cause and cause-specific mortality rates by sex for individuals whose usual occupation was law enforcement.

Findings The study population comprised ∼2.5 million working-age decedents (ages 16–64), including 15,384 LEOs. LEO decedents had an average age of 53.7 (SD = 9.4), they were predominantly of men (85.3% [n = 13,127]), and had a racial/ethnic composition that closely mirrored that of the working-age population. LEOs exhibited higher all-cause mortality risk than the working-age population, with age-standardized mortality rates (ASMRs) of 421.8 (95% CI = [414.3, 429.4]) and 400.7 (95% CI = [383.9, 417.4]) per 100,000 for male and female LEOs, respectively. Among male LEOs, the leading causes of death were circulatory conditions (ASMR = 100.7, 95% CI = [97.2, 104.2]), cancer (ASMR = 82.5, 95% CI = [79.3, 85.7]), suicide (ASMR = 36.4, 95% CI = [34, 38.9]), and COVID-19 (ASMR = 49.7, 95% CI = [47.2, 52.1]) (all per 100,000). Among female LEOs, cancer was the leading cause of death (ASMR = 135.2, 95% CI = [125.6, 144.8] per 100,000).

Interpretation As first responders, LEOs face a unique constellation of occupational hazards that contribute to increased mortality risk. Our findings underscore the need for targeted intervention and prevention efforts to reduce the burden of cardiovascular, cancer-related, and suicide mortality among LEOs.

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Introduction

Law enforcement officers (LEOs) in the United States are routinely called upon to "protect and serve" the public amid some of the most challenging societal circumstances, including criminal incidents, emergencies, and personal crises. These occupational demands expose officers to a constellation of health risks that extend beyond the immediate physical dangers of the job. Chronic stress, long shifts, irregular sleep, trauma exposure, and public scrutiny can combine to create conditions that erode long-term health.[1,2] While media and policy discussions have increasingly focused on officer wellness, much of the empirical research remains fragmented, with a tendency to concentrate on mental health or injuries rather than long-term mortality.

A growing body of research suggests that LEOs face elevated risks of early death compared to the U.S. general population. Prior studies have linked the profession to increased rates of cardiovascular disease,

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Research in context

Evidence before this study

Law enforcement officers (LEOs) face multiple occupational stressors—including organizational pressures, traumatic events, long or irregular work hours, and other hazards—that can negatively affect health. Chronic stress of this kind is linked to increased mortality. However, little is known about the specific levels of all-cause and cause-specific mortality risk among LEOs in the United States.

In March 2025, we searched EMBASE and PubMed (MEDLINE) using the terms ("law enforcement officer" OR "police") AND ("all cause mortality" OR "cause specific mortality") AND "United States". We supplemented these searches with Google Scholar and our own knowledge of the field. Available studies suggest that LEOs experience higher mortality from heart disease, cancer, suicide, and other causes. Yet most prior research was limited by one or more factors: restricted geographic coverage (such as data from individual departments or states), a narrow focus on specific causes of death, or statistics that did not provide both absolute and relative mortality risk. These gaps leave an incomplete picture of the overall mortality burden among LEOs in the U.S.

Added value of this study

This study provides the first population-wide estimates of mortality risk for LEOs in the U.S. Using NOMS data, we address prior limitations by: (1) presenting nationwide mortality estimates; (2) going beyond all-cause mortality to provide a detailed analysis of cause-specific mortality using ICD-10 codes; and (3) reporting both absolute and relative mortality measures, allowing comparisons within the LEO population and with other groups. Our findings establish a comprehensive baseline against which more narrowly focused or geographically limited studies can be understood.

Implications of all the available evidence

Policing in the U.S. is a high-stress occupation associated with distinct and elevated risks of death from several causes. This study confirms and extends prior evidence, showing higher mortality among LEOs from heart disease, cancers, suicide, and, during the pandemic years, COVID-19. These results can inform health and wellness programs in law enforcement agencies by helping identify and prioritize the specific causes of death that most contribute to excess mortality among LEOs.

cancer, and suicide.[3–7] These outcomes are likely driven by a mix of physiological stress responses, behavioral coping mechanisms (e.g., substance use), and long-term exposure to occupational hazards. However, most existing studies focus on a single cause of death, a narrow cohort, or a single agency, limiting generalizability and obscuring the broader patterns of mortality risk across the profession.

Given that more than 800,000 individuals serve in sworn law enforcement roles in the U.S. (see Supplementary Material), this represents a significant gap in the public and occupational health literature. A comprehensive understanding of how and why LEOs die is essential for identifying preventable risks and shaping intervention strategies. The aim of this study is to describe all-cause and cause-specific mortality risk among U.S. LEOs by reporting crude and age-adjusted mortality rates from 2020 to 2023 using data from the National Occupational Mortality Surveillance (NOMS) program.

Methods

Overview

We analyzed all publicly available data from the NOMS Program, which included data from 2020 to 2023. The NOMS Program is a collaboration between the National Institute for Occupational Safety and Health (NIOSH), the National Center for Health Statistics (NCHS), and reporting jurisdictions.[8] Using death certificate data from the NCHS, information about cause of death, employment, and demographics (e.g., age, race/ethnicity) are collated by the NOMS Program. The NOMS Program reached complete coverage of the United States (i.e., 52 participating jurisdictions including Washington D.C. and New York City) in 2022. Data for 2020 and 2021 had 47 and 50 participating jurisdictions, respectively (Supplementary Table S1 gives participating jurisdictions by year). Using these data, we identified working-age individuals whose "usual occupation" was law enforcement, as well as their recorded cause of death and other demographic information like age, sex, and race/ethnicity. Combining these data with population data from the American Community Survey (ACS), we calculated all-cause and cause-specific mortality rates (described below).

Measures

Usual occupation

The United States Standard Certificate of Death[9] records employment information to determine the decedent's "usual" occupation/industry. The term "usual" denotes the occupation/industry in which an individual was employed for the longest duration of their working life. "Occupation" refers to the type of work an individual engaged in while "industry" is the type of business (e.g., hospital and school nurses have the same occupation, but different industries). Here, we rely solely on usual occupation as nearly all LEOs work in the same industry (i.e., public administration). We targeted three specific occupational groups related to law

enforcement work (Note: NOMS data prior to 2023 used 2012 Census codes, while the 2023 vintage of the NOMS data used 2018 census codes): (1) police officers/police and sheriff's patrol officers, (2) detectives and criminal investigators, and (3) first-line supervisors of police and detectives (Supplementary Table S2 gives census codes of law enforcement occupations by year).

Cause of death

The International Classification of Disease (ICD, 10th revision; ICD-10)[10] codes were used to inform our analysis regarding the cause of death for all decedents. ICD-10 codes were extracted from the medical certification portion of death certificates by the Division of Vital Statistics (DVS) of the NCHS[11] and translated into record-axis (i.e., person-based) codes, a process that reassigns ICD-10 codes in the context of all medical conditions originally listed. The resulting ICD-10 codes are high-quality, granular descriptions of the leading cause of death for all decedents contained in the NOMS data (a note about data quality of ICD-10 codes is provided in the Supplementary Methods and visual diagnostics are provided in Supplementary Figure S1). We aggregated ICD-10 codes up to the level of ICD-10 chapters to balance specificity of causes and sufficiently large numbers of decedents per cause to ensure the stability of mortality estimates (Supplementary Table S3 provides a list of all cause-specific analyses by chapter).

Demographic information

Demographic information was also extracted from death certificates including age at death, biological sex, and race/ethnicity information. We grouped age into 10-year age bands (i.e., 16–24, 25–34, 35–44, 45–54, 55–64). This approach was taken to facilitate direct age standardization. We present results for a 4-category classification of combined race/ethnicity including Hispanic and three non-Hispanic categories (i.e., Black, White, and all other non-Hispanic racial groups). Small cell counts prevented a more granular treatment of race/ethnicity in the current analysis.

Analysis

Samples selection

We restricted our analysis to NOMS decedents who met the following criteria: (1) were of working age (16–64 years at death); (2) had a usual occupation that was neither military nor unpaid (e.g., homemaker, volunteer; see Supplementary Table S2 for excluded census codes); (3) were permanent residents or U.S. citizens; and (4) had complete data on usual occupation, cause of death, and demographics variables of age, sex, race/ethnicity. The Organisation for Economic Co-operation and Development defines "working age" as 15–64 years[12]; however, we excluded individuals who died before age 16 because the American Community Survey (ACS)—our source for population denominators—does not collect occupational data for individuals under 16. This approach defines our analytic population as the non-military, non-institutionalized, working-age decedent population in the U.S. (hereafter, the "population" or "working-age population"). Within this group, we identified 15,384 LEO decedents out of a total 2,532,257 decedents (Table 1).

Analytic approach

All-cause and cause-specific mortality rates were the primary analytic outputs of this study. Crude mortality rates (CMRs) were calculated by dividing the number of LEO deaths in the NOMS data by a working-age LEO population denominator derived from the ACS. Age-standardized mortality rates (ASMRs) were calculated using the direct standardization method[13] by applying observed age-specific rates (i.e., within 10-year age bins) to the age structure of a standard population for both LEOs and the working-age population and then summing age-specific rates to get the ASMR (See Supplementary Methods for details on the calculation of mortality rates and variance estimates). Following prior work from the CDC using the NOMS data,[14] we used the 2000 Decennial Census as the standard population[15] (Supplementary Table S4). ASMRs allow for comparisons across groups or time points by accounting for differences in age structure, but represent relative—not absolute—mortality risk. CMRs, by contrast, reflect absolute mortality risk at specific time points within groups. As this was a population-based analysis, we did not conduct hypothesis tests, but standard errors were calculated for all CMRs and ASMRs to characterize variability.

Finally, we also calculated "mean" mortality rates that include information across all years to provide a sense of overall mortality burden in the study period. These mean mortality rates were calculated by pooling all deaths for a specific stratum across years and dividing by the sum of the corresponding person-years (i.e., 4 times the stratum-specific denominator). For ASMRs, the same weighting procedure was applied using the total pooled deaths and population estimates, with variance estimates reflecting the combined information across strata and years. Results are reported in three sections: (1) descriptive statistics, (2) all-cause mortality, and (3) cause-specific mortality. Supplementary analyses examine the robustness of findings to alternative estimation methods and assess sensitivity to data disruptions related to the COVID-19 pandemic.

Data source for population denominators

We used the 2019–2023 5-year American Community Survey Public Use Microdata Sample (ACS-PUMS) and person-level frequency weights to estimate population denominators for all reported mortality rates.[16] We selected ACS-PUMS for three main reasons: (1) it is a

Variable	LEOs, N = 15,384[a]		Working-age pop., N = 2,516,873	
	Male N = 13,127[b]	Female N = 2,257[b]	Male N = 1,703,938[b]	Female N = 812,935[b]
Year				
2020	3137 (24%)	565 (25%)	408,946 (24%)	192,638 (24%)
2021	3920 (30%)	656 (29%)	488,138 (29%)	231,082 (28%)
2022	3185 (24%)	509 (23%)	423,294 (25%)	204,118 (25%)
2023	2885 (22%)	527 (23%)	383,560 (23%)	185,097 (23%)
Age	54 (9)	54 (10)	51 (12)	53 (11)
Age (binned)				
16–24	115 (0.9%)	25 (1.1%)	55,968 (3.3%)	16,458 (2.0%)
25–34	672 (5.1%)	119 (5.3%)	164,132 (9.6%)	56,201 (6.9%)
35–44	1187 (9.0%)	225 (10.0%)	235,371 (14%)	99,727 (12%)
45–54	3683 (28%)	532 (24%)	386,346 (23%)	186,544 (23%)
55–64	7470 (57%)	1356 (60%)	862,121 (51%)	454,005 (56%)
Race/Ethnicity				
White	9086 (69%)	1265 (56%)	1,069,736 (63%)	519,568 (64%)
Black	2249 (17%)	708 (31%)	303,352 (18%)	173,890 (21%)
Hispanic	1318 (10%)	204 (9.0%)	247,937 (15%)	79,595 (9.8%)
Other	474 (3.6%)	80 (3.5%)	82,913 (4.9%)	39,882 (4.9%)
Cause of Death (ICD-10 Chapter)				
Circulatory (9)	3212 (24%)	391 (17%)	381,372 (22%)	148,062 (18%)
Cancer (2)	2625 (20%)	768 (34%)	274,154 (16%)	223,763 (28%)
External Causes (20)	2584 (20%)	358 (16%)	491,141 (29%)	138,129 (17%)
Provisional Codes (Covid-19) (22)	1592 (12%)	176 (7.8%)	126,977 (7.5%)	60,763 (7.5%)
Digestive (11)	759 (5.8%)	115 (5.1%)	106,486 (6.2%)	53,551 (6.6%)
Metabolic (4)	718 (5.5%)	89 (3.9%)	87,398 (5.1%)	42,675 (5.2%)
Respiratory (10)	374 (2.8%)	106 (4.7%)	66,146 (3.9%)	46,338 (5.7%)
Nervous System (6)	350 (2.7%)	67 (3.0%)	31,573 (1.9%)	22,460 (2.8%)
Infection/Parasite (1)	249 (1.9%)	48 (2.1%)	36,545 (2.1%)	20,267 (2.5%)
Genitourinary (14)	202 (1.5%)	36 (1.6%)	23,259 (1.4%)	14,585 (1.8%)
Mental/Behavioral (5)	186 (1.4%)	38 (1.7%)	39,778 (2.3%)	13,557 (1.7%)
Hematopoietic (3)	103 (0.8%)	26 (1.2%)	9664 (0.6%)	7482 (0.9%)
Suppressed	173 (1.3%)	39 (1.7%)	29,445 (1.7%)	21,303 (2.6%)

[a]These numbers reflect the total number of decedents with complete information; however, 82,821 decedents had missing occupational information and an additional 3159 decedents (462 LEOs) had missing race/ethnicity information. These cases (representing 3.28% of the complete NOMS data) were not included in the analysis. [b]n (%); Mean (SD).

Table 1: **Descriptive statistics of the working-age decedents (16–64) in the 2020–2023 NOMS data (*N~Total~* = 2,532,257).**

continuous, nationally representative survey conducted by the U.S. Census Bureau to reliably capture the intercensal population and housing estimates using a multi-mode approach to data collection (e.g., mailed surveys, computer assisted telephone interviews, and in-person interviews); (2) the 5-year data enable more accurate estimates for relatively small groups (e.g., LEOs) compared to data sources that use data from a single month (e.g., the Current Population Survey) or single year (e.g., the ACS-PUMS 1-year data); and (3) the larger sample size (approximately 5% of the U.S. population) produces more stable estimates over time—particularly important given pandemic-related disruptions to survey collection.

While ACS-PUMS is uniquely suited for this purpose, two limitations are worth noting. First, use of 5-year estimates means the population denominators are time-invariant within strata (e.g., White male LEOs), so annual mortality rates reflect year-to-year changes in deaths rather than true year-specific mortality risk. Second, the ACS survey weights are not designed for occupation-level estimates. We addressed this issue by calibrating the survey weights to align with an external estimate of the LEO workforce calculated using data from two data sources: the Law Enforcement Management and Administrative Statistics survey and Census of Federal Law Enforcement Officers survey (both administered in 2020). See Supplementary Methods for full calibration details.

Ethical statement

This study did not require institutional review board (IRB) approval because it analyzed only publicly available, de-identified data. This study followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) reporting guidelines for a cross-sectional study.[17]

Role of funding source
The authors received no funding support for the current work.

Results

Descriptive results

Between 2020 and 2023, a total of 15,384 working-age individuals whose usual occupation was law enforcement died in the United States (Table 1). Most deceased law enforcement officers (LEOs) were men (85.3%) and their racial/ethnic composition generally mirrored decedents from the rest of the working-age population, though some exceptions were noted. Among male LEOs who died, a greater percentage were White (69.2% vs. 62.8% in the population) and a lower percentage were Hispanic (10% vs. 14.6% in the population). Among female LEOs, a lower percentage of decedents were White (56% vs. 63.9% in the population) and a greater percentage were Black (31.4% vs. 21.4% in the population). Beginning around age 46, a greater percentage of LEOs died compared decedents from the working-age population (Fig. 1, Panel A). Annually, as might be expected due to the COVID-19 pandemic, all-cause mortality counts for LEOs were highest in 2021 (N = 4576) compared to the other years in the NOMS data (N's ranged from 3412–3702). From the 2020 baseline, the percentage of LEO deaths increased by a greater degree during the peak of the pandemic (2021) compared to the population (Fig. 1B). Across specific causes of death among LEOs, causes related to the circulatory system accounted for the greatest percentage of deaths (23.4%), followed by cancers (22.1% of deaths) and external causes (19.1% of deaths) (Fig. 1C and D).

We next present national-level mortality rates that incorporate population denominators. We begin with all-cause mortality rates, followed by cause-specific rates; all are stratified by sex. For within-group comparisons, we report crude mortality rates (CMRs), as group-specific population denominators did not vary over time and CMRs provide a more direct measure of absolute mortality risk. For between-group comparisons, we report age-standardized mortality rates (ASMRs) to account for differences in underlying age distributions. ASMRs are a relative metric and should not be interpreted as reflecting absolute mortality burden. Following CDC guidelines, we do not report rates based on fewer than 20 deaths per subgroup as these may be unreliable.

All-cause mortality among law enforcement officers

LEOs in the United States experienced considerable variation in all-cause mortality between 2020 and 2023. From 2020 to 2021 (i.e., when mortality peaked), the CMR for male LEOs increased from 466.8 (95% CI = [450.5, 483.2]) to 583.3 (95% CI = [565.1, 601.6]) per 100,000 (i.e., an increase of 116.5 deaths per 100,000) (Table 2). Female LEOs experienced a similar pattern, with their CMR increasing from 423.5 (95% CI = [388.6, 458.4]) to 491.7 (95% CI = [454.1, 529.4]) per 100,000. When comparing ASMRs, male and female LEOs showed nearly identical rates at both the start (400.1–400.5 per 100,000, respectively) and end of the period (374.7–377.2 per 100,000, respectively). The intervening years were defined by a larger increase in mortality for male LEOs compared to their female counterparts. In 2021, for instance, male LEO mortality peaked at 499.8 (95% CI = [483.6, 516.1]) per 100,000 while female LEOs only increased to 461.1 (95% CI = [425.6, 496.6]) per 100,000.

Although female LEOs had a lower absolute mortality compared to male LEOs, comparisons of sex-specific mortality rates to the rest of the working-age population revealed an excess mortality burden for female LEOs. For instance, the mean mortality rate for female LEOs over the study period ($ASMR_{mean}$ = 400.7, 95% CI = [383.9, 417.4] per 100,000) was 2.2 times larger than the mean mortality rate for the female working-age population ($ASMR_{mean}$ = 181.4, 95% CI = [181, 181.8] per 100,000). Male LEOs, in contrast, experienced a mean mortality rate for the period that was only 1.1 times (i.e., 8.1%) larger than that of the male working-age population ($ASMR_{mean}$ = 421.8, 95% CI = [414.3, 429.4] and 390.3, 95% CI = [389.7, 390.9] per 100,000, respectively) (Fig. 2A).

Unique patterns of mortality were also observed among LEOs along the dimensions of race and ethnicity. In terms of both absolute level of mortality risk and annual change, all-cause mortality was similar for White LEOs across the period regardless of sex (Fig. 2B). As above, we observed excess mortality burden for LEOs compared to the population for both sexes, but White female LEOs demonstrated a greater disparity with the population ($ASMR_{mean}$ = 421, 95% CI = [397.5, 444.5] vs. 175.5, 95% CI = [174.9, 176] per 100,000) compared to White male LEOs ($ASMR_{mean}$ = 422.2, 95% CI = [413.1, 431.3] vs. 362.6, 95% CI = [361.9, 363.4] per 100,000) (Supplementary Table S5). This sex-bias was also observable for female LEOs who were either Black ($ASMR_{mean}$ = 472.7, 95% CI = [436.6, 508.8] per 100,000) or Hispanic ($ASMR_{mean}$ = 249, 95% CI = [213.9, 284] per 100,000) (Note: mortality rates were not presented for female LEOs of "Other" races/ethnicities due to there being fewer than 20 decedents per year for this group).

Unique among all groups, Hispanic male LEOs exhibited a mortality burden that was consistently low. Hispanic male LEOs ($ASMR_{mean}$ = 328.2, 95% CI = [309.7, 346.7] per 100,000) fared better when compared against other racial/ethnic groups within law enforcement and against their counterparts in the working-age population ($ASMR_{mean}$ = 443.7, 95% CI = [441.9, 445.4]

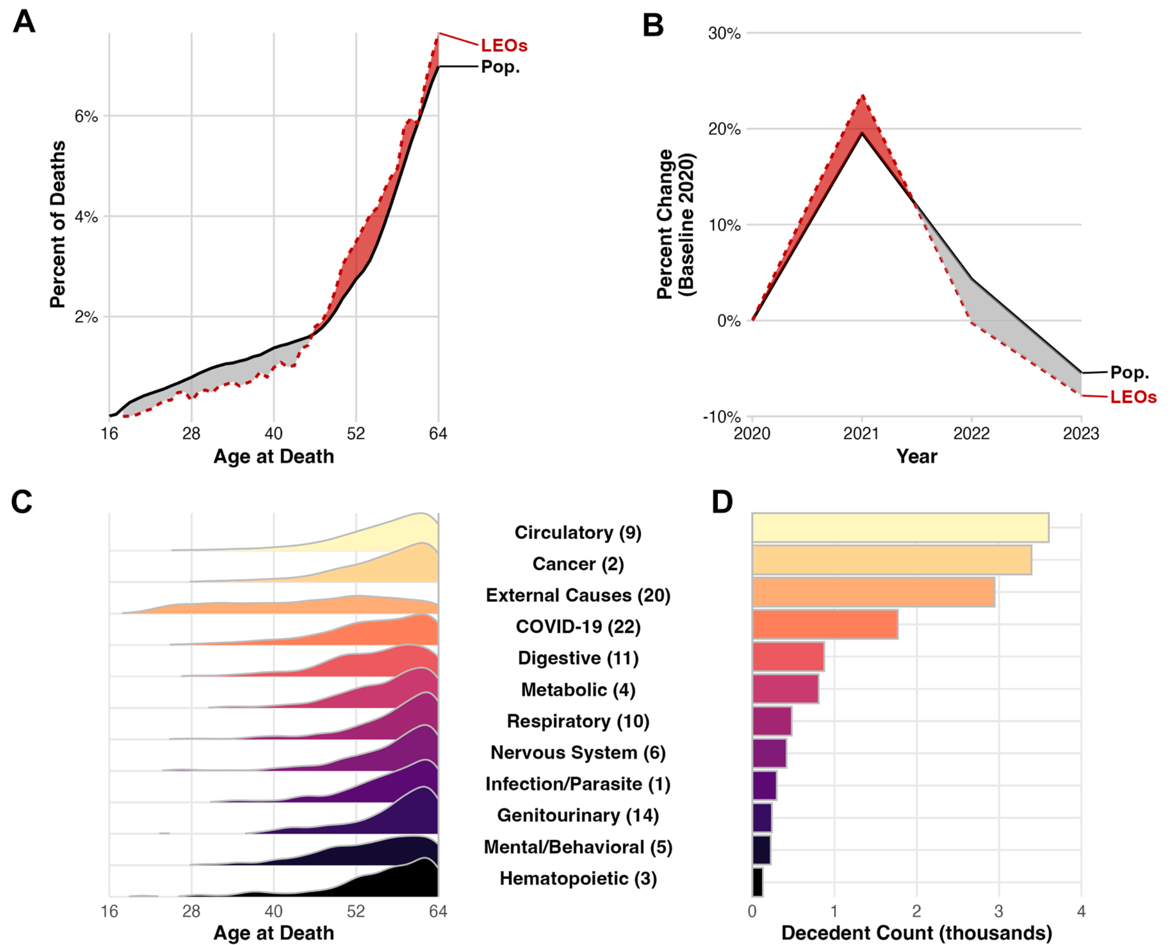

Fig. 1: All-cause and cause-specific mortality trends for LEOs compared to the population and across the working age years. **Panel A** shows the percent of LEO deaths (dashed red line) compared to the population (solid black line) from age 16 to 64. After age 46, LEOs exhibited a greater percentage of deaths relative to the percent of deaths from the population. **Panel B** presents the change in total deaths for LEOs and the rest of the working-age population relative to a 2020 baseline. LEOs experienced a greater percent increase in deaths in 2021 compared to the population. After 2021, however, LEOs experienced a smaller change in percent deaths compared to the population. **Panel C** presents the cause-specific density curves of LEO deaths across ages 16–64. Causes correspond to all ICD-10 chapters (parentheses) with at least 20 law enforcement decedents for each year of data. **Panel D** presents the raw counts (thousands) of law enforcement decedents across all four years of data. Abbreviations: LEOs, law enforcement officers; Pop., working-age population.

per 100,000). In contrast, male LEOs who were either Black or of "Other" racial/ethnic groups did not consistently differ from their population counterparts–although, Black male LEOs exhibited the highest mortality burden across all male LEO race/ethnicity groups ($ASMR_{mean}$ = 585.9, 95% CI = [558.9, 612.9] per 100,000).

These results use various methods to account for known axes of variation in mortality across the population (e.g., age, sex, race/ethnicity). To test the robustness of these results to the method of estimation, we used a general linear modeling (GLM) approach to model the count data as rates by including an exposure variable (log of the at-risk population).[18] Using negative binomial regression (i.e., to address overdispersion observed in the data), we re-estimated the above mortality rates by regressing group counts on occupation (i.e., LEO vs. other), sex, race/ethnicity, 10-year age band, and year of death. Although we did not observe excess mortality for White male LEOs using this approach, the other main results reported above were largely replicated (see Supplementary Results for full details and Supplementary Tables S6 and S7 for results). We also used this method to assess the sensitivity of our results to the excess mortality in the study period due to the COVID-19 pandemic. We removed all COVID-19 mortality cases from the data and re-estimated the negative binomial models—the pattern

Year	LEOs			Working-age pop.		
	Count	CMR (95% CI)	ASMR (95% CI)	Count	CMR (95% CI)	ASMR (95% CI)
Female						
2020	565	423.53 [388.6–458.4]	400.54 [367.1–434]	192,638	200.92 [200–201.8]	170.86 [170.1–171.7]
2021	656	491.74 [454.1–529.4]	461.13 [425.6–496.6]	231,082	241.01 [240–242]	206.74 [205.9–207.6]
2022	509	381.55 [348.4–414.7]	363.76 [331.7–395.8]	204,118	212.89 [212–213.8]	182.30 [181.5–183.1]
2023	527	395.04 [361.3–428.8]	377.24 [344.4–410]	185,097	193.05 [192.2–193.9]	165.74 [165–166.5]
Mean	2257	422.96 [405.5–440.4]	400.67 [383.9–417.4]	812,935	211.97 [211.5–212.4]	181.41 [181–181.8]
At-Risk	133,404			95,879,705		
Male						
2020	3137	466.82 [450.5–483.2]	400.10 [385.6–414.6]	408,946	432.93 [431.6–434.3]	371.22 [370–372.4]
2021	3920	583.34 [565.1–601.6]	499.82 [483.6–516.1]	488,138	516.77 [515.3–518.2]	447.43 [446.1–448.7]
2022	3185	473.97 [457.5–490.4]	412.71 [397.6–427.9]	423,294	448.12 [446.8–449.5]	388.72 [387.5–389.9]
2023	2885	429.32 [413.7–445]	374.73 [360.3–389.2]	383,560	406.05 [404.8–407.3]	353.68 [352.5–354.8]
Mean	13,127	488.37 [480–496.7]	421.84 [414.3–429.4]	1,703,938	450.97 [450.3–451.6]	390.26 [389.7–390.9]
At-Risk	671,987			94,460,175		

Abbreviations: ASMR, age-standardized mortality rate; CI, confidence interval; CMR, crude mortality rate; LEO, law enforcement officer.

Table 2: **Sex-stratified all-cause mortality rates among LEOs and the working-age population (2020–2023).**

of results was unchanged. Results of models with/without COVID-19 cases are visualized in Supplementary Figure S2.

Cause-specific mortality among law enforcement officers

To better understand the mortality burden among law enforcement personnel, we examined cause-specific mortality using ICD-10 codes. Causes of death were grouped by ICD-10 chapter to balance specificity with sufficient case counts for reliable estimation. For clarity and comparability, we present mean annualized ASMRs based on pooled deaths over the four-year study period. Following standard practice, we do not report rates for ICD-10 chapters with fewer than 20 deaths (for law enforcement) per stratum. Due to the male-dominated composition of the law enforcement workforce, this threshold led to the suppression of most female-specific results. We report cause-specific mortality for male LEOs across twelve causes of death (from 22 ICD-10 chapters); for female LEOs, only five causes—circulatory, cancers, external causes, digestive, and respiratory—met inclusion criteria (Supplementary Table S3 provides a complete list of reported cause-specific results by sex). All sex-stratified cause-specific mortality rates are reported in the Supplementary Material (Supplementary Tables S8–S19). We also report cause-specific mortality rates for three ICD-10 chapters (i.e., for cancers, circulatory conditions, and external causes) that are stratified by sex and race/ethnicity (Supplementary Tables S20–S22); however, we focus our reporting on results stratified by sex only.

We found strong overall agreement between the leading causes of death among male LEOs and the working-age population (Fig. 3A). However, several exceptions were noted, especially in the top four causes of death. First, among male LEOs, circulatory conditions were the leading cause of death (24.5% of deaths [n = 3212]), whereas external causes ranked first among all other working-age male decedents (28.8% of deaths [n = 491,141]). While male LEOs had greater mortality risk from circulatory conditions compared to the male working-age population ($ASMR_{mean}$ = 100.7 vs. 81 per 100,000), they had lower mortality risk from external causes ($ASMR_{mean}$ = 91, 95% CI = [87, 95.1] vs. 131.6, 95% CI = [131.2, 132] per 100,000). For all male decedents (LEOs and the rest of the population), cancers and COVID-19 were the third and fourth leading causes of death over the study period. In both cases, however, male LEOs exhibited an exaggerated mortality burden relative to the population. For instance, male LEOs had a mean ASMR of 49.7 (95% CI = [47.2, 52.1]) per 100,000 due to COVID-19, compared to 27.9 (95% CI = [27.7, 28.1]) per 100,000 in the population. In 2021, COVID-19 mortality was at its height and the disparity in its mortality burden between male LEOs and the population also peaked (ASMRs were 116.9, 95% CI = [109.3, 124.5] and 63.8, 95% CI = [63.3, 64.3] per 100,000, respectively). Supplementary Figures S3 and S4 present the leading causes of death overtime for all LEOs and the working-age population and highlight the exagerated impact of COVID-19 on LEO mortality.

Among female LEOs, the top three causes of death were (in order) cancers, circulatory conditions, and external causes. Female LEOs exhibited greater mortality risk for all three causes compared to female decedents in the population. The disparity in mortality burden for cancers was notable, however, with mean ASMRs of 135.2 (95% CI = [125.6, 144.8]) and 47.1 (95% CI = [46.9, 47.3]) per 100,000 for female LEOs and the population, respectively. And while male LEOs also

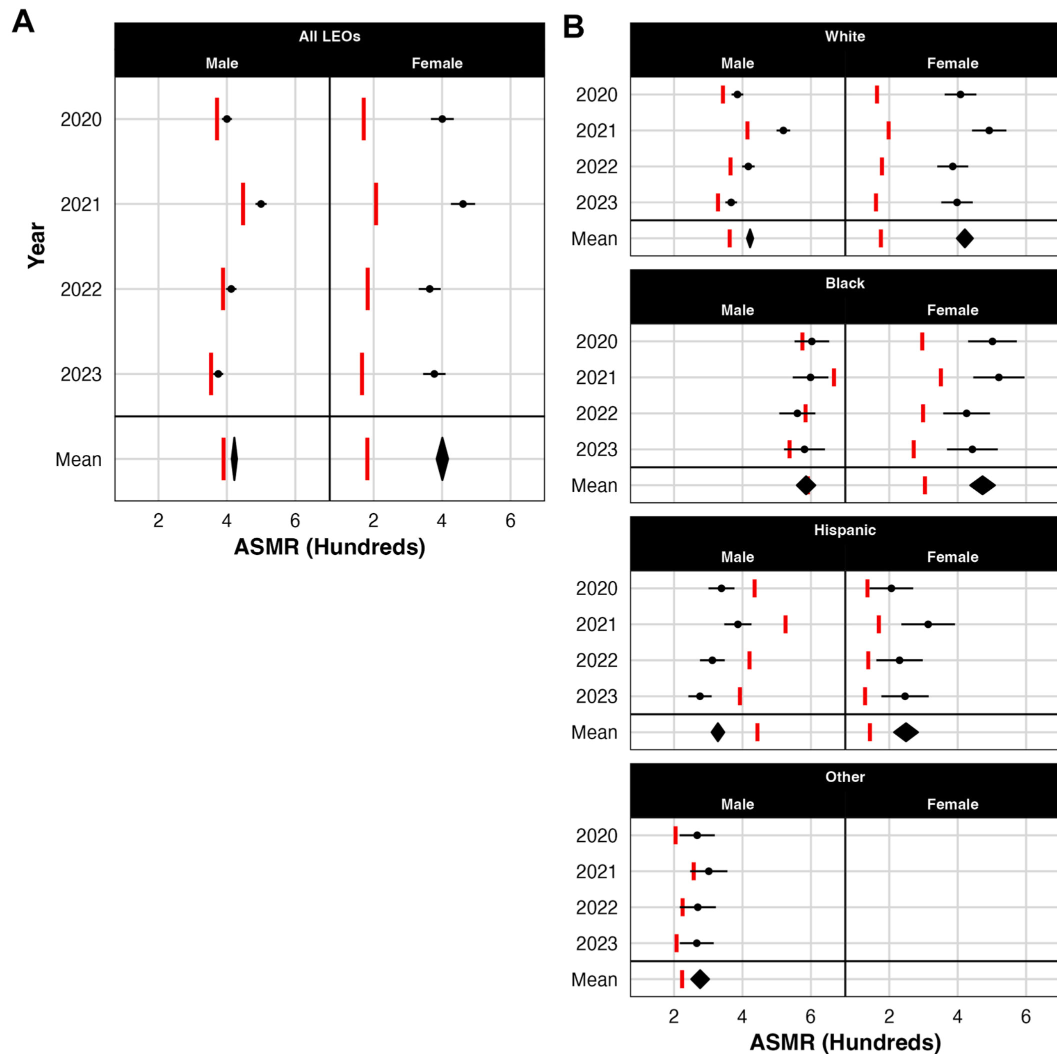

Fig. 2: Age-standardized mortality rates (ASMRs) for all-cause mortality among all LEOs and stratified subgroups across years. ASMRs and 95% confidence intervals (CIs) are plotted for individual years. Means of annual ASMRs (black diamonds) are also presented. Population point estimates of ASMRs (vertical red lines) are displayed for comparison purposes. **Panel A** presents sex-stratified ASMRs for all LEOs. **Panel B** presents sex-stratified ASMRs for different racial/ethnic groups separately. Abbreviation: LEOs, law enforcement officers.

exhibited an exaggerated cancer mortality burden compared to the population (mean ASMRs of 82.5 and 55.1 per 100,000, respectively), it too was small compared to the cancer burden of female LEOs.

To provide cause-specific mortality rates with more fire-grained clinical relevance than ICD-10 chapters, we examined smaller groupings within the top three cause of death categories using the National Center for Health Statistics (NCHS) classification scheme. This system summarizes ICD-10 codes into 39 more refined categories.[19] These "NCHS groups" are useful for providing a more focused discussion around clinically relevant categories (Supplementary Tables S23–S54). Overall, we again observed a high degree of concordance between male LEOs and the working-age population in the rankings of individual causes of death within circulatory (Supplementary Tables S27, S41–S45) and cancer (Supplementary Tables S27, S29–S35) groupings, with male LEOs generally demonstrating elevated mortality rates compared to the rest of the male population (Fig. 3B). The largest discrepancies in specific causes of death were observed for external causes.

Among male LEOs, the leading external cause of death was intentional self-harm/suicide (n = 1070 deaths), accounting for 41.4% of externally-caused deaths and 8.2% of all male LEO deaths. This stands in contrast to the general working-age male population,

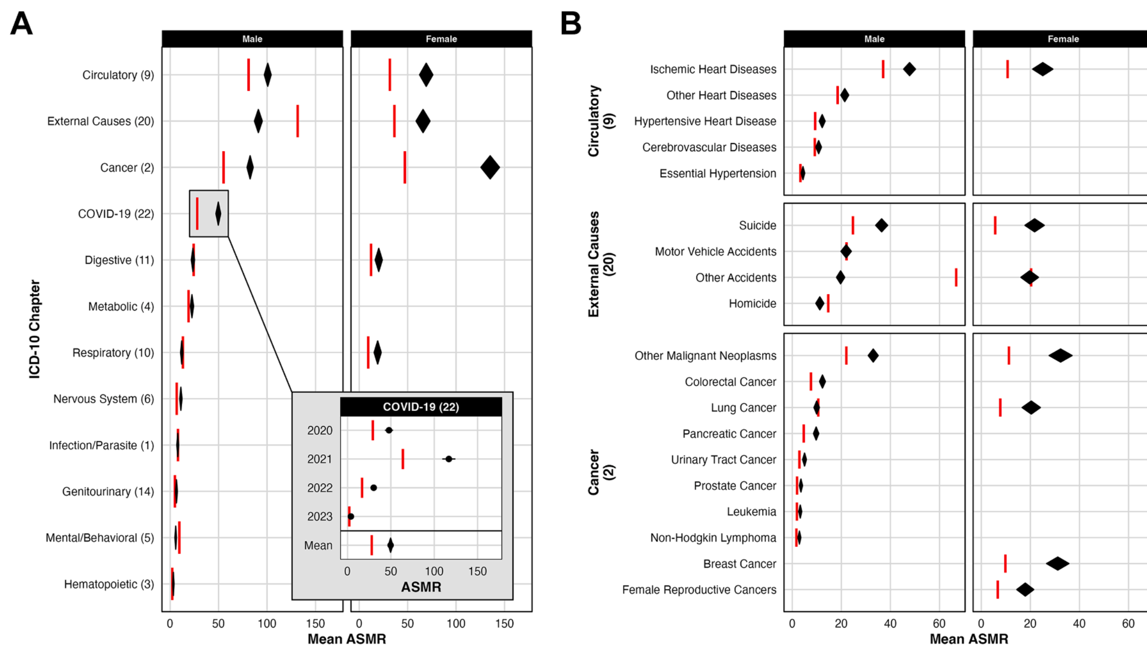

Fig. 3: Age-standardized mortality rates (ASMRs) for cause-specific mortality among law enforcement officers (LEOs). Mean ASMRs are represented by black diamonds, the width corresponding to their 95% confidence interval (CI). Population point estimates of mean ASMRs (vertical red lines) are displayed for comparison purposes. **Panel A** presents cause-specific ASMRs for individual ICD-10 chapters. The inset plot highlights the high volatility of COVID-19 mortality among LEOs. **Panel B** presents cause-specific mean ASMRs for the NCHS groups within the top three causes of death (i.e., circulatory, external causes, and cancers). Abbreviation: ICD-10, International Classification of Diseases (10th revision).

where suicide deaths across the study period (n = 92,935) accounted for only 18.9% of externally-caused deaths and 5.5% of all male deaths (Supplementary Table S54). Compared to intentional self-harm/suicide, externally-caused deaths attributed to "other accidents" (n = 607) accounted for a smaller percentage of deaths among male LEOs (23.5%) compared to the working-age population (51.1% [n = 250,848]).

As with the analysis at the level of ICD-10 chapters, fewer cause-specific mortality rates at the level of NCHS groups were estimated for female LEOs due to the smaller number of decedents. Mortality rates for breast cancer, female reproductive cancers, lung cancers, and other malignant neoplasms, ischemic heart diseases, intentional self-harm/suicide, and other accidents were included (Supplementary Tables, 26, 28, 30, 32, 44, 53, and 54, respectively). In all cases (i.e., except for other accidents), however, female LEOs exhibited exaggerated mortality burden relative to female decedents in the working-age population. For cause-specific mortality rates for all included NCHS groups, refer to Supplementary Tables S25–S54 (Note: NCHS groups include a "other diseases" category that includes ICD-10 codes from different chapters. For all of the presented results, we nested NCHS groups within ICD-10 chapters to provide some limited degree of specificity for this catch-all category).

Dissecting external causes of death—suicide and accidental deaths

After observing distinct patterns of externally caused mortality among LEOs—increased mortality risk for suicide and decreased risk from other accidents (compared to the working-age population)—we increased the level of resolution of our analysis of ICD-10 codes to provide more insight into these trends. Using individual ICD-10 codes, we subdivided intentional self-harm/suicide deaths into eight categories defined by the method of suicide completion (Supplementary Figure S5). Among LEOs, we found that firearms were the predominant method for suicide completion for male LEOs (86% of suicide deaths [n = 919]). Firearms were also the leading method for suicide completion among male decedents in the population, though the margin was lower (55.5% of suicide deaths [n = 51,527]). Unlike the working-age population wherein male and female decedents had somewhat distinct patterns in the methods used for suicide completion, male and female LEOs exhibited comparatively similar levels of elevated reliance on firearms (86% and 73.4% [n = 919 and 91], respectively).

Within the NCHS group for "other accidents", we subdivided ICD-10 codes into ten homogeneous groups (Supplementary Figure S6) and found that causes of death deemed "accidental poisonings" (ICD-10

codes X40–49; e.g., drug overdose, alcohol poisoning) were underrepresented among male LEOs compared to the population (i.e., 48.3% vs. 81.8% of deaths [n = 293 and 204,847], respectively). The same disparity in accidental poisonings was observed for female LEOs and the population (59.1% vs. 81.9% of deaths [n = 68 and 63,426], respectively). The relative dearth of accidental poisonings among LEOs helps to explain why the their mortality risk from the more general NCHS grouping of "other accidents" is substantively lower than that observed for the working-age population.

Discussion

Law enforcement officers (LEOs) in the United States face a higher mortality burden than the general population. Until now, evidence on the scale and nature of this burden has been limited and fragmented. Using data from over 2.5 million individuals, we conducted the first comprehensive assessment of mortality risk among >15,000 working-age decedents whose usual occupation was law enforcement. Our analysis revealed elevated all-cause and cause-specific mortality risks, with shifting patterns from 2020 to 2023 that reflected the impact of the COVID-19 pandemic.

LEOs consistently exhibited elevated mortality risk compared to the general population, with the disparity peaking in 2021 during the height of the COVID-19 pandemic. Risk varied by sex and race/ethnicity: male and Black LEOs had the highest absolute mortality, while female and White LEOs experienced greater relative excess risk compared to their peers in the general population. Hispanic LEOs generally showed the lowest mortality, with Hispanic male LEOs also faring better than their population counterparts. These patterns suggest that employment in law enforcement differentially impacts mortality risk across demographic groups. While law enforcement carries health risks—likely due to occupational stressors and exposures—it also provides benefits such as stable income and health insurance. The net effect on mortality may therefore depend on a LEO's baseline risk. For example, because working-age women in the general population have relatively low mortality, even modest increases among female LEOs translate to a large relative risk. Such a pattern of excess mortality risk among female LEOs was repeatedly observed in our results. While rarely experiencing greater mortality risk than male LEOs (the notable exception being the mortality risk from cancers), female LEOs experienced a greater mortality burden than their working-age counterparts in the population across almost every specific cause of death studied, as well as all-cause mortality. The elevated mortality risk among female LEOs during working-age years likely stems from multiple intersecting mechanisms that disproportionately affect women, including higher rates of PTSD and depression among female officers, greater exposure to workplace sexual harassment and discrimination creating chronic stress, intensified work-family conflict due to the "double burden" of domestic responsibilities, and shift work disruption of circadian rhythms and immune function compounded by gender-specific health vulnerabilities.[20–25]

The leading causes of death among LEOs mirrored those in the working-age population, though their rankings differed (e.g., external causes were the third leading cause among LEOs vs. the leading cause in the population). Within the general categories of circulatory and cancer-related deaths—the first and second leading causes among LEOs (by count)——most specific causes showed elevated mortality risk. The most pronounced differences between male LEOs and the population were in external causes of death. Two specific external causes of death showed marked differences with the rest of the working-age population: intentional self-harm/suicide and accidental deaths. The ASMR for suicide among male LEOs during the study period was 36.4 deaths per 100,000, 1.5 times higher than the 24.7 deaths per 100,000 in the general population. A similar pattern was observed for female LEOs, though the risk was lower (ASMR of 21.7 per 100,000). This finding aligns with recent evidence from the *First H.E.L.P.* database that reports a suicide mortality rate of 21.4 per 100,000 active duty LEOs (i.e., male and female) between 2016 and 2022.[3] Other work has documented elevated rates of suicidal ideation[26] and suicide deaths[5] among LEOs compared to other occupations. These elevated risks are likely due to a combination of occupational stress, repeated trauma exposure, substance use, strained interpersonal relationships, and ready access to firearms.[26] Regarding firearms, the NOMS data do not allow us to assess the causal role of firearm access in LEO suicide; however, the current findings show clearly that firearms play a disproportionate role in suicide completion for LEOs, a fact that suicide prevention efforts within law enforcement agencies must address. Another external cause of death—other accidents—was substantively less prominent among LEOs than in the population. Closer examination revealed that the main driver of this disparity was the preponderance of deaths by accidental poisoning (e.g., overdose, alcohol poisoning) in the working-age population.

Our findings for cause-specific mortality are consistent with prior research identifying circulatory conditions, cancers, and suicide as leading causes of death among LEOs.[6] However, this analysis extends prior work by providing national-level mortality estimates across all leading causes, enabling comparisons to the general population and within the law enforcement workforce (e.g., by time, subgroup, and cause of death). Our results underscore the need for targeted interventions to reduce law enforcement mortality from these causes. The International Association of Chiefs of

Police (IACP) and the National Law Enforcement Officers Memorial Fund (NLEOMF) serve as centralized platforms for LEO health and wellness programming.[27,28] However, our findings do not identify specific etiological factors driving the mortality burden among LEOs. Prior studies have suggested several plausible contributors, such as shift work, high-intensity situations, chronic trauma, exposure to vehicle emissions and hazardous materials for elevating chronic disease risk[2,7,29] and factors related to interpersonal relationships, substance use, sleep quality, physical/mental health, and firearm access for suicide risk.[30] Addressing these risks will require coordinated collaboration between researchers and law enforcement agencies to develop and implement effective interventions tailored to the occupational realities of law enforcement.

The study period of this analysis is notable for spanning a global public health crisis—the COVID-19 pandemic. Documenting COVID-19-related mortality is essential, particularly among first responders like LEOs, yet the pandemic complicates efforts to establish a stable baseline for LEO mortality. For example, COVID-19 was the leading cause of death among LEOs in 2021 but fell out of the top ten by 2023 (Supplementary Figure S3). In contrast, COVID-19 peaked as only the fourth leading cause of death in the general population from 2020 to 2021 before declining (Supplementary Figure S4). LEOs—and first responders more broadly[31]—experienced disproportionately high COVID-19 mortality during this period. We investigated the impact of COVID-19 on our estimates by removing all COVID-19-related deaths from the data in a sensitivity analysis and found that the overall trends in our results were not substantively impacted.

But what explains the disproportionate COVID-19 mortality rates among LEOs? This elevated risk likely reflects the intersection of occupational exposure, institutional culture, and individual behavioral choices. As frontline responders, LEOs were uniquely vulnerable to infection during the early stages of the pandemic, often working with the public in unprotected and high-contact environments where social distancing and common prevention practices were impractical. This vulnerability was likely compounded by vaccine hesitancy within the law enforcement community, which has been documented and may have further increased the risk of severe outcomes.[32,33] Additionally, in some jurisdictions, institutional and political resistance to public health guidance may have discouraged adherence to protective behaviors such as masking, social distancing, and vaccination.[34] Taken together, occupational hazards, variation in the use of personal protective equipment, and individual attitudes towards prevention measures likely created conditions that made COVID-19 the leading cause of law enforcement deaths in 2021.

We acknowledge several limitations. First, the analysis is based on individuals whose usual occupation was law enforcement. As a result, the findings do not isolate mortality risk for active-duty LEOs but rather capture trends among those who spent most of their careers in the profession, including those who died after retirement or career changes. This approach has trade-offs: it excludes short-term workers with minimal law enforcement exposure but includes individuals whose long-term occupational risks were shaped by the job. This brings the analysis closer to identifying deaths that may have occurred *because* of the job—not just *during* it. Second, the NOMS data did not achieve full national coverage until 2022. In 2020 and 2021, only 47 and 50 of 52 jurisdictions, respectively, submitted records. Because we used denominators representing the full U.S. population (including all 50 states and D.C.), mortality rates in those early years may be conservative. Third, we used a 5-year average to estimate population denominators, which limits inferences about absolute annual mortality risk. However, this approach improves stability across demographic strata and helps mitigate issues introduced by COVID-19-related disruptions in survey administration. Finally, there is a definitional mismatch between the numerator and denominator: NOMS identifies a decedent's usual occupation, while ACS-PUMS captures current occupation. Following prior work,[35] we restricted analyses to the working-age population (16–64), where alignment between usual and current occupation is higher. Nonetheless, some misclassification may remain.

LEOs face a heightened mortality burden—not only overall, but in the timing, causes, and demographic distribution of death. These patterns likely reflect the cumulative impact of occupational stress, hazardous exposures, and institutional challenges. Mortality risk was driven primarily by circulatory diseases, cancers, external causes (notably suicide), and—though its impact has receded—COVID-19. We hope this study offers a clear, unified evidence base for researchers, law enforcement professionals, and policymakers working to understand and reduce the mortality risks confronting this critical workforce.

Contributors
The study was conceptualized and designed by PTT, JCB, JPB, and MHM. PTT conducted data curation and conducted the formal analysis, assisted by JCB and MHM. PTT, JCB, and MHM wrote and edited the original manuscript. PTT and MHM directly accessed and verified the underlying data reported in the manuscript. PTT coordinated the submission and peer review process. PTT, JCB, JPB, and MHM critically reviewed the manuscript, tables, and figures and approved the final version.

Data sharing statement
All data used in the current work are publicly available. Data may be accessed or downloaded at the following websites: American Community Survey data (https://www.census.gov/programs-surveys/acs.html); National Occupational Mortality Surveillance data (https://www.cdc.

gov/nchs/nvss/mortality_public_use_data.htm). Decennial census data (2000) was downloaded via the {*tidycensus*} R package.[36]

Declaration of generative AI and AI-assisted technologies in the writing process

The authors used *ChatGPT* as an editorial tool during the editing phase of this work. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Declaration of interests

The authors declare no conflict of interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lana.2025.101270.

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