The Disproportionate Cost of Smoking for African Americans in California

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Objectives. We estimated the economic impact of smoking on African Americans in California in 2002, including smoking-attributable health care expenditures and productivity losses from smoking-caused mortality.

Methods. We estimated econometric models of smoking-attributable ambulatory care, prescription drugs, inpatient care, and home health care using national and state survey data. We assessed smoking-attributable mortality using epidemiological models.

Results. Adult smoking prevalence for African Americans was 19.3% compared with 15.4% for all Californians. The health care cost of smoking was $626 million for the African American community. A total of 3013 African American Californians died of smoking-attributable illness in 2002, representing a loss of over 49 000 years of life and $784 million in productivity. The total cost of smoking for this community amounted to $1.4 billion, or $1.8 billion expressed in 2008 dollars.

Conclusions. Although African Americans account for 6% of the California adult population, they account for over 8% of smoking-attributable expenditures and fully 13% of smoking-attributable mortality costs. Our findings confirm the need to tailor tobacco control programs to African Americans to mitigate the disproportionate burden of smoking for this community. (*Am J Public Health.* 2010;100:152–158. doi:10.2105/AJPH.2008.149542)

Cigarette smoking continues to be a major public health hazard in the United States. Each year, over 440 000 Americans die from cigarette smoking.[1] Smoking accounts for 1 of every 5 deaths and leads to substantial health care costs and lost productivity.[2–5] Minority groups have the highest illness and mortality rates, and among them, African Americans bear the greatest burden.[6–8] African American adults are more likely to die from 3 leading causes of smoking-related death—coronary heart disease, stroke, and lung cancer—than other adults.[7] They have high rates of tobacco-related cancer.[9]

Although smoking prevalence has declined among African American adults since 1990, as it has among the general population, it remains unacceptably high. In the United States in 2007, smoking prevalence was higher among African American men than among White men (24.8% versus 23.1%) but lower among African American women than among White women (15.8% versus 19.8%).[10] In California in 2005, the highest adult smoking prevalence was among African Americans (18.9%), compared with 14.5% among Whites, 11.8% among Hispanics, and 11.0% among Asian/Pacific Islanders.[11]

Although there is a growing body of evidence documenting the high rates of smoking and smoking-related disease among African Americans, research documenting the resulting economic impact is lacking. We estimated the economic impact of smoking for the African American community in California for 2002, which will be useful for guiding policymakers and advocates to develop programs and policies that can mitigate the impact of smoking for this population. We developed 2 measures of economic impact: smoking-attributable health care expenditures and productivity losses resulting from smoking-attributable mortality.

METHODS

We estimated smoking-attributable health care expenditures and mortality costs by using a prevalence-based annual cost approach.[2,12,13] The economic burden of smoking was estimated for all smoking-related illness and deaths incurred in a given year regardless of when a person first became ill. A "smoking-attributable fraction," which indicated the proportion of expenditures or deaths that could be attributed to smoking, was estimated and applied to the total measure of interest. The approaches for determining the smoking-attributable fractions for health care expenditures and mortality were somewhat different.

Data

Several data sets were used. The primary data set for estimating the national model of smoking-attributable health care expenditures was the Medical Expenditure Panel Survey (MEPS) Annual Consolidated Person files.[14] The MEPS survey uses the National Health Interview Survey (NHIS) as its sampling frame. Each year a new MEPS panel is established, drawing from the previous year's NHIS households so that the MEPS data can be linked to the NHIS data.[15] The MEPS is a nationally representative survey containing detailed information about each individual's health care utilization, expenditures, associated *International Classification of Diseases, Ninth Revision* (*ICD-9*) codes, and source of payment for each type of health care service. It also contains information about health status, medical conditions, and demographic and socioeconomic characteristics. However, the MEPS does not include questions about individual smoking history. Instead, the NHIS Sample Adult file collects individuals' smoking history and other risk behaviors for adults aged 18 years and older. Therefore, we linked the MEPS data to the NHIS Sample Adult files in the analyses. We pooled the 1998/2002 linked MEPS–NHIS data to increase the sample size for African Americans. The final linked sample contained data on 39 625 adults: 5662 African Americans, 7075 Hispanics, and 26 888 others.

The 2002 California Tobacco Survey Adult Interview File[16] was used to determine smoking prevalence in California. The Adult Interview File includes detailed information on cigarette smoking behavior, attitudes toward smoking, media exposure to smoking, use of other tobacco products, and demographic characteristics for adults aged 18 years and older. The 2002 file contained data on 20 525 adults, including 1713 African Americans.

We used the 2003 California Health Interview Survey (CHIS)[17] data for estimating California-specific smoking-attributable health care expenditures. The CHIS includes information about individuals' smoking history, other risk behaviors, and demographic and socioeconomic characteristics. This information was put into the estimated national model of smoking-attributable health care expenditures to compute the predicted expenditures for Californians. The 2003 CHIS contained data on 42 044 adults, including 2615 African Americans.

We used the 2002 California Death Statistical Master File[18] to determine the total number of deaths from smoking-related diseases. This file is a compilation of all death certificates in California and contains the underlying cause of death and demographic information, including race/ethnicity. The 2002 California life tables[19] were used to determine life expectancy by gender and age. Unfortunately, life expectancy specific to African Americans is not available.

Measures

Smoking-related diseases. For the analysis of smoking-attributable health care expenditures, we used the diseases for which incidence is identified in the 2004 US Surgeon General Report as being causally related to cigarette smoking.[20] Included are cardiovascular diseases (ischemic heart disease, other heart disease, cerebrovascular disease, atherosclerosis, aortic aneurysm, other circulatory diseases), respiratory diseases (chronic bronchitis, emphysema, chronic airways obstruction), and cancer (of the urinary bladder; cervix uteri; esophagus; kidney and renal pelvis; larynx; stomach; lung, trachea, and bronchus; lip, oral cavity, and pharynx; pancreas; and acute myeloid leukemia). The *ICD* codes for these smoking-related diseases were detailed in 2 recent studies.[1,9] In our smoking-attributable mortality analysis, smoking-related diseases are those identified as being underlying causes of death attributable to cigarette smoking in the American Cancer Society's Cancer Prevention Study-II.[21,22]

Smoking status. Current smokers were defined as those who had smoked at least 100 cigarettes in their lifetime and who currently smoked every day or some days. Former smokers were defined as those who had smoked 100 cigarettes in their lifetime but did not currently smoke. Never smokers were defined as those who had not smoked 100 cigarettes during their lifetime.

Independent variables. Demographic variables included age, gender, race/ethnicity (non-Hispanic African Americans [hereafter called African Americans], Hispanics, and others), educational level (less than high school, high school graduate, some college, college graduate), marital status (married; widowed, separated, or divorced; never married), and region (Northeast, Midwest, South, West). Socioeconomic variables included family poverty status (poor, low income, middle income, high income) and health insurance coverage (proportion of year covered by Medicare, proportion of year covered by Medicaid, proportion of year covered by private insurance, uninsured). Using the poverty threshold developed by the US Census Bureau,[23] we created 4 categories of family poverty status: less than 125%, 125% to 199%, 200% to 399%, and 400% or above of the federal poverty level. Other risk behaviors included body weight status (by body mass index [BMI; defined as weight in kilograms divided by height in meters squared]; underweight$<$18.5 kg/m^2; normal=18.5–24.9 kg/m^2; overweight=25.0–29.9 kg/m^2; obese$\geq$30.0 kg/m^2) and alcohol drinking status (heavy drinkers [$\geq$5 drinks per day]; others).

Analysis of Smoking-Attributable Health Care Expenditures

We analyzed smoking-attributable expenditures for 4 types of health care services: hospital inpatient care, ambulatory care, prescription drugs, and home health care. All 39 625 adults aged 18 years and older from the 1998/2002 linked MEPS-NHIS data were included in the analysis. The estimation of smoking-attributable health care expenditures was done separately for African Americans and for other racial/ethnic groups.

Estimation of smoking-attributable fraction. To estimate the smoking-attributable fraction, we first developed a national model that analyzed the impact of smoking on health care expenditures using the econometric approach developed by the authors and described in detail elsewhere.[3–5,12,24] The national model consisted of 10 equations. In the first equation, the dependent variable was the propensity of having any smoking-related diseases. The independent variables included the interaction between age and smoking status, gender, age, education, marital status, region, body weight status, and alcohol drinking status. This equation was estimated as a probit model. In the second equation, the dependent variable was the propensity of having poor health (measured by health status of excellent, very good, good, fair, or poor). The independent variables were the same as those in the first equation except for the addition of the predicted propensity of having smoking-related diseases.[5] The second equation was estimated as an ordered probit model.[25]

The remaining 8 equations were pairs of expenditure equations for the 4 types of health care services. Each pair comprised a 2-part model.[26] In the first-part equation, the dependent variable was the propensity of having positive expenditures in a given year for all kinds of diseases, including smoking-related diseases and other diseases. In the second-part equation, the dependent variable was the logarithmic expenditures for those individuals with positive expenditures. The independent variables in both parts of the 2-part model were the same, including the interaction between age and smoking status, gender, age, education, marital status, region, body weight status, alcohol drinking status, family poverty status, health insurance coverage, and the predicted propensity of having poor health.[5] The first-part equation was estimated by a probit model and the second-part equation was estimated by ordinary least squares. We adjusted annual expenditures to 2002 dollars by using the appropriate medical care component of the Consumer Price Index.[27]

After we estimated the 10-equation national model using the linked MEPS–NHIS data, we applied the estimated parameters to the CHIS data to calculate 2 sets of predicted expenditures for California. The first set of predicted expenditures was calculated for current and former smokers, and the second

set was calculated for "hypothetical" current and "hypothetical" former smokers. "Hypothetical" current (former) smokers were identical to current (former) smokers in every way except that they were assumed to be never smokers. The difference between these 2 sets of predicted expenditures was the excess cost of smoking. The ratio of the excess cost of smoking to the total predicted expenditures from the first set of predictions was the smoking-attributable fraction for health care expenditures.

Estimation of California health care expenditures by race/ethnicity. California health care expenditures for each racial/ethnic group were estimated by applying the national model to data on California demographics and population. First, using the 2002 MEPS data, we estimated a national model of annual expenditures for adults aged 18 years and older for each type of health care service. This national model controlled for age, gender, race/ethnicity, region, education, marital status, and family poverty status. Second, the estimated parameters were applied to all adults in the 2003 CHIS data to predict their expenditures. These predictions were then averaged to obtain per-person expenditures for each racial/ethnic group in California. Third, per-person expenditures were multiplied by the 2002 California adult population[28] to derive the unadjusted California expenditures for each racial/ethnic group. Finally, an adjustment was made so that the sum of California expenditures across all racial/ethnic groups would equal the state expenditure estimates as published by the Centers for Medicare and Medicaid Services.[29]

Estimation of smoking-attributable expenditures for African American Californians. We estimated the smoking-attributable health care expenditures for African American Californians for each type of health care service by multiplying the appropriate smoking-attributable fraction by the corresponding California health care expenditures for African Americans. For example, if the smoking-attributable fraction for hospital inpatient care was 0.14 and the California hospital inpatient care expenditures were $2.870 billion, the estimated smoking-attributable health care expenditures for hospital inpatient care would be $402 million (0.14×$2.870 billion).

TABLE 1—Adult Smoking Prevalence, by Race/Ethnicity and Gender: California, 2002

	Current Smokers	Former Smokers	Never Smokers
Race/Ethnicity and Gender	No. in 1000s (%)	No. in 1000s (%)	No. in 1000s (%)
All adults	3 624 (15.4)	4 873 (20.7)	15 077 (64.0)
Men	2 205 (19.0)	2 699 (23.2)	6 705 (57.8)
Women	1 418 (11.9)	2 174 (18.2)	8 372 (70.0)
African American adults	287 (19.3)	267 (17.9)	936 (62.8)
Men	154 (21.4)	135 (18.8)	430 (59.8)
Women	133 (17.3)	132 (17.1)	506 (65.6)

Smoking-Attributable Mortality Analysis

Three measures of smoking-attributable mortality were estimated: deaths, years of potential life lost, and productivity losses. We included only California adults aged 35 years and older in this analysis.

We first calculated the smoking-attributable fractions of mortality separately for African American Californians and all Californians, using an adaptation of the standard epidemiological formula for attributable risk[30]:

$$(1)\ \mathrm{SAF}_{ijag} = \frac{(\mathrm{PN}_{jag} + \mathrm{PC}_{jag} \times \mathrm{RRC}_{iag} + \mathrm{PF}_{jag} \times \mathrm{RRF}_{iag}) - 1}{\mathrm{PN}_{jag} + \mathrm{PC}_{jag} \times \mathrm{RRC}_{iag} + \mathrm{PF}_{jag} \times \mathrm{RRF}_{iag}}$$

where SAF denotes smoking-attributable fraction; PN, PC, and PF denote the prevalence rate of never, current, and former smokers, respectively; RRC and RRF denote the relative risk of mortality for current and former smokers relative to never smokers, respectively; the subscript i is for disease category, j is for racial/ethnic group, a is for age group (35–64, ≥65, or ≥35 years), and g is for gender. The relative risk estimates came from the American Cancer Society's Cancer Prevention Study-II for current and former smokers for each underlying cause of death.[21,22] Smoking prevalence rates for African American Californians and for all Californians were obtained from the 2002 California Tobacco Survey.

We next determined the number of smoking-attributable deaths by multiplying the smoking-attributable fraction for each subgroup by the corresponding total number of deaths in California in 2002.[19] The smoking-attributable years of potential life lost was estimated as the product of smoking-attributable deaths and the average number of years of life expectancy remaining at the age of death. The value of lost productivity from smoking-caused premature deaths was estimated as the product of smoking-attributable deaths and the present value of lifetime earnings for each California adult who died.

We calculated the present value of lifetime earnings by using a computer program maintained at the University of California, San Francisco.[31] For each gender and age group, the

TABLE 2—Smoking-Attributable Fractions and Smoking-Attributable Health Care Expenditures, by Race/Ethnicity and Type of Health Care Service: California, 2002

	Ambulatory Care	Drugs	Hospital Inpatient Care	Home Health Care	Total
Smoking-attributable fraction[a]					
All adult Californians	0.04	0.07	0.10	0.14	0.07
African American adult Californians	0.04	0.08	0.14	0.22	0.10
Smoking-attributable expenditures, $1000					
All adult Californians	1 476 556	1 172 289	4 426 723	530 236	7 605 805
African American adult Californians	79 222	63 471	399 544	83 394	625 632

[a]The proportion of expenditures or deaths that can be attributed to smoking.

calculation took into account California-specific life expectancy and the probability that a California adult would be in the labor market or keeping house. The calculation also considered labor market earnings and an imputed value for housekeeping services. A discount rate of 3% was used to convert all dollars to their equivalent in 2002 dollars.[32] The details about the data sources and calculation of the value of lifetime earnings have been described by the authors elsewhere.[31]

RESULTS

In 2002, 3.6 million adult Californians were current smokers, including 287 000 African Americans (Table 1). African American adult Californians smoked at a higher rate than Californians in general—19.3% versus 15.4%. In addition, of the nearly 5 million California adult former smokers, 267 000 were African American.

Smoking-Attributable Health Care Expenditures

The estimates of smoking-attributable fractions for health care expenditures were generally higher for African American Californians than for Californians in general for all 4 types of health care services (Table 2). For African Americans, 10% of total health care expenditures across all types of health care services were attributable to smoking, compared with 7% for all Californians. The estimated smoking-attributable health care expenditures for African American Californians were greatest for hospital inpatient care ($400 million), followed by home health care ($83 million), ambulatory care ($79 million), and prescription drugs ($63 million). When the 4 types of health care services are summed, total smoking-attributable health care expenditures for African Americans in 2002 amounted to $626 million, accounting for 8.2% of the state total smoking-attributable health care expenditures of $7.6 billion.

Smoking-Attributable Mortality

Table 3 shows the number of deaths, years of potential life lost, and productivity losses attributed to smoking, by underlying cause of death, for African American Californians in 2002. A total of 39 680 Californians died of smoking-related illness, including 3013 African Americans. Cardiovascular disease accounted for nearly half of these deaths (46%), neoplasms accounted for over one third (35%), and the remaining deaths were from respiratory diseases (19%). For the African American community, these deaths represented over 49 000 years of potential life lost. The value of lost productivity was $784 million—13% of the state total. The years of potential life lost per death were higher for African Americans than for all Californians—16.3 years versus 12.5 years. Similarly, the productivity losses per death

TABLE 3—Deaths, Years of Potential Life Lost, and Productivity Losses Attributed to Smoking for African Americans, by Cause of Death: California, 2002

Cause of Death	No. of Deaths	Potential Life Lost,[a] y		Productivity Losses[b]	
		Total	Per Death	Total, $1000	Per Death, $
Neoplasms					
All neoplasms	1 051	17 789	16.9	266 995	253 922
Lip, oral cavity, pharynx	51	1 075	20.9	23 069	449 451
Esophagus	50	900	17.9	15 020	298 623
Pancreas	57	956	16.7	12 866	224 777
Larynx	28	529	18.9	9 240	329 783
Trachea, lung, bronchus	818	13 572	16.6	195 221	238 743
Cervix, uterus	10	247	25.3	4 057	414 852
Urinary bladder	20	218	10.9	1 360	67 941
Kidney, other urinary	17	291	17.0	6 162	360 425
Cardiovascular disease					
All cardiovascular disease	1 392	23 801	17.1	425 857	305 954
Rheumatic heart disease	3	43	14.9	460	157 504
Hypertension	148	2 519	17.0	46 915	316 902
Ischemic heart disease	775	12 819	16.5	221 374	285 472
35–64 y	352	9 002	25.6	205 732	584 939
≥65 y	424	3 816	9.0	15 642	36 914
Pulmonary heart disease	10	187	18.6	3 275	326 041
Other heart disease	126	2 080	16.5	40 387	319 948
Cerebrovascular disease	239	4 846	20.3	91 594	383 084
35–64 y	146	4 001	27.5	87 643	601 625
≥65 y	93	844	9.0	3 951	42 296
Atherosclerosis	25	274	10.8	2 972	116 949
Aortic aneurysm	39	708	18.3	14 806	383 548
Other arterial diseases	26	325	12.5	4 074	156 185
Respiratory disease					
All respiratory disease	569	7 526	13.2	90 722	159 302
Respiratory tuberculosis	2	35	16.8	616	293 921
Pneumonia, influenza	103	1 179	11.5	13 756	133 562
Bronchitis, emphysema	63	933	14.9	15 159	242 109
Asthma	11	288	26.2	6 259	569 242
Chronic airways obstruction	391	5 090	13.0	54 932	140 564
All smoking-related causes					
African Americans	3 013	49 116	16.3	783 573	260 075
All Californians	39 680	495 809	12.5	6 068 077	152 925

Note. Numbers may not add to total because of rounding.
[a]Based on life expectancy at death.[30]
[b]Discounted at 3% to 2002 US dollars.

were higher for African Americans than for all Californians—$260 075 versus $152 926. These results reflect the fact that African American Californians died at younger ages from smoking-related disease than other Californians.

Total Smoking-Attributable Costs

In 2002, the total cost of smoking for the African American community in California was $1.4 billion, including $626 million in smoking-attributable health care expenditures and $784 million in lost productivity from premature deaths (Table 4). The total per-person cost was $895 for the state's 1.6 million African American adults[28]—1.7 times greater than the per-person cost for all California adults. The total cost per African American smoker was $4910, which is 1.3 times greater than that for all California smokers. When the Consumer Price Index is used to convert costs into 2008 dollars,[27] the total cost of smoking for the African American community in California totaled $1.8 billion, including $847 million for health care and $988 million for lost productivity.

DISCUSSION

California has one of the most comprehensive tobacco control programs in the United States and the world. Smoking prevalence has been steadily declining as a result. However, not all Californians have benefited equally from these efforts. Smoking prevalence for African Americans remained the highest among all racial/ethnic groups as of 2005.[11] The African American community suffers disproportionately from the health effects of smoking. This study provides an objective measure of this burden. Although African Americans account for 6% of the California adult population,[28] they account for over 8% of smoking-attributable health care expenditures and fully 13% of smoking-attributable mortality costs. Hence, the cost to the community in terms of health care expenditures and lost lives is substantial.

In its own documents, RJ Reynolds identified ethnic smokers, specifically African Americans and Hispanics, as one of their demographic growth sectors.[34,35] Accordingly, the tobacco industry has marketed cigarette brands that are specifically targeted to African Americans, such as Uptown and Kool.[7,34,35] African Americans have been shown to be among the most responsive to tobacco industry promotional offers on cigarettes.[36] In addition, the tobacco industry has a long history of providing economic support to communities of color in terms of jobs, sponsorship of activities, and contributions to community groups and leaders.[7,37] Contributions to the African American community are thought to be on the order of $25 million a year.[34,35] Many African American publications rely on revenues from cigarette advertising.[7] Yerger and Malone assert that "the price extracted from the community in pain, suffering, sickness, early death and loss of community elders may outweigh financial gains."[38(p342)] Our findings indicate that this support from the tobacco industry has come at a great cost in terms of health care expenditures and lost lives. For African Americans, this cost totals nearly $5000 for each smoker and $900 for each adult regardless of smoking status.

Our findings are subject to several limitations. First, the estimates were based on the best available data for California; however, some data elements were not available. Although smokers' relative risks of mortality by gender and disease have been published, specific mortality risk data for African Americans are not available. Given that African Americans are more likely to die of smoking-related coronary heart disease, stroke, or lung cancer than other smokers, their relative risks of mortality might be greater than those for the general population. In addition, it has been shown that African Americans have higher serum cotinine levels than Whites when they smoke the same number of cigarettes,[39] suggesting that they may absorb more nicotine than Whites.[40] It has also been shown that African Americans are nicotine dependent at lower levels of cigarettes smoked per day than others.[41] For all these reasons, data specific to African Americans on mortality risks would likely increase our cost estimates. Life expectancy data and earnings data specific to African Americans were also unavailable.

Second, African Americans are more likely to be exposed to secondhand smoke than others,[42,43] but this effect was not included here. The impact of this secondhand smoke exposure would most likely increase disease rates, health expenditures, and premature deaths. Third, we were unable to estimate smoking-attributable nursing home expenditures. Fourth, work-loss days and lost days of household production due to smoking-attributable disabilities were not estimated here, but would surely add to the economic burden. Fifth, African Americans' smoking behavior differs from that of others. For example, mentholated cigarettes are popular in this community.[44] Previous studies have

TABLE 4—Total and Per-Person Cost of Smoking, by Race/Ethnicity and Type of Cost: California, 2002

	2002		2008[a]	
	African Americans	All Californians	African Americans	All Californians
Total cost, $1000				
Health care expenditures	625 632	7 605 805	847 131	10 189 648
Mortality	783 573	6 068 077	988 372	7 654 065
Total	1 409 205	13 673 882	1 835 503	17 843 714
Cost per adult, $				
Health care expenditures	398	294	538	394
Mortality	498	235	628	296
Total	895	529	1 166	690
Cost per smoker, $				
Health care expenditures	2 180	2 099	2 952	2 812
Mortality	2 730	1 674	3 444	2 112
Total	4 910	3 773	6 395	4 924

[a]Costs were updated to 2008 dollars through use of the appropriate medical care component of the Consumer Price Index[24] for health care expenditures and hourly compensation in the business sector for mortality costs.

suggested that mentholated cigarettes are associated with greater disease incidence.[45] We were unable to determine whether the type of cigarettes would affect the magnitude of smoking-attributable health care expenditures.

Sixth, African Americans and other minority groups are more likely to be occasional smokers than Whites.[7] We did include this characteristic in our models, but were unable to discern any significant impact on health and health care expenditures. Finally, our estimates are point estimates and do not account for the sampling variability in smoking prevalence, relative risks, or health care expenditure estimates.

There is some good news. At the national level, smoking prevalence for African Americans was lower than that for Whites in 2007,[10] primarily because of a large decrease in smoking by African American women; African American males still smoke at greater rates than White males. Data do not yet show this decline in California, but if it occurs, a reduction in smoking-related costs is likely to follow. Further work needs to focus on developing specific measures to address the limitations described in this section so that we can fully understand the economic burden of smoking on African Americans. Our findings are likely to underestimate the true burden of smoking for African Americans in California. Nonetheless, our results confirm the need for designing tobacco control programs that can be tailored to African Americans to mitigate the disproportionate burden of smoking borne by this community. ■

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Contributors

W. Max conceptualized the study, obtained the funding, supervised the analyses, and contributed to the writing of the article. H.-Y. Sung helped develop the study design and research proposal, developed the analysis plan, supervised all data analyses, and helped write the article. L.-Y. Tucker conducted the analyses of health care costs and contributed to the writing of the article. B. Stark conducted the analyses of mortality costs and contributed to the writing of the article. All authors reviewed the article and approved the final version.

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Human Participant Protection

This study was certified as exempt by the Committee on Human Research of the University of California, San Francisco.

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