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National Longitudinal Mortality Study

Bibliography May 18, 2022

1. Iguidbashian J, Cotton J, King RW, Carroll AM, Gergen AK, Meguid RA, Fullerton DA, Suarez-Pierre A. Survival following lung transplantation: A population-based nested case-control study. *J Card Surg*. 2022;37:1153-1160. doi: 10.1111/jocs.16365

ID : 157

BACKGROUND: Lung transplantation is the mainstay of treatment for patients with end-stage respiratory failure. This study sought to evaluate survival following transplantation compared to the general population and quantify standardized mortality ratios (SMRs) using a nested case-control study design. METHODS: Control subjects were nonhospitalized inhabitants of the United States identified through the National Longitudinal Mortality Study. Case subjects were adults who underwent lung transplantation between 1990 and 2007 and identified through the Organ Procurement and Transplantation Network. Propensity-matching (5:1, nearest neighbor, caliper = 0.1) was utilized to identify suitable control subjects based on age, sex, race, and location of residency. The primary study endpoint was 10-year survival. RESULTS: About 14,977 lung transplant recipients were matched to 74,885 nonhospitalized US residents. The 10-year survival rate of lung transplant recipients was 28% (95% confidence interval [CI] = 27%-29%). The population expected mortality rate was 19 deaths/100 person-years while the observed ratio was 104 deaths/100 person-years (SMR = 5.39, 95% CI = 5.35-5.43). The largest discrepancies between observed and expected mortality rates were in females (SMR = 5.97), Hispanic (SMR = 10.70), and single lung recipients (SMR = 5.92). SMRs declined over time (1990-1995 = 5.79, 1996-2000 = 5.64, and 2001-2007 = 5.10). Standardized mortality peaks in the first year after transplant and decreases steadily over time. CONCLUSIONS: Lung transplant recipients experience a fivefold higher SMR compared to the nonhospitalized population. Long-term mortality rates have experienced consistent decline over time.

2. Brite J. The Association Between Educational Attainment and Mortality: Examining Absolute and Relative Effects by Race/Ethnicity. *Ethn Dis*. 2022;32:1-10. doi: 10.18865/ed.32.1.1

ID : 158

OBJECTIVES: To determine whether the association between educational attainment and mortality varies by race/ethnicity on the absolute and relative scales, including among understudied races/ethnicities. METHODS: Data were obtained from the US National Longitudinal Mortality Study (1983-1984). Hazard models for adults aged ≥25 years (n=725,756) with race/ethnicity by educational interaction terms were used to test relative interaction; linear binomial models were used to test for absolute interaction. RESULTS: For the most part, educational gradients in mortality did not differ across race/ethnicity on the multiplicative scale. Conversely, additive interactions appear to be significant. Blacks gained more in terms of reduced mortality rates for each additional year of schooling. The educational gradient in Whites is also notable as the lowest educated Whites have similar absolute numbers of expected deaths as Blacks similarly educated. At higher levels of education, Whites gain substantially in terms of longer longevity. The educational gradient in Asians, Hispanics, and Native Americans is narrower compared to both Whites and Blacks. CONCLUSIONS: The association between educational attainment and mortality does not function uniformly across race/ethnicity.

3. Xu W, Topping M, Fletcher J. State of birth and cardiovascular disease mortality: Multilevel analyses of the National Longitudinal Mortality Study. *SSM Popul Health*. 2021;15:100875. doi: 10.1016/j.ssmph.2021.100875

ID : 160

Cardiovascular disease (CVD) is the leading contributor to mortality in the United States. Previous studies have linked early life individual and family factors, along with various contemporaneous place-based exposures to differential individual CVD mortality risk. However, the impacts of early life place exposures and how they compare to the effects of an individual's current place of residence on CVD mortality risk is not well understood. Using the National Longitudinal Mortality Study, this research examined the effects of both state of birth and state of residence on individual's risk of CVD mortality. We estimated individual mortality risk by estimating multi-level logistic regression models. We found that during a follow-up period of 11 years, 18,292 (4.2%) out of 433,345 participants died from CVD. The impact of state of birth on subsequent CVD mortality risk are greater than state of residence, even after adjusting for socio-demographic factors. Individuals who were born in certain states such as Tennessee, Kentucky, and Pennsylvania on average had higher CVD mortality risk. Conversely, those born in California, North Dakota, and Montana were found to have lower risk, no matter where they presently live. This study implies that early life state-level environments may be more prominent to individual's CVD mortality risk, compared to the state in which one lives. Future research should address specific mechanisms through which state of birth may affect people's risk of CVD mortality.

4. Suarez-Pierre A, Lui C, Zhou X, Giuliano K, Etchill E, Almaraz-Espinoza A, Crawford TC, Fraser CD, 3rd, Whitman GJ, Choi CW, et al. Long-term Survival After Heart Transplantation: A Population-based Nested Case-Control Study. *The Annals of thoracic surgery*. 2021;111:889-898. doi: 10.1016/j.athoracsur.2020.05.163

ID : 148

5. Kposowa AJ, Breault K. Disability Status, Unemployment, and Alcohol-Related Liver Disease (ALD) Mortality: A Large Sample Individual Level Longitudinal Study. *Subst Abuse Rehabil*. 2021;12:81-88. doi: 10.2147/sar.S334851

ID : 159

PURPOSE: Unlike previous research, we evaluate disability within expanded employment status factors and stratify gender, race and ethnicity in alcohol-related liver disease (ALD) mortality in a large sample individual level longitudinal study. MATERIALS AND METHODS: The National Longitudinal Mortality Study (NLMS) was used covering the period 1990-2011. Statistical analysis involved the use of proportional hazards regression on a sample of almost 1.4 million people aged 18 and older, of whom 2638 died of ALD by the end of the follow-up period. RESULTS: With expanded employment status factors, disability (HR=3.76 [95%] CI 3.22, 4.39), unemployment (HR=1.90, CI 1.56, 2.31), and those not otherwise in the labor force (HR=2.31, CI 2.08, 2.56) were strongly related to ALD mortality compared to the employed. When stratified, gender, race, and ethnicity were not important modifiers in the relationships between disability, unemployment, those not in the labor force and subsequent ALD mortality. Consistent with other studies, males, minority status, living in a highly urban area, renting as opposed to owning a home, lower educational attainment, marital statuses other than marriage, low income, and age were related to ALD mortality. CONCLUSION: In addition to unemployment which has been previously studied in a large longitudinal sample, disabled people who were unable to work and those not looking for work had a higher risk of ALD mortality. Alcohol consumption, abuse and morbidity in these populations are of considerable clinical concern.

6. Kposowa AJ, Aly Ezzat D, Breault K. Diabetes Mellitus and Marital Status: Evidence from the National Longitudinal Mortality Study on the Effect of Marital Dissolution and the Death of a Spouse. *Int J Gen Med*. 2021;14:1881-1888. doi: 10.2147/ijgm.S307436

ID : 161

PURPOSE: This study evaluates the full impact of marital status on diabetes mellitus by stratifying the analysis by gender, including socioeconomic covariates and, unlike most studies, extending marital status by separating out previously conflated status categories. METHODS: Release 5 of the National Longitudinal Mortality Study (NLMS) was used for the data. Logistic regression was applied to the data from 1990 to 2011. The effective sample size consists of 1,384,507 individuals age 18 and above recruited into the study (via the Current Population Surveys), 3,955 of whom had died of diabetes mellitus by 2011. RESULTS: For minority men and non-Hispanic white men, divorced/separated status was significantly related to diabetes mortality, respectively (OR=1.318, CI=1.010, 1.719; and OR=1.283, CI=1.054, 1.562). For minority women and non-Hispanic white women, widowed status was related to diabetes mortality, respectively (OR=1.349, CI=1.107, 1.643; and OR=1.262, CI=1.113, 1.431). CONCLUSION: Contrary to recent epidemiological studies in which divorced/separated and widowed status were combined into one covariate, this United States study finds that divorced/separated men and widowed women are at increased risk for diabetes mellitus mortality, and that among these populations at risk, minorities are at higher risk than whites. The study highlights the importance of marital status and gender differences in the risk of death from diabetes.

7. Xu W, Engelman M, Palloni A, Fletcher J. Where and When: Sharpening the lens on geographic disparities in mortality. *SSM Popul Health*. 2020;12:100680. doi: 10.1016/j.ssmph.2020.100680

ID : 146

Life course theories suggest that geographic disparities in mortality may reflect a history of place-based exposures rather than (or in addition to) contemporaneous exposures; yet, few studies examined early life place exposures and later life mortality in the US due to data limitations. The aim of this study is to assess and compare the importance of state of birth and state of residence in predicting mortality for adults over age 50 in the US. Using nationally representative data of nearly 100,000 adults over age 50 from the National Longitudinal Mortality Study, we estimated individual mortality risk using multi-level logistic regression with state of birth and state of residence as second-level random effects. We assessed whether state of residence and state of birth contributed to the variation in adult mortality. We also decomposed state-of-residence random effects to compare "movers" and "stayers." Our results indicate that state of birth is a stronger predictor of age-, race/ethnicity- and sex-adjusted mortality in the US than state of residence at the time of death. The adult mortality profiles of many states are substantially impacted by the composition of "movers." Failing to account for residential mobility has clouded our understanding of the patterns and causes of geographic differences in adult mortality. Measures of geographic residence across the life course can improve models of adult mortality in the US and inform interventions to address geographic disparities in longevity.

8. Muennig P, Vail D, Hakes JK. Can antipoverty programmes save lives? Quasi-experimental evidence from the Earned Income Tax Credit in the USA. *BMJ Open*. 2020;10:e037051. doi: 10.1136/bmjopen-2020-037051

ID : 154

OBJECTIVE: To estimate the impact of state-level supplements of the Earned Income Tax Credit (EITC) on mortality in the USA. The EITC supplements the wages of lower-income workers by providing larger returns when taxes are filed. SETTING: Nationwide sample spanning 25 cohorts of people across every state in the USA. PARTICIPANTS: 793 000 respondents within the National Longitudinal Mortality Survey (NLMS) between 1986 and 2011, a representative sample of the USA. INTERVENTION: State-level supplementation to the EITC programme. Some, but not all, states added EITC supplementation to varying degrees beginning in 1986 (Wisconsin) and most recently in 2015 (California). Participants who were eligible in states with supplementary programmes were compared with those who were not eligible for supplementation. Comparisons were made both before and after implementation of the supplementary programme (a difference-in-difference, intent-to-treat analysis). This quasi-experimental approach further controls for age, gender, marital status, race or ethnicity, educational attainment, income and employment status. PRIMARY AND SECONDARY OUTCOME MEASURES: The primary outcome measure was survival at 10 years. Secondary outcome measures included survival at 5 years and survival to the end of the intervention period. RESULTS: We find an association between state supplemental EITC and survival, with a HR of 0.973 (95% CI=0.951-0.996) for each US$100 of EITC increase (p<0.05). CONCLUSION: State-level supplemental EITC may be an effective means of increasing survival in the USA.

9. Kposowa AJ, Ezzat DA, Breault KD. Marital status, sex, and suicide: new longitudinal findings and Durkheim's marital status propositions\*. *Sociological Spectrum*. 2020;40:81-98. doi: 10.1080/02732173.2020.1758261

ID : 149

10. Inoue-Choi M, Christensen CH, Rostron BL, Cosgrove CM, Reyes-Guzman C, Apelberg B, Freedman ND. Dose-Response Association of Low-Intensity and Nondaily Smoking With Mortality in the United States. *JAMA Netw Open*. 2020;3:e206436. doi: 10.1001/jamanetworkopen.2020.6436

ID : 155

IMPORTANCE: An increasing proportion of US smokers smoke at low intensity and not every day. Some nondaily smokers have always had this pattern, whereas others previously smoked daily. The effect of reducing the level of smoking from daily to nondaily smoking and the dose response at low smoking levels are poorly understood. OBJECTIVE: To evaluate risk of all-cause and cause-specific mortality among nondaily and daily cigarette smokers, by cigarettes per month, years after reducing from daily to nondaily smoking, and years since quitting. DESIGN, SETTING, AND PARTICIPANTS: A prospective cohort study using harmonized data from multiple cycles of the Tobacco Use Supplements to the Current Population Survey (TUS-CPS), linked to the National Death Index, were analyzed during the period from 2018 to 2020. Adults completed the 1992-1993, 1995-1996, 1998-1999, 2000, 2001-2002, 2003, 2006-2007, or 2010-2011 TUS-CPS. Cigarette smokers were classified as daily or nondaily users; current nondaily smokers were further categorized by whether they previously smoked every day. MAIN OUTCOMES AND MEASURES: Hazard ratios (HRs) and 95% CIs for risks of mortality vs never smoking. Age was the underlying time metric, adjusted for sex, race/ethnicity, education, survey year, and household income. RESULTS: Among 505 500 participants (aged 18-103 years), approximately 47 000 deaths occurred. The median number of cigarettes smoked per month was 600 (interquartile range, 300-600) (20 cigarettes per day [interquartile range, 10-20 cigarettes per day]) for daily cigarette smokers and 40 (interquartile range, 15-90) for lifelong nondaily smokers. Nevertheless, both current daily (HR, 2.32; 95% CI, 2.25-2.38) and lifelong nondaily (HR, 1.82; 95% CI, 1.65-2.01) smokers had higher all-cause mortality risks than never smokers. Associations were observed for 6 to 10 cigarettes per month and increased with greater-intensity use. Nondaily smokers who previously smoked every day had lower mortality risks than daily smokers, with similar HRs after 10 or more years of nondaily smoking as lifelong nondaily smokers (HR vs never smokers, 1.73; 95% CI, 1.56-1.92). Yet, their risks were higher than former smokers who quit 10 or more years before (HR vs never smokers, 1.18; 95% CI, 1.15-1.22). CONCLUSIONS AND RELEVANCE: Although reducing smoking from daily to nondaily was associated with decreased mortality risk, cessation was associated with far greater benefit. Lifelong nondaily smokers have higher mortality risks than never smokers, even among those smoking 6 to 10 cigarettes per month. Thus, all smokers should quit, regardless of how infrequently they smoke.

11. Hosgood HD, 3rd, Cosgrove C, Klugman M, Rohan T, Altekruse S. Lung Cancer Mortality Among Smokers and Never-Smokers in the United States. *Epidemiology*. 2020;31:e24-e25. doi: 10.1097/ede.0000000000001159

ID : 156

12. Fraser GE, Cosgrove CM, Mashchak AD, Orlich MJ, Altekruse SF. Lower rates of cancer and all-cause mortality in an Adventist cohort compared with a US Census population. *Cancer*. 2020;126:1102-1111. doi: 10.1002/cncr.32571

ID : 130

BACKGROUND: Previous research suggests that Adventists, who often follow vegetarian diets, live longer and have lower risks for many cancers than others, but there are no national data and little published comparative data for black subjects. METHODS: This study compared all-cause mortality and cancer incidence between the nationally inclusive Adventist Health Study 2 (AHS-2) and nonsmokers in US Census populations: the National Longitudinal Mortality Study (NLMS) and its Surveillance, Epidemiology, and End Results substudy. Analyses used proportional hazards regression adjusting for age, sex, race, cigarette smoking history, and education. RESULTS: All-cause mortality and all-cancer incidence in the black AHS-2 population were significantly lower than those for the black NLMS populations (hazard ratio [HR] for mortality, 0.64; 95% confidence interval [CI], 0.59-0.69; HR for incidence, 0.78; 95% CI, 0.68-0.88). When races were combined, estimated all-cause mortality was also significantly lower in the AHS-2 population at the age of 65 years (HR, 0.67; 95% CI, 0.64-0.69) and at the age of 85 years (HR, 0.78; 95% CI, 0.75-0.81), as was cancer mortality; this was also true for the rate of all incident cancers combined (HR, 0.70; 95% CI, 0.67-0.74) and the rates of breast, colorectal, and lung cancers. Survival curves confirmed the mortality results and showed that among males, AHS-2 blacks survived longer than white US subjects. CONCLUSIONS: Substantially lower rates of all-cause mortality and cancer incidence among Adventists have implications for the effects of lifestyle and perhaps particularly diet on the etiology of these health problems. Trends similar to those seen in the combined population are also found in comparisons of black AHS-2 and NLMS subjects.

13. Aram J, Johnson NJ, Lee MT, Slopen N. Drug overdose mortality is associated with employment status and occupation in the National Longitudinal Mortality Study. *Am J Drug Alcohol Abuse*. 2020;46:769-776. doi: 10.1080/00952990.2020.1820018

ID : 147

BACKGROUND: Since 1999, over 702,000 people in the US have died of a drug overdose, and the drug overdose death rate has increased from 6.2 to 21.8 per 100,000. Employment status and occupation may be important social determinants of overdose deaths. OBJECTIVES: Estimate the risk of drug overdose death by employment status and occupation, controlling for other social and demographic factors known to be associated with overdose deaths. METHODS: Proportional hazard models were used to study US adults in the National Longitudinal Mortality Study with baseline measurements taken in the early 2000s and up to 6 years of follow-up (n = 438,739, 53% female, 47% male). Comparisons were made between adults with different employment statuses (employed, unemployed, disabled, etc.) and occupations (sales, construction, service occupations, etc.). Models were adjusted for age, sex, race/ethnicity, education, income and marital status. RESULTS: Adults who were disabled (hazard ratio (HR) = 6.96 (95% CI = 6.81-7.12)), unemployed (HR = 4.20, 95% CI = 4.09-4.32) and retired (HR = 2.94, 95% CI = 2.87-3.00) were at higher risk of overdose death relative to those who were employed. By occupation, those working in service (HR = 2.05, 95% CI = 1.97-2.13); construction and extraction (HR = 1.69, 95% CI = 1.64-1.76); management, business and financial (HR = 1.39, 95% CI = 1.33-1.44); and installation, maintenance and repair (HR = 1.32, 95% CI = 1.25-1.40) occupations displayed higher risk relative to professional occupations. CONCLUSIONS: In a large national cohort followed prospectively for up to 6 years, several employment statuses and occupations are associated with overdose deaths, independent of a range of other factors. Efforts to prevent overdose deaths may benefit from focusing on these high-risk groups.

14. Kposowa AJ, Aly Ezzat D, Breault K. New Findings On Gender: The Effects Of Employment Status On Suicide. *Int J Womens Health*. 2019;11:569-575. doi: 10.2147/ijwh.S216504

ID : 129

Background and objectives: The purpose of the study was to evaluate the impact of gender and employment on suicide with the use of expanded unemployment statuses as covariates. Methods: Data were obtained from release 5 of the National Longitudinal Mortality Study, a prospective study of deaths in the United States. Proportional hazards regression models were fitted to the data based on follow-up from 1990 to 2011. Results: Unemployment was significantly associated with suicide (ARR=1.628, 95% CI=1.356, 1.954), and men had suicide deaths that were five times greater than women (ARR=5.104, 95% CI=4.565, 5.707), however when the sample was stratified by sex, the impact of unemployment on suicide was much higher among women (ARR=2.988, 95% CI=2.045, 4.366) than among men (ARR=1.393, 95% CI=1.131, 1.717). Conclusion: Contrary to many findings and gender assumptions, unemployed women in the U.S. have higher deaths from suicide than unemployed men. Discussion focused on explanations for gender disparities in unemployment.

15. Fletcher JM. Examining the long-term mortality effects of early health shocks. *Applied Economics Letters*. 2019;26:902-908. doi: 10.1080/13504851.2018.1520960

ID : 151

16. Fisher MT, Tan-Torres SM, Gaworski CL, Black RA, Sarkar MA. Smokeless tobacco mortality risks: an analysis of two contemporary nationally representative longitudinal mortality studies. *Harm Reduct J*. 2019;16:27. doi: 10.1186/s12954-019-0294-6

ID : 128

BACKGROUND: Assessments supporting smokeless tobacco (SLT) disease risk are generally decades old. Newer epidemiological data may more accurately represent the health risks associated with contemporary US-based SLT products, many of which contain lower levels of hazardous and potentially hazardous chemicals compared to previously available SLT products. METHODS: Data from two longitudinal datasets (National Longitudinal Mortality Study-NLMS, and the National Health Interview Survey-NHIS) were analyzed to determine potential associations between SLT use and/or cigarette smoking and all-cause and disease-specific mortality. Mortality hazard ratios (HR) were estimated using a Cox proportional hazards regression model applied to various groups, including never users of any tobacco or SLT product, and current and former SLT users and/or cigarette smokers. RESULTS: The two datasets yielded consistent findings with similar patterns evident for the specific causes of death measured. All-cause mortality risk for exclusive SLT users was significantly lower than that observed for exclusive cigarette smokers and dual SLT/cigarette users. Similar trends were found for mortality from diseases of the heart, chronic lower respiratory diseases, and malignant neoplasms. Mortality risk for lung cancer in exclusive cigarette smokers was increased by about 12-fold over never-tobacco users but was rarely present in exclusive SLT users in either survey (NHIS, < 5 cases/1,563 observations; NLMS, 3 cases/1,863 observations). While the data in the surveys are limited, SLT use by former cigarette smokers was not associated with an increase in the lung cancer risk HR compared to that by former cigarette smokers who never used SLT. CONCLUSIONS: Emerging epidemiological data provides a new perspective on the health risks of SLT use compared to risks associated with cigarette smoking. HR estimates derived from two current US datasets, which include data on contemporary tobacco products, demonstrate a clear mortality risk differential between modern SLT products and cigarettes. Cigarette smokers had an increased overall mortality risk and risk for several disease-specific causes of death, while SLT users consistently had lower mortality risks.

17. Cook A. The education-suicide mortality gradient. *Applied Economics Letters*. 2019;26:717-721. doi: 10.1080/13504851.2018.1489499

ID : 152

18. Behrendt CE, Cosgrove CM, Johnson NJ, Altekruse SF. Are associations between psychosocial stressors and incident lung cancer attributable to smoking? *PLoS One*. 2019;14:e0218439. doi: 10.1371/journal.pone.0218439

ID : 127

PURPOSE: To learn whether reported associations between major psychosocial stressors and lung cancer are independent of smoking history. METHODS: Subjects were at least 25 years old and without lung cancer at enrollment in the United States Census Bureau's National Longitudinal Mortality Survey in 1995-2008. Follow-up via Surveillance Epidemiology and End Results and National Death Index continued until lung cancer diagnosis, death, or December 2011. Involuntary unemployment, widowhood, and divorce, stratified by sex, were tested for association with subsequent lung cancer using proportional hazards regression for competing risks. Smoking status, years smoked, cigarettes per day, and years since quitting were imputed when missing. RESULTS: At enrollment, subjects (n = 100,733, 47.4% male, age 49.1(+/-15.8) years) included 17.6% current smokers, 23.5% former smokers. Of men and women, respectively, 11.3% and 15.0% were divorced/separated, 2.9% and 11.8% were widowed, and 2.9% and 2.3% were involuntarily unemployed. Ultimately, 667 subjects developed lung cancer; another 10,071 died without lung cancer. Adjusted for age, education, and ancestry, lung cancer was associated with unemployment, widowhood, and divorce/separation in men but not women. Further adjusted for years smoked, cigarettes per day, and years since quitting, none of these associations was significant in either sex. CONCLUSIONS: Once smoking is accounted for, psychosocial stressors in adulthood do not independently promote lung cancer. Given their increased smoking behavior, persons experiencing stressors should be referred to effective alternatives to smoking and to support for smoking cessation.

19. Al Hussein Al Awamlh B, Shoag JE, Ravikumar V, Posada L, Taylor BL, van der Mijn JC, Khan AI, Fainberg J, Al Hussein Alawamlh O, Scherr DS. Association of Smoking and Death from Genitourinary Malignancies: Analysis of the National Longitudinal Mortality Study. *J Urol*. 2019;202:1248-1254. doi: 10.1097/ju.0000000000000433

ID : 131

PURPOSE: We explored the association between tobacco use and genitourinary cancer specific survival in a contemporary, nationally representative sample of the United States civilian population. MATERIALS AND METHODS: A total of 493,282 participants in the National Longitudinal Mortality Study who provided detailed tobacco information from 1993 to 2005 were included in study. Our primary outcome was death from bladder, kidney or prostate cancer. Cause of death was determined from death certificates. Analyzed smoking parameters included smoking status at the time of the survey, age at the start of smoking and home smoking rules. Multivariable Cox regression models were used to assess associations of different smoking parameters with bladder, kidney and prostate cancer specific mortality. RESULTS: During a 5-year followup 5.6% of participants who had ever smoked died compared to 3.1% of those who had never smoked (p <0.0001). Of those who died of bladder, kidney and prostate cancer 62%, 58% and 62%, respectively, were ever smokers. On multivariable analysis ever smoking was associated with bladder and kidney cancer mortality (HR 1.92, 95% CI 1.25-2.97, and HR 1.54, 95% CI 1.01-2.34, respectively). Additionally, starting to smoke during teenage years and smoking at home were associated with bladder cancer specific mortality (HR 2.14, 95% CI 1.28-3.56 and HR 2.99, 95% CI 1.34-6.65) and kidney cancer specific mortality (HR 1.65, 95% CI 1.03-2.66 and HR 2.84, 95% CI 1.54-5.23, respectively). However, only everyday smoking was associated with an increased risk of prostate cancer mortality (HR 1.81, 95% CI 1.30-2.53). CONCLUSIONS: In a nationally representative study we confirmed the association between smoking intensity and mortality from genitourinary malignancies. Starting to smoke at a younger age and smoking at home conferred a significantly higher risk of death from bladder and kidney cancers.

20. Al Awamlh BAH, Shoag JE, Ravikumar V, Posada L, Taylor BL, van der Mijn JC, Khan AI, Fainberg J, Alawamlh OAH, Scherr DS. Association of Smoking and Death from Genitourinary Malignancies: Analysis of the National Longitudinal Mortality Study. *Journal of Urology*. 2019;202:1248-1253. doi: 10.1097/ju.0000000000000433

ID : 150

21. Percy-Laurry A, Altekruse SF, Hossain MB, O'Keefe AM, Johnson NJ, Kamangar F. Association Between Socioeconomic Status and Tumor Grade Among Black Men with Prostate Cancer. *J Natl Med Assoc*. 2018;110:53-57. doi: 10.1016/j.jnma.2017.06.019

ID : 124

BACKGROUND: Prostate cancer affects black men disproportionately. Black men have an increased incidence of prostate cancer diagnoses at earlier ages and higher grade as indicated by Gleason score, compared to other races. This study investigates the impact of socioeconomic status (SES) on prostate cancer tumor grade among black men. METHODS: Black men with a prostate cancer diagnosis during 1973-2011 were examined using individual-level data from the SEER NLMS database. Logistic regression model estimated the likelihood of receiving a diagnosis of high versus low grade prostate cancer based on self-reported SES status at the time of diagnosis. RESULTS: Men who completed high school only were statistically significantly more likely to have a higher prostate cancer grade than those with a bachelor's degree or higher. However, there was no dose-response effect across educational strata. Retirees were 30% less likely to have higher grade tumors compared to those who were employed. CONCLUSIONS: SES differences among black men did not fully explain the high grade of prostate cancer. Further research is needed on the biology of the disease and to assess access to medical care and prostate health education, discrimination, stress exposures, and social norms that might contribute to the aggressiveness of prostate cancer among black men.

22. Noland RB, Laham ML. Are low income and minority households more likely to die from traffic-related crashes? *Accid Anal Prev*. 2018;120:233-238. doi: 10.1016/j.aap.2018.07.033

ID : 125

An analysis of motor vehicle mortality is conducted using data from the Census Bureau's National Longitudinal Mortality Study for 1980, 1990, and 2000. The likelihood of being a motor vehicle crash fatality is compared to all other causes of death and not dying within the six year follow up period of the data. Using a multinomial logistic regression, mortality associations with the socioeconomics and demographics of individuals is examined. No association is found with a greater likelihood of being a motor vehicle mortality, based on family income, ethnicity, or race. Those living in rural areas, are unemployed or disabled, and residents of southern states are more likely to be a motor-vehicle fatality. These results conflict with those of many ecological studies that assume lower income neighborhoods (and their residents) are more likely to die due to motor-vehicle crashes.

23. Fletcher JM. New evidence on the impacts of early exposure to the 1918 influenza pandemic on old-age mortality. *Biodemography Soc Biol*. 2018;64:123-126. doi: 10.1080/19485565.2018.1501267

ID : 132

This paper provides new evidence of the impacts of early life exposure to the 1918 pandemic on old-age mortality by analyzing data from the National Longitudinal Mortality Study (n ~ 220,000). The specifications used year and quarter of birth indicators to assess the effects of timing of pandemic exposure and used Cox proportional hazard models for all-cause mortality outcomes. The findings suggest evidence of excess all-cause mortality for cohorts born during 1918 and mixed evidence for cohorts born in 1917 and 1919. Therefore, contrary to some existing research, the results suggest no consistent evidence of the importance of specific windows of exposure by gestation period.

24. Christensen CH, Rostron B, Cosgrove C, Altekruse SF, Hartman AM, Gibson JT, Apelberg B, Inoue-Choi M, Freedman ND. Association of Cigarette, Cigar, and Pipe Use With Mortality Risk in the US Population. *JAMA Intern Med*. 2018. doi: 10.1001/jamainternmed.2017.8625

ID : 123

Importance: Tobacco products have changed in recent years. Contemporary mortality risk estimates of combustible tobacco product use are needed. Objective: To investigate the mortality risks associated with current and former use of cigars, pipes, and cigarettes. Design, Setting, and Participants: The National Longitudinal Mortality Study is a longitudinal population-based, nationally representative health survey with mortality follow-up that includes demographic and other information from the Current Population Survey, tobacco product use information from the Tobacco Use Supplement, and mortality data from the National Death Index. In this study, participants provided tobacco use information at baseline in surveys starting from 1985 and were followed for mortality through the end of 2011. The study includes 357420 participants who reported exclusively using cigar, pipes, or cigarettes or reported never using any type of tobacco product. Exposures: Current or former exclusive use of any cigar (little cigar, cigarillos, large cigar), traditional pipe, or cigarette and never tobacco use. Information on current daily and nondaily use was also collected. Estimates adjusted for age, sex, race/ethnicity, education, and survey year. Main Outcomes and Measures: All-cause and cause-specific mortality as identified as the primary cause of death from death certificate information. Results: Of the 357420 persons included in the analysis, the majority of current and former cigar and pipe smokers were male (79.3%-98.0%), and smokers were more evenly divided by sex (46% of current daily smokers were male). There were 51 150 recorded deaths during follow-up. Exclusive current cigarette smokers (hazard ratio [HR], 1.98; 95% CI, 1.93-2.02) and exclusive current cigar smokers (HR, 1.20; 95% CI, 1.03-1.38) had higher all-cause mortality risks than never tobacco users. Exclusive current cigarette smokers (HR, 4.06; 95% CI, 3.84-4.29), exclusive current cigar smokers (HR, 1.61; 95% CI, 1.11-2.32), and exclusive current pipe smokers (HR, 1.58; 95% CI, 1.05-2.38) had an elevated risk of dying from a tobacco-related cancer (including bladder, esophagus, larynx, lung, oral cavity, and pancreas). Among current nondaily cigarette users, statistically significant associations were observed with deaths from lung cancer (HR, 6.24; 95% CI, 5.17-7.54), oral cancer (HR, 4.62; 95% CI, 1.84-11.58), circulatory death (HR, 1.43; 95% CI, 1.30-1.57), cardiovascular death (HR, 1.24; 95% CI, 1.11-1.39), cerebrovascular death (stroke) (HR, 1.39; 95% CI, 1.12-1.74), and chronic obstructive pulmonary disease (HR, 7.66; 95% CI, 6.09-9.64) as well as for daily smokers. Conclusions and Relevance: This study provides further evidence that exclusive use of cigar, pipes, and cigarettes each confers significant mortality risks.

25. Timberlake DS, Nikitin D, Johnson NJ, Altekruse SF. A longitudinal study of smokeless tobacco use and mortality in the United States. *Int J Cancer*. 2017;141:264-270. doi: 10.1002/ijc.30736

ID : 122

Few studies in the United States have examined longitudinally the mortality risks associated with use of smokeless tobacco (SLT). The sample of our study was composed of participants from the National Longitudinal Mortality Study who completed a single Tobacco Use Supplement to the Current Population Survey between the years 1985 and 2011. Using survival methods, SLT use at the baseline survey was examined as a predictor of all-cause mortality and cause-specific mortalities in models that excluded individuals who had ever smoked cigarettes, cigars or used pipes (final n = 349,282). The participants had median and maximum follow-up times of 8.8 and 26.3 years, respectively. Regression analyses indicated that compared to the never tobacco users, the current SLT users did not have elevated mortality risks from all cancers combined, the digestive system cancers and cerebrovascular disease. However, current SLT users had a higher mortality risk for coronary heart disease (CHD) [hazard ratio (HR) (95% CI) = 1.24 (1.05, 1.46)] relative to never tobacco users. In a separate model, the elevated risk for CHD mortality corresponded to the use of moist snuff [HR (95% CI) = 1.30 (1.03, 1.63)]. The associations with CHD mortality could be attributed to long-term nicotine exposure, other SLT constituents (e.g., metals) or the confounding effects of CHD risk factors not accounted for in our study. The study's findings contribute to the ongoing dialogue on tobacco harm reduction and the US FDA's evaluation of Modified Risk Tobacco Product applications submitted by American SLT manufacturers.

26. Singh GK, Jemal A. Socioeconomic and Racial/Ethnic Disparities in Cancer Mortality, Incidence, and Survival in the United States, 1950-2014: Over Six Decades of Changing Patterns and Widening Inequalities. *Journal of Environmental and Public Health*. 2017;2017:1-19. doi: 10.1155/2017/2819372

ID : 153

27. Sahin DB, Heiland FW. Black-White Mortality Differentials at Old-Age: New Evidence from the National Longitudinal Mortality Study. In: *Applied Demography and Public Health in the 21st Century*. Switzerland: Springer International Publishing; 2017.

ID : 121

28. Ma J, Altekruse S, Cosgrove C, Islami F, Jemal A. Educational Disparities in Mortality Between Adults Aged 50-64 and 66-79 Years, U.S. *Am J Prev Med*. 2017. doi: 10.1016/j.amepre.2017.02.008

ID : 115

INTRODUCTION: This study estimated differences in educational disparities in mortality between ages 50-64 and 66-79 years in the U.S. and explored factors contributing to the differences. METHODS: Based on the follow-up of a nationally representative cohort in the National Longitudinal Mortality Study 2002-2011, relative differences in educational disparities (relative index of inequality) between people aged 50-64 and 66-79 years were calculated for deaths from all causes, cancer, cardiovascular disease, injuries, and other causes by sex and race/ethnicity. Analyses were conducted in 2016. RESULTS: In all racial/ethnic-, sex-, and age-specific groups, death rates were higher among the least educated than the most educated groups for all causes combined and most specific causes except for injuries in non-Hispanic blacks. Among non-Hispanic whites, the relative index of inequality for all causes combined among the younger and older age groups was 5.6 (95% CI=4.9, 6.5) and 2.8 (95% CI=2.6, 3.0), respectively. Among non-Hispanic blacks, corresponding index values were 4.1 (95% CI=3.6, 4.6) and 1.7 (95% CI=1.6, 1.8). Larger disparities in the younger age group were also observed for cardiovascular disease, cancer, and other causes among non-Hispanic whites, non-Hispanic blacks, and all races combined. CONCLUSIONS: Educational disparities in mortality among non-Hispanic whites and blacks were 41%-61% lower in people aged 66-79 years than in those aged 50-64 years. Various factors may contribute to diminished disparities in the elderly, including differences in access to care, health perception, stress level, lifestyle, and health behaviors with advancing age and retirement.

29. Kavanagh SA, Shelley JM, Stevenson C. Does gender inequity increase men's mortality risk in the United States? A multilevel analysis of data from the National Longitudinal Mortality Study. *SSM Popul Health*. 2017;3:358-365. doi: 10.1016/j.ssmph.2017.03.003

ID : 119

30. Atekruse SF, Cosgrove C, Cronin K, Yu M. Comparing Cancer Registry Abstracted and Self-Reported Data on Race and Ethnicity. *J Registry Manag*. 2017;44:30-33.

ID : 126

Data on racial and ethnic subgroups from the National Cancer Institute's Surveillance, Epidemiology, End Results (SEER) program and Census Bureau population estimates are used to estimate cancer incidence rates. A SEER-National Longitudinal Mortality Study (NLMS) linkage of cancer cases diagnosed during 1973-2001 revealed mismatches in race classification from these sources affecting race-specific cancer incidence and mortality rates, particularly for minorities such as American Indians and Alaskan Natives (AIANs). Cancer registries obtain demographic data from various sources, including patient intake and provider records, administrative databases, and imputation algorithms. The primary Census Bureau source for racial/ethnic population denominators is self-reported survey data. We examined 7,970 SEER-NLMS cases diagnosed during 2003-2011 to update the comparison of patient race/ethnicity in cancer registry and population data sets. SEER and self-reported data did not agree for 5% of cases. The sensitivity of SEER data was better for whites (99%) and non-Hispanics (98%) than for multiracial individuals (23%) and all AIANs (40%). Intermediate sensitivities were seen for blacks as well as AIANs in Indian Health Service contract health service delivery areas (91%), Asians and Pacific Islanders (90%), and Hispanics (84%). As the United States becomes more diverse, a need exists to align race and ethnicity data from central cancer registries with population data, particularly for minority and multiracial groups. High-quality registry data on race and ethnicity, collected in a similar way as population estimates, will enhance cancer surveillance.

31. Roberts AL, Johnson NJ, Chen JT, Cudkowicz ME, Weisskopf MG. Race/ethnicity, socioeconomic status, and ALS mortality in the United States. *Neurology*. 2016. doi: 10.1212/wnl.0000000000003298

ID : 114

OBJECTIVE: To determine whether race/ethnicity and socioeconomic status are associated with amyotrophic lateral sclerosis (ALS) mortality in the United States. METHODS: The National Longitudinal Mortality Study (NLMS), a United States-representative, multistage sample, collected race/ethnicity and socioeconomic data prospectively. Mortality information was obtained by matching NLMS records to the National Death Index (1979-2011). More than 2 million persons (n = 1,145,368 women, n = 1,011,172 men) were included, with 33,024,881 person-years of follow-up (1,299 ALS deaths , response rate 96%). Race/ethnicity was by self-report in 4 categories. Hazard ratios (HRs) for ALS mortality were calculated for race/ethnicity and socioeconomic status separately and in mutually adjusted models. RESULTS: Minority vs white race/ethnicity predicted lower ALS mortality in models adjusted for socioeconomic status, type of health insurance, and birthplace (non-Hispanic black, HR 0.61, 95% confidence interval [CI] 0.48-0.78; Hispanic, HR 0.64, 95% CI 0.46-0.88; other races, non-Hispanic, HR 0.52, 95% CI 0.31-0.86). Higher educational attainment compared with < high school was in general associated with higher rate of ALS (high school, HR 1.23, 95% CI 1.07-1.42; some college, HR 1.24, 95% CI 1.04-1.48; college, HR 1.10, 95% CI 0.90-1.36; postgraduate, HR 1.31, 95% CI 1.06-1.62). Income, household poverty, and home ownership were not associated with ALS after adjustment for race/ethnicity. Rates did not differ by sex. CONCLUSION: Higher rate of ALS among whites vs non-Hispanic blacks, Hispanics, and non-Hispanic other races was not accounted for by multiple measures of socioeconomic status, birthplace, or type of health insurance. Higher rate of ALS among whites likely reflects actual higher risk of ALS rather than ascertainment bias or effects of socioeconomic status on ALS risk.

32. Muennig P, Masters R, Vail D, Hakes J. The effects of New York City's coordinated public health programmes on mortality through 2011. *Int J Epidemiol*. 2016. doi: 10.1093/ije/dyw290

ID : 120

BACKGROUND: In 2003, New York City (NYC) implemented a series of coordinated policies designed to reduce non-communicable disease. METHODS: We used coarsened exact matching (CEM) of individuals living inside and outside NYC between the years of 1992-2000 and 2002-10 to estimate difference-in-difference survival time models, a quasi-experimental approach. We also fitted age-period-cohort (APC) models to explore mortality impacts by gender, race, age, borough and cause of death over this same time period. RESULTS: Both CEM and APC models show that survival gains were large in the pre-2003 era of health policy reform relative to the rest of the USA, but small afterwards. There is no clear link between any policy and changes in mortality by age, gender, ethnicity, borough, or cause of death. CONCLUSIONS: NYC's gains in survival relative to the rest of the nation were not linked to the city's innovative and coordinated health policy efforts.

33. Montez JK, Zajacova A, Hayward MD. Explaining Inequalities in Women's Mortality between U.S. States. *SSM Popul Health*. 2016;2:561-571. doi: 10.1016/j.ssmph.2016.07.004

ID : 113

Inequalities in women's mortality between U.S. states are large and growing. It is unknown whether they reflect differences between states in their population characteristics, contextual characteristics, or both. This study systematically examines the large inequalities in women's mortality between U.S. states using a multilevel approach. It focuses on "fundamental" social determinants of mortality at the individual and state levels as potential explanations. We analyze data from the 2013 public-use National Longitudinal Mortality Study on women aged 45-89 years and estimate multilevel logistic regression models. The models include women's personal characteristics (age, race/ethnicity, education, employment, income, and marriage) and states' contextual characteristics (economic environment, social cohesion, sociopolitical orientation, physical infrastructure, and tobacco environment). We found that variation in women's mortality across states was significant (p<0.001). Adjusting for women's personal characteristics explained 30% of the variation. Additionally adjusting for states' contextual characteristics explained 62% of the variation; the most important characteristics were social cohesion and economic conditions. No significant mortality differences between any two states remained after accounting for individual and contextual characteristics. Supplementary analyses of men indicate that state contexts have stronger and more pernicious consequences for women than men. Taken together, the findings underscore the importance of 'bringing context back in' and taking a multilevel approach when investigating geographic inequalities in U.S. mortality.

34. Kposowa AJ, Johnson KAC. A cohort analysis of employment status and homicide victimization in the United States. *Sociological Spectrum*. 2016;36:93-108. doi: 10.1080/02732173.2015.1091757

ID : 98

The purpose of the study was to examine the impact of employment status on homicide victimization among cohort members. Data were derived from the US National Longitudinal Mortality Study. Cox proportional hazards regression models were fitted to the data. Analysis showed that employment status was significantly associated with homicide. The unemployed were over 50% more likely to become homicide victims than the employed. Persons not in the labor force were 1.3 times more likely to be victimized than employed cohort members. Results also showed that race was significantly associated with homicide. Non-Hispanic Blacks were over 4.5 times as likely to die as whites. Hispanics were nearly 1.9 times as likely to be victims as Non-Hispanic whites. When the sample was stratified by race/ethnicity, unemployment was highly significant for both non-Hispanic white and non-Hispanic African American men. Employment status is a significant risk factor for homicide victimization.

35. Kim D. The associations between US state and local social spending, income inequality, and individual all-cause and cause-specific mortality: The National Longitudinal Mortality Study. *Prev Med*. 2016;84:62-68. doi: 10.1016/j.ypmed.2015.11.013

ID : 101

OBJECTIVE: To investigate government state and local spending on public goods and income inequality as predictors of the risks of dying. METHODS: Data on 431,637 adults aged 30-74 and 375,354 adults aged 20-44 in the 48 contiguous US states were used from the National Longitudinal Mortality Study to estimate the impacts of state and local spending and income inequality on individual risks of all-cause and cause-specific mortality for leading causes of death in younger and middle-aged adults and older adults. To reduce bias, models incorporated state fixed effects and instrumental variables. RESULTS: Each additional $250 per capita per year spent on welfare predicted a 3-percentage point (-0.031, 95% CI: -0.059, -0.0027) lower probability of dying from any cause. Each additional $250 per capita spent on welfare and education predicted 1.6-percentage point (-0.016, 95% CI: -0.031, -0.0011) and 0.8-percentage point (-0.008, 95% CI: -0.0156, -0.00024) lower probabilities of dying from coronary heart disease (CHD), respectively. No associations were found for colon cancer or chronic obstructive pulmonary disease; for diabetes, external injury, and suicide, estimates were inverse but modest in magnitude. A 0.1 higher Gini coefficient (higher income inequality) predicted 1-percentage point (0.010, 95% CI: 0.0026, 0.0180) and 0.2-percentage point (0.002, 95% CI: 0.001, 0.002) higher probabilities of dying from CHD and suicide, respectively. CONCLUSIONS: Empirical linkages were identified between state-level spending on welfare and education and lower individual risks of dying, particularly from CHD and all causes combined. State-level income inequality predicted higher risks of dying from CHD and suicide.

36. Goldring T, Lange F, Richards-Shubik S. Testing for changes in the SES-mortality gradient when the distribution of education changes too. *J Health Econ*. 2016;46:120-130. doi: 10.1016/j.jhealeco.2015.12.002

ID : 108

We develop a flexible test for changes in the SES-mortality gradient that accounts for changes in the distribution of education, the most commonly used marker of SES. We implement the test for the period between 1984 and 2006 in the United States using microdata from the Census and other surveys linked to death records. Using our flexible test, we find that the evidence for a change in the SES-mortality gradient is not as strong as previous research has suggested. Our results indicate that the gradient increased for females during this time period, but we cannot rule out that the gradient among males has not changed. Informally, the results suggest that the changes for females are mainly driven by the bottom of the education distribution.

37. Chetty R, Stepner M, Abraham S, Lin S, Scuderi B, Turner N, Bergeron A, Cutler D. The Association Between Income and Life Expectancy in the United States, 2001-2014. *JAMA*. 2016;315:1750-1766. doi: 10.1001/jama.2016.4226

ID : 109

IMPORTANCE: The relationship between income and life expectancy is well established but remains poorly understood. OBJECTIVES: To measure the level, time trend, and geographic variability in the association between income and life expectancy and to identify factors related to small area variation. DESIGN AND SETTING: Income data for the US population were obtained from 1.4 billion deidentified tax records between 1999 and 2014. Mortality data were obtained from Social Security Administration death records. These data were used to estimate race- and ethnicity-adjusted life expectancy at 40 years of age by household income percentile, sex, and geographic area, and to evaluate factors associated with differences in life expectancy. EXPOSURE: Pretax household earnings as a measure of income. MAIN OUTCOMES AND MEASURES: Relationship between income and life expectancy; trends in life expectancy by income group; geographic variation in life expectancy levels and trends by income group; and factors associated with differences in life expectancy across areas. RESULTS: The sample consisted of 1,408,287,218 person-year observations for individuals aged 40 to 76 years (mean age, 53.0 years; median household earnings among working individuals, $61,175 per year). There were 4,114,380 deaths among men (mortality rate, 596.3 per 100,000) and 2,694,808 deaths among women (mortality rate, 375.1 per 100,000). The analysis yielded 4 results. First, higher income was associated with greater longevity throughout the income distribution. The gap in life expectancy between the richest 1% and poorest 1% of individuals was 14.6 years (95% CI, 14.4 to 14.8 years) for men and 10.1 years (95% CI, 9.9 to 10.3 years) for women. Second, inequality in life expectancy increased over time. Between 2001 and 2014, life expectancy increased by 2.34 years for men and 2.91 years for women in the top 5% of the income distribution, but by only 0.32 years for men and 0.04 years for women in the bottom 5% (P < .001 for the differences for both sexes). Third, life expectancy for low-income individuals varied substantially across local areas. In the bottom income quartile, life expectancy differed by approximately 4.5 years between areas with the highest and lowest longevity. Changes in life expectancy between 2001 and 2014 ranged from gains of more than 4 years to losses of more than 2 years across areas. Fourth, geographic differences in life expectancy for individuals in the lowest income quartile were significantly correlated with health behaviors such as smoking (r = -0.69, P < .001), but were not significantly correlated with access to medical care, physical environmental factors, income inequality, or labor market conditions. Life expectancy for low-income individuals was positively correlated with the local area fraction of immigrants (r = 0.72, P < .001), fraction of college graduates (r = 0.42, P < .001), and government expenditures (r = 0.57, P < .001). CONCLUSIONS AND RELEVANCE: In the United States between 2001 and 2014, higher income was associated with greater longevity, and differences in life expectancy across income groups increased over time. However, the association between life expectancy and income varied substantially across areas; differences in longevity across income groups decreased in some areas and increased in others. The differences in life expectancy were correlated with health behaviors and local area characteristics.

38. Brodish PH, Hakes JK. Quantifying the individual-level association between income and mortality risk in the United States using the National Longitudinal Mortality Study. *Soc Sci Med*. 2016;170:180-187. doi: 10.1016/j.socscimed.2016.10.026

ID : 112

Policy makers would benefit from being able to estimate the likely impact of potential interventions to reverse the effects of rapidly rising income inequality on mortality rates. Using multiple cohorts of the National Longitudinal Mortality Study (NLMS), we estimate the absolute income effect on premature mortality in the United States. A multivariate Poisson regression using the natural logarithm of equivilized household income establishes the magnitude of the absolute income effect on mortality. We calculate mortality rates for each income decile of the study sample and mortality rate ratios relative to the decile containing mean income. We then apply the estimated income effect to two kinds of hypothetical interventions that would redistribute income. The first lifts everyone with an equivalized household income at or below the U.S. poverty line (in 2000$) out of poverty, to the income category just above the poverty line. The second shifts each family's equivalized income by, in turn, 10%, 20%, 30%, or 40% toward the mean household income, equivalent to reducing the Gini coefficient by the same percentage in each scenario. We also assess mortality disparities of the hypothetical interventions using ratios of mortality rates of the ninth and second income deciles, and test sensitivity to the assumption of causality of income on mortality by halving the mortality effect per unit of equivalized household income. The estimated absolute income effect would produce a three to four percent reduction in mortality for a 10% reduction in the Gini coefficient. Larger mortality reductions result from larger reductions in the Gini, but with diminishing returns. Inequalities in estimated mortality rates are reduced by a larger percentage than overall estimated mortality rates under the same hypothetical redistributions.

39. Blecker S, Johnson NJ, Altekruse S, Horwitz LI. Association of Occupation as a Physician With Likelihood of Dying in a Hospital. *JAMA*. 2016;315:301-303. doi: 10.1001/jama.2015.16976

ID : 97

40. Arias E, Heron M, Hakes JK. The validity of race and Hispanic-origin reporting on death certificates in the United States: An update. Washington, DC: 2016.

ID : 111

41. Weisskopf MG, Cudkowicz ME, Johnson N. Military Service and Amyotrophic Lateral Sclerosis in a Population-based Cohort. *Epidemiology*. 2015;26:831-838. doi: 10.1097/ede.0000000000000376

ID : 95

BACKGROUND: Military service has been suggested to be associated with an increased risk of amyotrophic lateral sclerosis (ALS), but only one prospective study-of a volunteer cohort-has examined this question. METHODS: We prospectively assessed the relation between service in the military and ALS mortality among participants in the National Longitudinal Mortality Study, a population-representative cohort of U.S. men and women surveyed from 1973 through 2002. Participant follow-up was conducted from 1979 through 2002 for ALS mortality. There were 696,743 men and 392,571 women who were 25 years old or more with military service data. In this group, there were 375 male ALS deaths and 96 female ALS deaths. Adjusted hazard ratios (HRs) were calculated using Cox proportional hazards. RESULTS: Men who served in the military had an increased adjusted ALS death rate [HR: 1.23; 95% confidence interval (CI): 0.98, 1.53] compared with those who did not serve. An increase in ALS mortality was found among those who served during World War II (HR: 1.47; 95% CI: 1.13, 1.91) but not during other time periods. This pattern of results was similar for women, but with larger confidence intervals (HR for military service: 1.26; 95% CI: 0.29, 5.59; HR for service during World War II: 2.03; 95% CI: 0.45, 9.05). CONCLUSIONS: Military personnel have an increased risk of ALS, which may be specific to certain service periods although there was no data on actual deployment. Because of the longer follow-up time for World War II veterans, we cannot rule out that increased risk for those who served during other periods would be seen with further follow-up.

42. Singh GK, Siahpush M, Azuine RE, Williams SD. Widening Socioeconomic and Racial Disparities in Cardiovascular Disease Mortality in the United States, 1969-2013. *Int J MCH AIDS*. 2015;3:106-118.

ID : 118

OBJECTIVES: This study examined trends and socioeconomic and racial/ethnic disparities in cardiovascular disease (CVD) mortality in the United States between 1969 and 2013. METHODS: National vital statistics data and the National Longitudinal Mortality Study were used to estimate racial/ethnic and area- and individual-level socioeconomic disparities in CVD mortality over time. Rate ratios and log-linear regression were used to model mortality trends and differentials. RESULTS: Between 1969 and 2013, CVD mortality rates decreased by 2.66% per year for whites and 2.12% for blacks. Racial disparities and socioeconomic gradients in CVD mortality increased substantially during the study period. In 2013, blacks had 30% higher CVD mortality than whites and 113% higher mortality than Asians/Pacific Islanders. Compared to those in the most affluent group, individuals in the most deprived area group had 11% higher CVD mortality in 1969 but 40% higher mortality in 2007-2011. Education, income, and occupation were inversely associated with CVD mortality in both men and women. Men and women with low education and incomes had 46-76% higher CVD mortality risks than their counterparts with high education and income levels. Men in clerical, service, farming, craft, repair, construction, and transport occupations, and manual laborers had 30-58% higher CVD mortality risks than those employed in executive and managerial occupations. CONCLUSIONS AND GLOBAL HEALTH IMPLICATIONS: Socioeconomic and racial disparities in CVD mortality are marked and have increased over time because of faster declines in mortality among the affluent and majority populations. Disparities in CVD mortality may reflect inequalities in the social environment, behavioral risk factors such as smoking, obesity, physical inactivity, disease prevalence, and healthcare access and treatment. With rising prevalence of many chronic disease risk factors, the global burden of cardiovascular diseases is expected to increase further, particularly in low- and middle-income countries where over 80% of all CVD deaths occur.

43. Singh GK, Siahpush M, Azuine RE, Williams SD. Increasing Area Deprivation and Socioeconomic Inequalities in Heart Disease, Stroke, and Cardiovascular Disease Mortality Among Working Age Populations, United States, 1969-2011. *Int J MCH AIDS*. 2015;3:119-133.

ID : 117

OBJECTIVES: We examined the extent to which area- and individual-level socioeconomic inequalities in cardiovascular-disease (CVD), heart disease, and stroke mortality among United States men and women aged 25-64 years changed between 1969 and 2011. METHODS: National vital statistics data and the National Longitudinal Mortality Study were used to estimate area- and individual-level socioeconomic gradients in mortality over time. Rate ratios and log-linear and Cox regression were used to model mortality trends and differentials. RESULTS: Area socioeconomic gradients in mortality from CVD, heart disease, and stroke increased substantially during the study period. Compared to those in the most affluent group, individuals in the most deprived area group had, respectively 35%, 29%, and 73% higher CVD, heart disease, and stroke mortality in 1969, but 120-121% higher mortality in 2007-2011. Gradients were steeper for women than for men. Education, income, and occupation were inversely associated with CVD, heart disease, and stroke mortality, with individual-level socioeconomic gradients being steeper during 1990-2002 than in 1979-1989. Individuals with low education and incomes had 2.7 to 3.7 times higher CVD, heart disease, and stroke mortality risks than their counterparts with high education and income levels. CONCLUSIONS AND GLOBAL HEALTH IMPLICATIONS: Although mortality declined for all US groups during 1969-2011, socioeconomic disparities in mortality from CVD, heart disease and stroke remained marked and increased over time because of faster declines in mortality among higher socioeconomic groups. Widening disparities in mortality may reflect increasing temporal areal inequalities in living conditions, behavioral risk factors such as smoking, obesity and physical inactivity, and access to and use of health services. With social inequalities and prevalence of smoking, obesity, and physical inactivity on the rise, most segments of the working-age population in low- and middle-income countries will likely experience increased cardiovascular-disease burden in terms of higher morbidity and mortality rates.

44. Singh GK, Azuine RE, Siahpush M, Williams SD. Widening Geographical Disparities in Cardiovascular Disease Mortality in the United States, 1969-2011. *Int J MCH AIDS*. 2015;3:134-149.

ID : 116

OBJECTIVES: This study examined trends in geographical disparities in cardiovascular-disease (CVD) mortality in the United States between 1969 and 2011. METHODS: National vital statistics data and the National Longitudinal Mortality Study were used to estimate regional, state, and county-level disparities in CVD mortality over time. Log-linear, weighted least squares, and Cox regression were used to analyze mortality trends and differentials. RESULTS: During 1969-2011, CVD mortality rates declined fastest in New England and Mid-Atlantic regions and slowest in the Southeast and Southwestern regions. In 1969, the mortality rate was 9% higher in the Southeast than in New England, but the differential increased to 48% in 2011. In 2011, Southeastern states, Mississippi and Alabama, had the highest CVD mortality rates, nearly twice the rates for Minnesota and Hawaii. Controlling for individual-level covariates reduced state differentials. State- and county-level differentials in CVD mortality rates widened over time as geographical disparity in CVD mortality increased by 50% between 1969 and 2011. Area deprivation, smoking, obesity, physical inactivity, diabetes prevalence, urbanization, lack of health insurance, and lower access to primary medical care were all significant predictors of county-level CVD mortality rates and accounted for 52.7% of the county variance. CONCLUSIONS AND GLOBAL HEALTH IMPLICATIONS: Although CVD mortality has declined for all geographical areas in the United States, geographical disparity has widened over time as certain regions and states, particularly those in the South, have lagged behind in mortality reduction. Geographical disparities in CVD mortality reflect inequalities in socioeconomic conditions and behavioral risk factors. With the global CVD burden on the rise, monitoring geographical disparities, particularly in low- and middle-income countries, could indicate the extent to which reductions in CVD mortality are achievable and may help identify effective policy strategies for CVD prevention and control.

45. Roberts AL, Johnson NJ, Cudkowicz ME, Eum KD, Weisskopf MG. Job-related formaldehyde exposure and ALS mortality in the USA. *J Neurol Neurosurg Psychiatry*. 2015. doi: 10.1136/jnnp-2015-310750

ID : 94

46. Patel MI, Johnson N, Altekruse S, Rhoads K. Are Racial and Ethnic Disparities in Mortality from Acute Leukemia Due to Socioeconomic Status Factors? Data from the Surveillance Epidemiology and End Results Database Linked to the National Longitudinal Mortality Study. In: *Blood*. 2015.

ID : 99

47. Ho JY, Fenelon A. The Contribution of Smoking to Educational Gradients in U.S. Life Expectancy. *J Health Soc Behav*. 2015;56:307-322. doi: 10.1177/0022146515592731

ID : 96

Researchers have documented widening educational gradients in mortality in the United States since the 1970s. While smoking has been proposed as a key explanation for this trend, no prior study has quantified the contribution of smoking to increasing education gaps in longevity. We estimate the contribution of smoking to educational gradients in life expectancy using data on white men and women ages 50 and older from the National Longitudinal Mortality Study (N = 283,430; 68,644 deaths) and the National Health Interview Survey (N = 584,811; 127,226 deaths) in five periods covering the 1980s to 2006. In each period, smoking makes an important contribution to education gaps in longevity for white men and women. Smoking accounts for half the increase in the gap for white women but does not explain the widening gap for white men in the most recent period. Addressing greater initiation and continued smoking among the less educated may reduce mortality inequalities.

48. Jim MA, Arias E, Seneca DS, Hoopes MJ, Jim CC, Johnson NJ, Wiggins CL. Racial misclassification of american indians and alaska natives by Indian health service contract health service delivery area. *Am J Public Health*. 2014;104 Suppl 3:S295-302. doi: 10.2105/ajph.2014.301933

ID : 72

Objectives. We evaluated the racial misclassification of American Indians and Alaska Natives (AI/ANs) in cancer incidence and all-cause mortality data by Indian Health Service (IHS) Contract Health Service Delivery Area (CHSDA). Methods. We evaluated data from 3 sources: IHS-National Vital Statistics System (NVSS), IHS-National Program of Cancer Registries (NPCR)/Surveillance, Epidemiology and End Results (SEER) program, and National Longitudinal Mortality Study (NLMS). We calculated, within each data source, the sensitivity and classification ratios by sex, IHS region, and urban-rural classification by CHSDA county. Results. Sensitivity was significantly greater in CHSDA counties (IHS-NVSS: 83.6%; IHS-NPCR/SEER: 77.6%; NLMS: 68.8%) than non-CHSDA counties (IHS-NVSS: 54.8%; IHS-NPCR/SEER: 39.0%; NLMS: 28.3%). Classification ratios indicated less misclassification in CHSDA counties (IHS-NVSS: 1.20%; IHS-NPCR/SEER: 1.29%; NLMS: 1.18%) than non-CHSDA counties (IHS-NVSS: 1.82%; IHS-NPCR/SEER: 2.56%; NLMS: 1.81%). Race misclassification was less in rural counties and in regions with the greatest concentrations of AI/AN persons (Alaska, Southwest, and Northern Plains). Conclusions. Limiting presentation and analysis to CHSDA counties helped mitigate the effects of race misclassification of AI/AN persons, although a portion of the population was excluded.

49. Coady SA, Johnson NJ, Hakes JK, Sorlie PD. Individual education, area income, and mortality and recurrence of myocardial infarction in a Medicare cohort: the National Longitudinal Mortality Study. *BMC Public Health*. 2014;14:705. doi: 10.1186/1471-2458-14-705

ID : 75

BACKGROUND: The Medicare program provides universal access to hospital care for the elderly; however, mortality disparities may still persist in this population. The association of individual education and area income with survival and recurrence post Myocardial Infarction (MI) was assessed in a national sample. METHODS: Individual level education from the National Longitudinal Mortality Study was linked to Medicare and National Death Index records over the period of 1991-2001 to test the association of individual education and zip code tabulation area median income with survival and recurrence post-MI. Survival was partitioned into 3 periods: in-hospital, discharge to 1 year, and 1 year to 5 years and recurrence was partitioned into two periods: 28 day to 1 year, and 1 year to 5 years. RESULTS: First MIs were found in 8,043 women and 7,929 men. In women and men 66-79 years of age, less than a high school education compared with a college degree or more was associated with 1-5 year mortality in both women (HRR 1.61, 95% confidence interval 1.03-2.50) and men (HRR 1.37, 1.06-1.76). Education was also associated with 1-5 year recurrence in men (HRR 1.68, 1.18-2.41, < High School compared with college degree or more), but not women. Across the spectrum of survival and recurrence periods median zip code level income was inconsistently associated with outcomes. Associations were limited to discharge-1 year survival (RR lowest versus highest quintile 1.31, 95% confidence interval 1.03-1.67) and 28 day-1 year recurrence (RR lowest versus highest quintile 1.72, 95% confidence interval 1.14-2.57) in older men. CONCLUSIONS: Despite the Medicare entitlement program, disparities related to individual socioeconomic status remain. Additional research is needed to elucidate the barriers and mechanisms to eliminating health disparities among the elderly.

50. Anderson RN, Copeland G, Hayes JM. Linkages to improve mortality data for American Indians and Alaska Natives: a new model for death reporting? *Am J Public Health*. 2014;104 Suppl 3:S258-262. doi: 10.2105/ajph.2013.301647

ID : 77

Racial misclassification is a well-documented weakness of mortality data taken from death certificates. As a result, mortality statistics for American Indians and Alaska Natives (AI/ANs) present, at best, an inaccurate and misleading assessment of mortality in this population. Studies evaluating the quality of race/ethnicity reporting on death certificates have linked data from death certificates to other data sources collected when the decedent was still alive (e.g., Census, Current Population Survey). Such studies have shown substantial misclassification of AI/AN decedents. Despite limitations, linking mortality data from death certificates with data from other sources collected when decedents were living provides opportunities to evaluate and correct misclassification of populations such as AI/AN persons and facilitates the calculation and presentation of more accurate mortality statistics.

51. Singh GK, Rodriguez-Lainz A, Kogan MD. Immigrant health inequalities in the United States: use of eight major national data systems. *ScientificWorldJournal*. 2013;2013:512313. doi: 10.1155/2013/512313

ID : 76

Eight major federal data systems, including the National Vital Statistics System (NVSS), National Health Interview Survey (NHIS), National Survey of Children's Health, National Longitudinal Mortality Study, and American Community Survey, were used to examine health differentials between immigrants and the US-born across the life course. Survival and logistic regression, prevalence, and age-adjusted death rates were used to examine differentials. Although these data systems vary considerably in their coverage of health and behavioral characteristics, ethnic-immigrant groups, and time periods, they all serve as important research databases for understanding the health of US immigrants. The NVSS and NHIS, the two most important data systems, include a wide range of health variables and many racial/ethnic and immigrant groups. Immigrants live 3.4 years longer than the US-born, with a life expectancy ranging from 83.0 years for Asian/Pacific Islander immigrants to 69.2 years for US-born blacks. Overall, immigrants have better infant, child, and adult health and lower disability and mortality rates than the US-born, with immigrant health patterns varying across racial/ethnic groups. Immigrant children and adults, however, fare substantially worse than the US-born in health insurance coverage and access to preventive health services. Suggestions and new directions are offered for improvements in health monitoring and for strengthening and developing databases for immigrant health assessment in the USA.

52. Kposowa AJ. Marital status and HIV/AIDS mortality: evidence from the US National Longitudinal Mortality Study. *Int J Infect Dis*. 2013;17:e868-874. doi: 10.1016/j.ijid.2013.02.018

ID : 74

OBJECTIVES: The purpose of the study was to examine associations between marital status groups and death from HIV/AIDS. The primary hypothesis was that divorced and single/never married individuals have a much higher risk of death than married persons. METHODS: Data were derived from the third release of the US National Longitudinal Mortality Study. Cox proportional regression models were fitted to the data. RESULTS: It was found that marital status is associated with mortality from HIV. Divorced and separated individuals were 4.3 times more likely to die of HIV/AIDS than married individuals (adjusted relative risk (aRR) 4.321, 95% confidence interval (CI) 2.978, 6.269). Single/never married persons were 13 times as likely to die of HIV/AIDS as their married counterparts (aRR 13.092, 95% CI 9.652, 17.757). When the sample was stratified by sex, however, it was observed that while marital status was associated with HIV/AIDS mortality among men, it had no significant association with death in women. However, African-American women (aRR 9.23, 95% CI 4.47, 19.03) and Hispanic women (aRR 7.06, 95% CI 3.03, 16.45) had a significantly higher risk of death than their non-Hispanic white female counterparts. CONCLUSIONS: Marital status is a significant risk factor for mortality from HIV/AIDS, but this association is only valid for men. The different gender mortality experiences suggest that for HIV/AIDS more population-based studies comprising marital status risk factor histories are needed, given the limited research on marital status and mortality from the disease.

53. Espinosa J, Evans WN. Maternal bereavement: the heightened mortality of mothers after the death of a child. *Econ Hum Biol*. 2013;11:371-381. doi: 10.1016/j.ehb.2012.06.002

ID : 93

Using a 9-year follow-up of 69,224 mothers aged 20-50 from the National Longitudinal Mortality Survey, we investigate whether there is heightened mortality of mothers after the death of a child. Results from Cox proportional hazard models indicate that the death of a child produces a statistically significant hazard ratio of 2.3. There is suggestive evidence that the heightened mortality is concentrated in the first two years after the death of a child. We find no difference in results based on mother's education or marital status, family size, the child's cause of death or the gender of the child.

54. Daly MC, Wilson DJ, Johnson NJ. RELATIVE STATUS AND WELL-BEING: EVIDENCE FROM U. S. SUICIDE DEATHS. *Review of Economics and Statistics*. 2013;95:1480-1500.

ID : 73

55. Akinyemiju TF, Soliman AS, Johnson NJ, Altekruse SF, Welch K, Banerjee M, Schwartz K, Merajver S. Individual and neighborhood socioeconomic status and healthcare resources in relation to black-white breast cancer survival disparities. *J Cancer Epidemiol*. 2013;2013:490472. doi: 10.1155/2013/490472

ID : 6

Background. Breast cancer survival has improved significantly in the US in the past 10-15 years. However, disparities exist in breast cancer survival between black and white women. Purpose. To investigate the effect of county healthcare resources and SES as well as individual SES status on breast cancer survival disparities between black and white women. Methods. Data from 1,796 breast cancer cases were obtained from the Surveillance Epidemiology and End Results and the National Longitudinal Mortality Study dataset. Cox Proportional Hazards models were constructed accounting for clustering within counties. Three sequential Cox models were fit for each outcome including demographic variables; demographic and clinical variables; and finally demographic, clinical, and county-level variables. Results. In unadjusted analysis, black women had a 53% higher likelihood of dying of breast cancer and 32% higher likelihood of dying of any cause (P < 0.05) compared with white women. Adjusting for demographic variables explained away the effect of race on breast cancer survival (HR, 1.40; 95% CI, 0.99-1.97), but not on all-cause mortality. The racial difference in all-cause survival disappeared only after adjusting for county-level variables (HR, 1.27; CI, 0.95-1.71). Conclusions. Improving equitable access to healthcare for all women in the US may help eliminate survival disparities between racial and socioeconomic groups.

56. Montez JK, Hummer RA, Hayward MD. Educational attainment and adult mortality in the United States: a systematic analysis of functional form. *Demography*. 2012;49:315-336. doi: 10.1007/s13524-011-0082-8

ID : 8

A vast literature has documented the inverse association between educational attainment and U.S. adult mortality risk but given little attention to identifying the optimal functional form of the association. A theoretical explanation of the association hinges on our ability to describe it empirically. Using the 1979-1998 National Longitudinal Mortality Study for non-Hispanic white and black adults aged 25-100 years during the mortality follow-up period (N = 1,008,215), we evaluated 13 functional forms across race-gender-age subgroups to determine which form(s) best captured the association. Results revealed that the preferred functional form includes a linear decline in mortality risk from 0 to 11 years of education, followed by a step-change reduction in mortality risk upon attainment of a high school diploma, at which point mortality risk resumes a linear decline but with a steeper slope than that prior to a high school diploma. The findings provide important clues for theoretical development of explanatory mechanisms: an explanation for the selected functional form may require integrating a credentialist perspective to explain the step-change reduction in mortality risk upon attainment of a high school diploma, with a human capital perspective to explain the linear declines before and after a high school diploma.

57. Geruso M. Black-white disparities in life expectancy: how much can the standard SES variables explain? *Demography*. 2012;49:553-574. doi: 10.1007/s13524-011-0089-1

ID : 7

This article quantifies the extent to which socioeconomic and demographic characteristics can account for black-white disparities in life expectancy in the United States. Although many studies have investigated the linkages between race, socioeconomic status, and mortality, this article is the first to measure how much of the life expectancy gap remains after differences in mortality are purged of the compositional differences in socioeconomic characteristics between blacks and whites. The decomposition is facilitated by a reweighting technique that creates counterfactual estimation samples in which the distribution of income, education, employment and occupation, marital status, and other theoretically relevant variables among blacks is made to match the distribution of these variables among whites. For males, 80% of the black-white gap in life expectancy at age 1 can be accounted for by differences in socioeconomic and demographic characteristics. For females, 70% percent of the gap is accounted for. Labor force participation, occupation, and (among women only) marital status have almost no additional power to explain the black-white disparity in life expectancy after precise measures for income and education are controlled for.

58. Wilson FD, Rebhun U, Rivas S. Population Change and Changing Educational Attainment of Ethnic Groups in the United States, 1980-2000. *Population Research and Policy Review*. 2011;30:639-659. doi: 10.1007/s11113-011-9204-7

ID : 5

This study assesses the effect of population change on decade changes in the educational attainments of country of origin populations in the United States. Our data are derived from decennial censuses, NLMS, the World Bank, and INS. We find that changes in the share of country of origin populations with one or more years of post-secondary schooling are associated with selected components of population change during the 1980-1990 and 1990-2000 decades. The specific components include survivors during the decade, in-migration, and emigration of the foreign-born. Likewise, intra-generational mobility is found to be an important determinant of changes in educational attainment. The discussion addresses limitations of the data and suggests directions for future research as well as policy implications.

59. Schoeni RF, Dow WH, Miller WD, Pamuk ER. The economic value of improving the health of disadvantaged Americans. *Am J Prev Med*. 2011;40:S67-72. doi: 10.1016/j.amepre.2010.09.032

ID : 11

BACKGROUND: Higher educational attainment is associated with better health status and longer life. PURPOSE: This analysis estimates the annual dollar value of the benefits that would accrue to less-educated American adults if they experienced the lower mortality rates and better health of those with a college education. METHODS: Using estimates of differences in mortality among adults aged >/= 25 years by educational attainment from the National Longitudinal Mortality Survey and of education-based differentials in health status from published studies based on the Medical Expenditure Panel Survey, combined with existing estimates of the economic value of a healthy life year, the economic value of raising the health of individuals with less than a college education to the health of the college educated is estimated. RESULTS: The annual economic value that would accrue to disadvantaged (less-educated) Americans if their health and longevity improved to that of college-educated Americans is $1.02 trillion. CONCLUSIONS: This modeling exercise does not fully account for the social costs and benefits of particular policies and programs to reduce health disparities; rather, it provides a sense of the magnitude of the economic value lost in health disparities to compare with other social issues vying for attention. The aggregate economic gains from interventions that improve the health of disadvantaged Americans are potentially large.

60. Parlett LE, Bowman JD, van Wijngaarden E. Evaluation of occupational exposure to magnetic fields and motor neuron disease mortality in a population-based cohort. *J Occup Environ Med*. 2011;53:1447-1451. doi: 10.1097/JOM.0b013e318237a1d0

ID : 9

OBJECTIVE: Epidemiologic evidence for the association between electromagnetic fields and amyotrophic lateral sclerosis, the most common form of motor neuron disease (MND), has been inconclusive. We evaluated the association between electromagnetic fields and MND among workers in occupations potentially exposed to magnetic fields METHODS: MND mortality (ICD-9 335.2) was examined in the National Longitudinal Mortality Study using multivariable proportional hazards models. Occupational exposure to magnetic fields was determined on the basis of a population-based job-exposure matrix. Age at entry, education, race, sex, and income were considered for inclusion as covariates RESULTS: After adjusting for age, sex, and education, there were no increased risks of MND mortality in relation to potential magnetic field exposure, with hazard ratios around the null in all magnetic field exposure quartiles CONCLUSIONS: Our study does not provide evidence for an association between magnetic field exposure and MND mortality.

61. Du XL, Lin CC, Johnson NJ, Altekruse S. Effects of individual-level socioeconomic factors on racial disparities in cancer treatment and survival: findings from the National Longitudinal Mortality Study, 1979-2003. *Cancer*. 2011;117:3242-3251. doi: 10.1002/cncr.25854

ID : 10

BACKGROUND: This is the first study to use the linked National Longitudinal Mortality Study and Surveillance, Epidemiology, and End Results (SEER) data to determine the effects of individual-level socioeconomic factors (health insurance, education, income, and poverty status) on racial disparities in receiving treatment and in survival. METHODS: This study included 13,234 cases diagnosed with the 8 most common types of cancer (female breast, colorectal, prostate, lung and bronchus, uterine cervix, ovarian, melanoma, and urinary bladder) at age >/= 25 years, identified from the National Longitudinal Mortality Study-SEER data during 1973 to 2003. Kaplan-Meier methods and Cox regression models were used for survival analysis. RESULTS: Three-year all-cause observed survival for cases diagnosed with local-stage cancers of the 8 leading tumors combined was >/= 82% regardless of race/ethnicity. More favorable survival was associated with higher socioeconomic status. Compared with whites, blacks were less likely to receive first-course cancer-directed surgery, perhaps reflecting a less favorable stage distribution at diagnosis. Hazard ratio (HR) for cancer-specific mortality was significantly higher among blacks compared with whites (HR, 1.2; 95% confidence interval [CI], 1.1-1.3) after adjusting for age, sex, and tumor stage, but not after further controlling for socioeconomic factors and treatment (HR, 1.0; 95% CI, 0.9-1.1). HRs for all-cause mortality among patients with breast cancer and for cancer-specific mortality in patients with prostate cancer were significantly higher for blacks compared with whites after adjusting for socioeconomic factors, treatment, and patient and tumor characteristics. CONCLUSIONS: Favorable survival was associated with higher socioeconomic status. Racial disparities in survival persisted after adjusting for individual-level socioeconomic factors and treatment for patients with breast and prostate cancer.

62. Arias E, Eschbach K, Schauman WS, Backlund EL, Sorlie PD. The Hispanic mortality advantage and ethnic misclassification on US death certificates. *Am J Public Health*. 2010;100 Suppl 1:S171-177. doi: 10.2105/ajph.2008.135863

ID : 12

OBJECTIVES: We tested the data artifact hypothesis regarding the Hispanic mortality advantage by investigating whether and to what degree this advantage is explained by Hispanic origin misclassification on US death certificates. METHODS: We used the National Longitudinal Mortality Study, which links Current Population Survey records to death certificates for 1979 through 1998, to estimate the sensitivity, specificity, and net ascertainment of Hispanic ethnicity on death certificates compared with survey classifications. Using national vital statistics mortality data, we estimated Hispanic age-specific and age-adjusted death rates, which were uncorrected and corrected for death certificate misclassification, and produced death rate ratios comparing the Hispanic with the non-Hispanic White population. RESULTS: Hispanic origin reporting on death certificates in the United States is reasonably good. The net ascertainment of Hispanic origin is just 5% higher on survey records than on death certificates. Corrected age-adjusted death rates for Hispanics are lower than those for the non-Hispanic White population by close to 20%. CONCLUSIONS: The Hispanic mortality paradox is not explained by an incongruence between ethnic classification in vital registration and population data systems.

63. Arias E. United States life tables by Hispanic origin. 2010.

ID : 92

64. Lewis DR, Clegg LX, Johnson NJ. Lung disease mortality in the United States: the National Longitudinal Mortality Study. *Int J Tuberc Lung Dis*. 2009;13:1008-1014.

ID : 13

SETTING: The National Longitudinal Mortality Study (NLMS) offers the advantage of assessing mortality in a representative population of the United States. OBJECTIVE: To evaluate health disparities associated with lung cancer and chronic obstructive pulmonary disease (COPD) mortality in the United States and whether these associations are similar between these outcomes. DESIGN: The NLMS is a prospective study. Data from NLMS cohort years 1985, 1992, 1993, 1995 and 1996 were included, representing nearly 1.5 million person-years. Lung cancer and COPD mortality relative risks (RRs) from Cox regression analysis, including residential characteristics, marital status, education, health insurance and family income, were evaluated. RESULTS: By 1998, 1273 lung cancer deaths and 772 COPD deaths occurred. Lung cancer mortality rates were approximately two times higher than COPD mortality rates among race and ethnic groups. Cox regression analysis revealed that low education (RR = 1.77, significant, P = 0.01) and low family income (RR = 1.50, significant, P = 0.01) are associated with lung cancer and COPD mortality, controlling for age, race/ethnicity, sex and smoking status. CONCLUSIONS: COPD and lung cancer mortality have similar associations with health disparity indicators in the NLMS data, with some differences in the magnitude of the effect.

65. Cooper AR, Van Wijngaarden E, Fisher SG, Adams MJ, Yost MG, Bowman JD. A population-based cohort study of occupational exposure to magnetic fields and cardiovascular disease mortality. *Ann Epidemiol*. 2009;19:42-48. doi: 10.1016/j.annepidem.2008.10.001

ID : 15

PURPOSE: This cohort study aims to examine cardiovascular disease (CVD) mortality risks among workers in occupations potentially exposed to magnetic fields (MF). METHODS: Risks for major CVD mortality by potential job-related MF exposure were examined in a sample of U.S. workers from the National Longitudinal Mortality Study using multivariate proportional hazards models. RESULTS: After adjustment for demographic factors, there were no significant excess risks between individuals with medium (0.15 to <0.20 microT), high (0.20 to < 0.30 microT), or very high (>/= 0.30 microT) exposure levels as compared with individuals with background exposure levels of MF (<0.15 microT) for the CVD mortality outcomes. Indirect adjustment for potential confounding by current smoking prevalence did not change the pattern of these results. CONCLUSION: Our study does not provide evidence for an association between occupational MF exposure and CVD mortality risk.

66. Clegg LX, Reichman ME, Miller BA, Hankey BF, Singh GK, Lin YD, Goodman MT, Lynch CF, Schwartz SM, Chen VW, et al. Impact of socioeconomic status on cancer incidence and stage at diagnosis: selected findings from the surveillance, epidemiology, and end results: National Longitudinal Mortality Study. *Cancer Causes Control*. 2009;20:417-435. doi: 10.1007/s10552-008-9256-0

ID : 14

BACKGROUND: Population-based cancer registry data from the Surveillance, Epidemiology, and End Results (SEER) Program at the National Cancer Institute (NCI) are mainly based on medical records and administrative information. Individual-level socioeconomic data are not routinely reported by cancer registries in the United States because they are not available in patient hospital records. The U.S. representative National Longitudinal Mortality Study (NLMS) data provide self-reported, detailed demographic and socioeconomic data from the Social and Economic Supplement to the Census Bureau's Current Population Survey (CPS). In 1999, the NCI initiated the SEER-NLMS study, linking the population-based SEER cancer registry data to NLMS data. The SEER-NLMS data provide a new unique research resource that is valuable for health disparity research on cancer burden. We describe the design, methods, and limitations of this data set. We also present findings on cancer-related health disparities according to individual-level socioeconomic status (SES) and demographic characteristics for all cancers combined and for cancers of the lung, breast, prostate, cervix, and melanoma. METHODS: Records of cancer patients diagnosed in 1973-2001 when residing 1 of 11 SEER registries were linked with 26 NLMS cohorts. The total number of SEER matched cancer patients that were also members of an NLMS cohort was 26,844. Of these 26,844 matched patients, 11,464 were included in the incidence analyses and 15,357 in the late-stage diagnosis analyses. Matched patients (used in the incidence analyses) and unmatched patients were compared by age group, sex, race, ethnicity, residence area, year of diagnosis, and cancer anatomic site. Cohort-based age-adjusted cancer incidence rates were computed. The impact of socioeconomic status on cancer incidence and stage of diagnosis was evaluated. RESULTS: Men and women with less than a high school education had elevated lung cancer rate ratios of 3.01 and 2.02, respectively, relative to their college educated counterparts. Those with family annual incomes less than $12,500 had incidence rates that were more than 1.7 times the lung cancer incidence rate of those with incomes $50,000 or higher. Lower income was also associated with a statistically significantly increased risk of distant-stage breast cancer among women and distant-stage prostate cancer among men. CONCLUSIONS: Socioeconomic patterns in incidence varied for specific cancers, while such patterns for stage were generally consistent across cancers, with late-stage diagnoses being associated with lower SES. These findings illustrate the potential for analyzing disparities in cancer outcomes according to a variety of individual-level socioeconomic, demographic, and health care characteristics, as well as by area measures available in the linked database.

67. Stewart QT. The shape of inequality: racial disparities in age-specific mortality. *Biodemography Soc Biol*. 2008;54:152-182. doi: 10.1080/19485565.2008.9989140

ID : 17

There are significant mortality disparities across racial and socioeconomic (SES) groups. Although the mechanisms behind these disparities remain vague, there is a clear connection between the mortality disparities across racial and SES groups. It is less clear, though, if the relationship between SES and racial mortality disparities varies across the life course. Prior research indicates that both racial and SES mortality disparities decline over the life course. These results suggest that if we standardize mortality rates for age-variation in the SES-mortality relationship, then the age-pattern of racial mortality disparities will be attenuated. Using data from the National Longitudinal Mortality Study, I analyze the relationship between SES and racial disparities in age-specific mortality among adults aged 25 and over. The results suggest that racial differences in SES are most important early in the adult life, and are minimally related to the convergence in racial mortality disparities at the oldest ages.

68. Meara ER, Richards S, Cutler DM. The gap gets bigger: changes in mortality and life expectancy, by education, 1981-2000. *Health Aff (Millwood)*. 2008;27:350-360. doi: 10.1377/hlthaff.27.2.350

ID : 18

In this paper we examine educational disparities in mortality and life expectancy among non-Hispanic blacks and whites in the 1980s and 1990s. Despite increased attention and substantial dollars directed to groups with low socioeconomic status, within race and gender groups, the educational gap in life expectancy is rising, mainly because of rising differentials among the elderly. With the exception of black males, all recent gains in life expectancy at age twenty-five have occurred among better-educated groups, raising educational differentials in life expectancy by 30 percent. Differential trends in smoking-related diseases explain at least 20 percent of this trend.

69. Edwards R. Who is hurt by procyclical mortality? *Soc Sci Med*. 2008;67:2051-2058. doi: 10.1016/j.socscimed.2008.09.032

ID : 16

There is renewed interest in understanding how fluctuations in mortality and in health are related to fluctuations in economic conditions. The traditional perspective that economic recessions lower health and raise mortality has been challenged by recent findings that reveal mortality is actually procyclical. The epidemiology of the phenomenon - traffic accidents, cardiovascular disease, and smoking and drinking - suggests that socioeconomically vulnerable populations might be disproportionately at risk of "working themselves to death" during periods of heightened economic activity. In this paper, I examine mortality by individual characteristic during the 1980s and 1990s using the U.S. National Longitudinal Mortality Study. I find scant evidence that disadvantaged groups are significantly more exposed to procyclical mortality. Rather, working-age men with more education appear to bear a heavier burden, while those with little education experience countercyclical mortality.

70. Arias E, Schauman W, Eschbach K, Sorlie P, Backlund E. The validity of race and Hispanic origin reporting on death certificates in the United States. 2008.

ID : 91

71. Clegg LX, Reichman ME, Hankey BF, Miller BA, Lin YD, Johnson NJ, Schwartz SM, Bernstein L, Chen VW, Goodman MT, et al. Quality of race, Hispanic ethnicity, and immigrant status in population-based cancer registry data: implications for health disparity studies. *Cancer Causes Control*. 2007;18:177-187. doi: 10.1007/s10552-006-0089-4

ID : 20

Population-based cancer registry data from the Surveillance, Epidemiology, and End Results (SEER) Program at the National Cancer Institute are based on medical records and administrative information. Although SEER data have been used extensively in health disparities research, the quality of information concerning race, Hispanic ethnicity, and immigrant status has not been systematically evaluated. The quality of this information was determined by comparing SEER data with self-reported data among 13,538 cancer patients diagnosed between 1973-2001 in the SEER--National Longitudinal Mortality Study linked database. The overall agreement was excellent on race (kappa = 0.90, 95% CI = 0.88-0.91), moderate to substantial on Hispanic ethnicity (kappa = 0.61, 95% CI = 0.58-0.64), and low on immigrant status (kappa = 0.21. 95% CI = 0.10, 0.23). The effect of these disagreements was that SEER data tended to under-classify patient numbers when compared to self-identifications, except for the non-Hispanic group which was slightly over-classified. These disagreements translated into varying racial-, ethnic-, and immigrant status-specific cancer statistics, depending on whether self-reported or SEER data were used. In particular, the 5-year Kaplan-Meier survival and the median survival time from all causes for American Indians/Alaska Natives were substantially higher when based on self-classification (59% and 140 months, respectively) than when based on SEER classification (44% and 53 months, respectively), although the number of patients is small. These results can serve as a useful guide to researchers contemplating the use of population-based registry data to ascertain disparities in cancer burden. In particular, the study results caution against evaluating health disparities by using birthplace as a measure of immigrant status and race information for American Indians/Alaska Natives.

72. Backlund E, Rowe G, Lynch J, Wolfson MC, Kaplan GA, Sorlie PD. Income inequality and mortality: a multilevel prospective study of 521 248 individuals in 50 US states. *Int J Epidemiol*. 2007;36:590-596. doi: 10.1093/ije/dym012

ID : 19

BACKGROUND: Some of the most consistent evidence in favour of an association between income inequality and health has been among US states. However, in multilevel studies of mortality, only two out of five studies have reported a positive relationship with income inequality after adjustment for the compositional characteristics of the state's inhabitants. In this study, we attempt to clarify these mixed results by analysing the relationship within age-sex groups and by applying a previously unused analytical method to a database that contains more deaths than any multilevel study to date. METHODS: The US National Longitudinal Mortality Study (NLMS) was used to model the relationship between income inequality in US states and mortality using both a novel and previously used methodologies that fall into the general framework of multilevel regression. We adjust age-sex specific models for nine socioeconomic and demographic variables at the individual level and percentage black and region at the state level. RESULTS: The preponderance of evidence from this study suggests that 1990 state-level income inequality is associated with a 40% differential in state level mortality rates (95% CI = 26-56%) for men 25-64 years and a 14% (95% CI = 3-27%) differential for women 25-64 years after adjustment for compositional factors. No such relationship was found for men or women over 65. CONCLUSIONS: The relationship between income inequality and mortality is only robust to adjustment for compositional factors in men and women under 65. This explains why income inequality is not a major driver of mortality trends in the United States because most deaths occur at ages 65 and over. This analysis does suggest, however, the certain causes of death that occur primarily in the population under 65 may be associated with income inequality. Comparison of analytical techniques also suggests coefficients for income inequality in previous multilevel mortality studies may be biased, but further research is needed to provide a definitive answer.

73. van Wijngaarden E, Dosemeci M. Brain cancer mortality and potential occupational exposure to lead: findings from the National Longitudinal Mortality Study, 1979-1989. *Int J Cancer*. 2006;119:1136-1144. doi: 10.1002/ijc.21947

ID : 21

We evaluated the association between potential occupational lead exposure and the risk of brain cancer mortality in the National Longitudinal Mortality Study (NLMS), which is a prospective census-based cohort study of mortality among the noninstitutionalized United States population (1979-1989). The present study was limited to individuals for whom occupation and industry were available (n = 317,968). Estimates of probability and intensity of lead exposure were assigned using a job-exposure matrix (JEM). Risk estimates for the impact of lead on brain cancer mortality were computed using standardized mortality ratio (SMR) and proportional hazards and Poisson regression techniques, adjusting for the effects of age, gender and several other covariates. Brain cancer mortality rates were greater among individuals in jobs potentially involving lead exposure as compared to those unexposed (age- and gender-adjusted hazard ratio (HR) = 1.5; 95% confidence interval (CI) = 0.9-2.3) with indications of an exposure-response trend (probability: low HR = 0.7 (95% CI = 0.2-2.2), medium HR = 1.4 (95% CI = 0.8-2.5), high HR = 2.2 (95% CI = 1.2-4.0); intensity: low HR = 1.2 (95% CI = 0.7-2.1), medium/high HR = 1.9 (95% CI = 1.0-3.4)). Brain cancer risk was greatest among individuals with the highest levels of probability and intensity (HR = 2.3; 95% CI = 1.3-4.2). These findings provide further support for an association between occupational lead exposure and brain cancer mortality, but need to be interpreted cautiously due to the consideration of brain cancer as one disease entity and the absence of biological measures of lead exposure.

74. Lin CC, Johnson NJ. Decomposition of life expectancy and expected life-years lost by disease. *Stat Med*. 2006;25:1922-1936. doi: 10.1002/sim.2381

ID : 22

Life expectancy is commonly used to summarize the life-time mortality experience of a population. Differences in life expectancy are well-known across different levels of socioeconomic status such as income and education. A recent simulation study of potential life-years lost has shown the effects that major diseases contribute to differences in life expectancy at birth. We propose a general methodology to decompose life expectancy and expected life-years lost by disease in order to determine the contribution of diseases to differences in life expectancy at each given age. We show that the estimates for the life expectancy, expected life-years lost and their variances at each age can be computed backward recursively from an old age. The difference in life expectancy between groups will be shown to include contributions from diseases and life-year differences which occur after an old age cut-off beyond which the contribution of diseases cannot be easily determined. Diseases will be grouped into 14 major disease categories. Data from the National Longitudinal Mortality Study will be used for demonstration purposes.

75. Elo IT, Martikainen P, Smith KP. Socioeconomic differentials in mortality in Finland and the United States: the role of education and income. *European Journal of Population-Revue Europeenne De Demographie*. 2006;22:179-203. doi: 10.1007/s10680-006-0003-5

ID : 4

We document social inequalities in cause-specific mortality at ages 35-64 in Finland and the United States, countries with different health systems, income distributions, and social welfare programs for the working-aged population. The education-mortality gradient was the most marked for Finnish men and for causes of death linked to risk-taking, health behaviors, and stress. The association between family income and mortality was curvilinear in both countries. The effects of education and income were strongly attenuated after controlling for each other, marital status, and labor force participation, with the greatest attenuation observed for income in Finland and education in the United States.

76. Kim C, Eby E, Piette JD. Is education associated with mortality for breast cancer and cardiovascular disease among black and white women? *Gend Med*. 2005;2:13-18.

ID : 23

BACKGROUND: Although low socioeconomic status (SES) has been found to be an important risk factor for all-cause mortality in women, the association is inconsistent across specific causes of death. SES appears to have different associations with 2 common causes of mortality in women: low SES is associated with greater cardiovascular disease (CVD) mortality in women but may also be associated with lower breast cancer mortality. OBJECTIVE: We examined the association between SES and CVD and breast cancer mortality among black and white women. METHODS: Our analysis sample included black and white women participating in the National Longitudinal Mortality Study, which links US Census Bureau Current Population Surveys with the National Death Index between 1979 and 1989. Education and income were used as SES indicators. For each cause of death, we used multivariate logistic regression to estimate variation in mortality risk across SES levels within each racial group. RESULTS: The sample included 21,303 black women and 186,322 white women. Unadjusted cumulative incidence (over a mean follow-up period of 8.7 years) of CVD mortality was 4.2% among black women and 2.3% among white women, and of breast cancer mortality was 0.3% among black women and 0.4% among white women. After adjustment for age, marital status, and urban or rural residence, less education was still associated with greater CVD mortality among black women (odds ratio [OR], 1.8; 95% Cl, 1.03-3.0) and white women (OR, 1.4; 95% Cl, 1.3-1.6). However, less than a high school education was associated with lower breast cancer mortality among white women (OR, 0.73; 95% CI, 0.6-0.9) but not among black women (OR, 1.1; 95% Cl, 0.5-2.3). Similar ORs were obtained when income was examined. CONCLUSIONS: The association between SES and cause-specific mortality may differ between black and white women for breast cancer death but not CVD death. Better understanding of these inter actions could guide the targeting of more effective interventions.

77. Edwards RD, Tuljapurkar S. Inequality in life spans and a new perspective on mortality convergence across industrialized countries. *Population and Development Review*. 2005;31:645-+. doi: 10.1111/j.1728-4457.2005.00092.x

ID : 3

The second half of the twentieth century witnessed substantial convergence in life expectancy around the world. We examine differences in the age pattern of mortality in industrialized countries over time to show that inequality in adult life spans, which we measure with the standard deviation of life table ages at death above age 10 years, S-10, is increasingly responsible for the remaining divergence in mortality. We report striking differences in level and trend of S-10 across industrialized countries since 1960, which cannot be explained by aggregate socioeconomic inequality or differential external-cause mortality. Rather, S-10 reflects both within- and between-group inequalities in life spans and conveys new information about their combined magnitudes and trends. These findings suggest that the challenge for health policies in this century is to reduce inequality, not just lengthen life.

78. Sorlie PD, Coady S, Lin C, Arias E. Factors associated with out-of-hospital coronary heart disease death: the national longitudinal mortality study. *Ann Epidemiol*. 2004;14:447-452. doi: 10.1016/j.annepidem.2003.10.002

ID : 25

PURPOSE: A significant portion of coronary heart disease deaths occur out of the hospital, prior to access to life saving medical care. Improving the immediacy of care could have important impact on coronary mortality. METHODS: The objective of this research is to identify factors associated with the occurrence of out-of-hospital coronary heart disease death as compared with in-hospital. Identification of these factors could lead to additional strategies for rapid treatment of coronary attack symptoms. A large national cohort study with individually identified characteristics was matched to the National Death Index to identify deaths by cause occurring in up to 11 years of follow-up. Approximately 60,000 deaths occurred in the cohort of approximately 700,000 participants aged 25 years or more. Location of death was defined as either in- or out-of-hospital. RESULTS: Among deaths classified as coronary heart disease (CHD), multivariate logistic models of the association between selected demographic and socioeconomic characteristics of individuals prior to death and place of death show that black persons are more likely to die out of hospital, as are persons who live alone or are unmarried, persons at the lowest end of the income distribution, and persons who live in rural areas vs. urban areas. CONCLUSIONS: The factors most strongly associated with a CHD death occurring out-of-hospital as compared with in-hospital are race (black persons are 1.23 times more likely to die out of hospital than white persons, net of demographic and socioeconomic differentials) and living status (persons who are not married are 1.60 times more likely to die out of hospital than persons who are married, net of demographic and socioeconomic characteristics). Attention should be paid to these groups to emphasize the need for rapid attention to the signs of a coronary attack so that rapid and potentially life saving intervention can be implemented.

79. Phelan JC, Link BG, Diez-Roux A, Kawachi I, Levin B. "Fundamental causes" of social inequalities in mortality: a test of the theory. *J Health Soc Behav*. 2004;45:265-285.

ID : 24

Medicine and epidemiology currently dominate the study of the strong association between socioeconomic status and mortality. Socioeconomic status typically is viewed as a causally irrelevant "confounding variable" or as a less critical variable marking only the beginning of a causal chain in which intervening risk factors are given prominence. Yet the association between socioeconomic status and mortality has persisted despite radical changes in the diseases and risk factors that are presumed to explain it. This suggests that the effect of socioeconomic status on mortality essentially cannot be understood by reductive explanations that focus on current mechanisms. Accordingly, Link and Phelan (1995) proposed that socioeconomic status is a "fundamental cause" of mortality disparities-that socioeconomic disparities endure despite changing mechanisms because socioeconomic status embodies an array of resources, such as money, knowledge, prestige, power, and beneficial social connections, that protect health no matter what mechanisms are relevant at any given time. We identified a situation in which resources should be less helpful in prolonging life, and derived the following prediction from the theory: For less preventable causes of death (for which we know little about prevention or treatment), socioeconomic status will be less strongly associated with mortality than for more preventable causes. We tested this hypothesis with the National Longitudinal Mortality Study, which followed Current Population Survey respondents (N = 370,930) for mortality for nine years. Our hypothesis was supported, lending support to the theory of fundamental causes and more generally to the importance of a sociological approach to the study of socioeconomic disparities in mortality.

80. Lin CC, Rogot E, Johnson NJ, Sorlie PD, Arias E. A further study of life expectancy by socioeconomic factors in the National Longitudinal Mortality Study. *Ethn Dis*. 2003;13:240-247.

ID : 26

OBJECTIVES: The objective of this article is to provide estimates of life expectancy for White, Black, and Hispanic populations by socioeconomic factors. Effects of educational, income, employment, and marital status on life expectancy are presented and interpreted. DESIGN: The National Longitudinal Mortality Study, consisting of a number of Current Population Surveys (CPS) linked to mortality information obtained from the National Death Index, provides data to construct life tables for various socioeconomic and demographic groups. Probabilities of death are estimated using a person-year approach to accommodate the aging of the population over 11 years of follow up. RESULTS: Across various ethnicity-race-sex groups, longer life expectancy was observed for individuals with higher levels of education and income, and for those who were married and employed. The differences in life expectancy between levels of the socioeconomic characteristics tended to be larger for men than for women. Also, differences were found to be larger for the non-Hispanic Black population compared to the non-Hispanic White population. Hispanic White men exhibited patterns similar to those of non-Hispanic White and Black men. CONCLUSIONS: For selected ethnicity-race-sex groups, the impact of socioeconomic variables on life expectancy is dramatic. The shorter life expectancy observed among the poor, the less educated, the unmarried, and those not in the labor force, highlights the impact of socioeconomic disadvantage on survival. Further, the substantial 14-year differential favoring the employed over those not in the labor force may be partially explained by unemployment due to poor health. Another reason may be that employed individuals have greater access to health care than do those not in the labor force.

81. Singh GK, Siahpush M. Ethnic-immigrant differentials in health behaviors, morbidity, and cause-specific mortality in the United States: an analysis of two national data bases. *Hum Biol*. 2002;74:83-109.

ID : 27

This study examines the extent to which various ethnic-immigrant and US-born groups differ in their risks of all-cause and cause-specific mortality, morbidity, and health behaviors. Using data from the National Longitudinal Mortality Study, 1979-1989, we estimated, for major US racial and ethnic groups, mortality risks of immigrants relative to those of the US-born. The Cox regression model was used to adjust mortality differentials by age, sex, marital status, rural/urban residence, education, and family income. Logistic regression was fitted to the National Health Interview Survey data to determine whether health status and behaviors vary among ethnic-immigrant groups and by length of US residence. Compared with US-born whites of equivalent socioeconomic and demographic background, foreign-born blacks, Hispanics, and Asians/Pacific Islanders (APIs), US-born APIs, US-born Hispanics, and foreign-born whites had, respectively, 48%, 45%, 43%, 32%, 26%, and 16% lower mortality risks. While American Indians did not differ significantly from US-born whites, US-born blacks had an 8% higher mortality risk. Black and Hispanic immigrants experienced, respectively, 52% and 26% lower mortality risks than their US-born counterparts. Considerable differentials were also found in mortality for cancer, cardiovascular, respiratory, infectious disease, and injury, and in morbidity and health behaviors, with API and Hispanic immigrants generally experiencing the lowest risks. Consistent with the acculturation hypothesis, immigrants' risks of smoking, obesity, hypertension, and chronic condition, although substantially lower than those for the US-born, increased with increasing length of US residence. Given the substantial nativity differences in health status and mortality, future waves of immigrants of diverse ethnic and cultural backgrounds will likely have a sizeable impact on the overall health, disease, and mortality patterns in the United States.

82. Singh GK, Siahpush M. All-cause and cause-specific mortality of immigrants and native born in the United States. *Am J Public Health*. 2001;91:392-399.

ID : 30

OBJECTIVES: This study examined whether US-born people and immigrants 25 years or older differ in their risks of all-cause and cause-specific mortality and whether these differentials, if they exist, vary according to age, sex, and race/ethnicity. METHODS: Using data from the National Longitudinal Mortality Study (1979-1989), we derived mortality risks of immigrants relative to those of US-born people by using a Cox regression model after adjusting for age, race/ethnicity, marital status, urban/rural residence, education, occupation, and family income. RESULTS: Immigrant men and women had, respectively, an 18% and 13% lower risk of overall mortality than their US-born counterparts. Reduced mortality risks were especially pronounced for younger and for Black and Hispanic immigrants. Immigrants showed significantly lower risks of mortality from cardiovascular diseases, lung and prostate cancer, chronic obstructive pulmonary diseases, cirrhosis, pneumonia and influenza, unintentional injuries, and suicide but higher risks of mortality from stomach and brain cancer and infectious diseases. CONCLUSIONS: Mortality patterns for immigrants and for US-born people vary considerably, with immigrants experiencing lower mortality from several major causes of death. Future research needs to examine the role of sociocultural and behavioral factors in explaining the mortality advantage of immigrants.

83. Richardus JH, Kunst AE. Black-white differences in infectious disease mortality in the United States. *Am J Public Health*. 2001;91:1251-1253.

ID : 28

OBJECTIVES: This study determined the degree to which Black-White differences in infectious disease mortality are explained by income and education and the extent to which infectious diseases contribute to Black-White differences in all-cause mortality. METHODS: A sample population of the National Longitudinal Mortality Study from 1979 through 1981 was analyzed and followed up through 1989. RESULTS: Infectious disease mortality among Blacks was higher than among Whites, with a relative risk of 1.53 after adjustment for age and sex and 1.34 after further adjustment for income and education. Death from infectious diseases contributed to 9.3% of the difference in all-cause mortality. CONCLUSIONS: In the United States, infectious diseases account for nearly 10% of the excess all-cause mortality rates in Blacks compared with Whites.

84. Muntaner C, Sorlie P, O'Campo P, Johnson N, Backlund E. Occupational hierarchy, economic sector, and mortality from cardiovascular disease among men and women. Findings from the National Longitudinal Mortality Study. *Ann Epidemiol*. 2001;11:194-201.

ID : 29

PURPOSE: Although socioeconomic position has been identified as a determinant of cardiovascular disease among employed men and women in the U.S., the role of economic sector in shaping this relationship has yet to be examined. We sought to estimate the combined effects of economic sector-one of the three major sectors of the economy: finance, government and production-and socioeconomic position on cardiovascular mortality among employed men and women. METHODS: Approximately 375,000 men and women 25 years of age or more were identified from selected Current Population Surveys between 1979 and 1985. These persons were followed for cardiovascular mortality through use of the National Death Index for the years 1979 through 1989. RESULTS: In men, the lowest cardiovascular mortality was found for professionals in the finance sector (76/100,000 person/years). The highest cardiovascular mortality was found among male non-professional workers in the production sector (192/100,000 person years). A different pattern was observed among women. Professional women in the finance sector had the highest rates of cardiovascular mortality (133/100,000 person years). For both men and women, the professional/non-professional gap in cardiovascular mortality was lower in the government sector than in the production and finance sectors. These associations were strong even after adjustment for age, race and income. CONCLUSIONS: Characteristics of government, finance and production work differentially influence the risk of cardiovascular disease mortality. Men, women, professionals and non-professionals experience this risk differently.

85. Kposowa AJ. Unemployment and suicide: a cohort analysis of social factors predicting suicide in the US National Longitudinal Mortality Study. *Psychol Med*. 2001;31:127-138.

ID : 32

BACKGROUND: The purpose of the study was to examine the effect of employment status measured at baseline on the risk of suicide by years of follow-up, using a large nationally representative sample of the US population. METHODS: Cox regression models were applied to data from the National Longitudinal Mortality Study, based on the 1979-1989 follow-up. In estimating the effect of baseline employment status on suicide, adjustments were made for baseline demographic and socio-economic variables. RESULTS: After 3 years of follow-up, unemployed men were a little over twice as likely to commit suicide as their employed counterparts. Among men, the lower the socio-economic status, the higher the suicide risk. Among women, in each year of follow-up, the unemployed had a much higher suicide risk than the employed. After 9 years of follow-up unemployed women were over three times more likely to kill themselves than their employed counterparts. CONCLUSIONS: Unemployment is strongly related to suicide, but this relationship is more enduring and stronger among women. For men, the unemployment effect is stronger at earlier years of follow-up. In women, unemployment increases the risk of suicide regardless of the number of follow-up years. The finding with regard to women disconfirms earlier research reports suggesting that unemployment affects suicide only in men.

86. Kaufman JS, Kaufman S. Assessment of structured socioeconomic effects on health. *Epidemiology*. 2001;12:157-167.

ID : 31

Social epidemiologists study effects of variables such as education or income on health outcomes. Because other factors may influence both the exposure and the outcome, adjustments are commonly made in an effort to estimate the "independent" effect of exposure. The validity of common adjustment strategies when estimating the outcome distribution under hypothetical interventions of the exposure is potentially compromised by structured relations between covariates, observed and unobserved. These considerations of covariate structure may be particularly important for the study of "distal" socioeconomic factors that affect health through specified intermediates, therefore making standard adjustments in social epidemiology potentially problematic. Two related approaches have been proposed for defining and estimating causal effects in light of covariate structure: Robins' g-computation algorithm and Pearl's non-parametric structural equations. We review the conceptual foundation for these techniques, and provide a heuristic example using data from the National Longitudinal Mortality Study (NLMS) to demonstrate the extent to which selected causal effects (contrasts between hypothetical intervention regimens) are sensitive to structured relations among measured and unmeasured covariates, even in very simple systems.

87. Deaton AS, Paxson C. Mortality, Education, Income, and Inequality among American Cohorts. In: Wise DA, ed. *Themes in the Economics of Aging*. Chicago: University of Chicago Press; 2001:129-170.

ID : 90

88. Singh GK, Hoyert DL. Social epidemiology of chronic liver disease and cirrhosis mortality in the United States, 1935-1997: trends and differentials by ethnicity, socioeconomic status, and alcohol consumption. *Hum Biol*. 2000;72:801-820.

ID : 33

This study examines trends and ethnic and socioeconomic differentials in chronic liver disease and cirrhosis mortality in the United States. Age-adjusted death rates from the National Vital Statistics System were used to analyze race and sex-specific mortality trends from 1968 through 1997. Age-adjusted liver cirrhosis mortality and per capita alcohol consumption data from 1935 through 1996 were modeled using time-series regression. Moreover, the Cox hazards regression was applied to the National Longitudinal Mortality Study, 1979-1989, to examine socioeconomic differentials at the individual level, whereas multivariate ordinary least squares regression was used to model state-specific cirrhosis mortality from 1990 to 1992 as a function of socioeconomic variables and alcohol consumption at the ecological level. Chronic liver disease and cirrhosis continues to be an important cause of death in the United States, even after three decades of consistently declining mortality rates. For both men and women aged 25 years and older, significant mortality differentials were found by age, race/ethnicity, marital status, family income, and employment status. For men, marked differentials were also found by nativity, rural-urban residence, and education. Unemployment, minority concentration, and alcohol consumption were major predictors of state-specific cirrhosis mortality. Both time-series and cross-sectional data indicate a strong correlation between alcohol consumption and US cirrhosis mortality. Substantial ethnic and socioeconomic differences in cirrhosis mortality suggest the need for social and public health policies and interventions that target such high-risk groups as American Indians, Hispanic Americans, the socially isolated, and the poor.

89. Singh GK. Socioeconomic and behavioral differences in health, morbidity, and mortality in Kansas: empirical data models and analyses. In: Tarlov A, St.Peter R, eds. *The Society and Population Health Reader, Volume II: A State and Community Perspective*. New York: The New York Press; 2000:15-56.

ID : 89

90. Mackenbach JP, Cavelaars AE, Kunst AE, Groenhof F. Socioeconomic inequalities in cardiovascular disease mortality; an international study. *Eur Heart J*. 2000;21:1141-1151. doi: 10.1053/euhj.1999.1990

ID : 34

BACKGROUND: Differences between socioeconomic groups in mortality from and risk factors for cardiovascular diseases have been reported in many countries. We have made a comparative analysis of these inequalities in the United States and 11 western European countries. The aims of the analysis were (1) to compare the size of inequalities in cardiovascular disease mortality between countries, and (2) to explore the possible contribution of cardiovascular risk factors to the explanation of between-country differences in inequalities in cardiovascular disease mortality. DATA AND METHODS: Data on ischaemic heart disease, cerebrovascular disease and total cardiovascular disease mortality by occupational class and/or educational level were obtained from national longitudinal or unlinked cross-sectional studies. Data on smoking, alcohol consumption, overweight and infrequent consumption of fresh vegetables by occupational class and/or educational level were obtained from national health interview or multipurpose surveys and from the European Union's Eurobarometer survey. Age-adjusted rate ratios for mortality were correlated with age-adjusted odds ratios for the behavioural risk factors. RESULTS: In all countries mortality from cardiovascular diseases is higher among persons with lower occupational class or lower educational level. Within western Europe, a north-south gradient is apparent, with relative and absolute inequalities being larger in the north than in the south. For ischaemic heart disease, but not for cerebrovascular disease, an even more striking north-south gradient is seen, with some 'reverse' inequalities in southern Europe. The United States occupy intermediate positions on most indicators. Inequalities in cardiovascular disease mortality are associated with inequalities in some risk factors, especially cigarette smoking and excessive alcohol consumption. CONCLUSIONS: Socioeconomic inequalities in cardiovascular disease mortality are a major public health problem in most industrialized countries. Closing the gap between low and high socioeconomic groups offers great potential for reducing cardiovascular disease mortality. Developing effective methods of behavioural risk factor reduction in the lower socioeconomic groups should be a top priority in cardiovascular disease prevention.

91. Kposowa AJ. Marital status and suicide in the National Longitudinal Mortality Study. *J Epidemiol Community Health*. 2000;54:254-261.

ID : 38

OBJECTIVES: The purpose of the study was to examine the effect of marital status on the risk of suicide, using a large nationally representative sample. A related objective was to investigate the association between marital status and suicide by sex. METHODS: Cox proportional hazards regression models were applied to data from the National Longitudinal Mortality Study, based on the 1979-1989 follow up. In estimating the effect of marital status, adjustments were made for age, sex, race, education, family income, and region of residence. RESULTS: For the entire sample, higher risks of suicide were found in divorced than in married persons. Divorced and separated persons were over twice as likely to commit suicide as married persons (RR = 2.08, 95% confidence intervals (95% CI) 1.58, 2.72). Being single or widowed had no significant effect on suicide risk. When data were stratified by sex, it was observed that the risk of suicide among divorced men was over twice that of married men (RR = 2.38, CI 1.77, 3.20). Among women, however, there were no statistically significant differentials in the risk of suicide by marital status categories. CONCLUSIONS: Marital status, especially divorce, has strong net effect on mortality from suicide, but only among men. The study showed that in epidemiological research on suicide, more accurate results would be obtained if samples are stratified on the basis of key demographic or social characteristics. The study further observed that failure to control for relevant socioeconomic variables or combining men and women in the same models could produce misleading results.

92. Johnson NJ, Backlund E, Sorlie PD, Loveless CA. Marital status and mortality: the national longitudinal mortality study. *Ann Epidemiol*. 2000;10:224-238.

ID : 35

PURPOSE: To examine the effect of marital status (married, widowed, divorced/separated, and never-married) on mortality in a cohort of 281,460 men and women, ages 45 years and older, of black and white races, who were part of the National Longitudinal Mortality Study (NLMS). METHODS: Major findings are based on assessments of estimated relative risk (RR) from Cox proportional hazards models. Duration of bereavement for the widowed is also estimated using the Cox model. RESULTS: For persons aged 45-64, each of the non-married groups generally showed statistically significant increased risk compared to their married counterparts (RR for white males, 1.24-1.39; white females, 1.46-1.49; black males, 1.27-1.57; and black females, 1. 10-1.36). Older age groups tended to have smaller RRs than their younger counterparts. Elevated risk for non-married females was comparable to that of non-married males. For cardiovascular disease mortality, widowed and never-married white males ages 45-64 showed statistically significant increased RRs of 1.25 and 1.32, respectively, whereas each non-married group of white females showed statistically significant increased RRs from 1.50 to 1.60. RRs for causes other than cardiovascular diseases or cancers were high (for white males ages 45-64: widowed, 1.85; divorced/separated, 2.15; and never-married, 1.48). The importance of labor force status in determining the elevated risk of non-married males compared to non-married females by race is shown. CONCLUSIONS: Each of the non-married categories show elevated RR of death compared to married persons, and these effects continue to be strong after adjustment for other socioeconomic factors.

93. Jackson SA, Anderson RT, Johnson NJ, Sorlie PD. The relation of residential segregation to all-cause mortality: a study in black and white. *Am J Public Health*. 2000;90:615-617.

ID : 37

OBJECTIVES: This study investigated the influence of an aggregate measure of the social environment on racial differences in all-cause mortality. METHODS: Data from the National Longitudinal Mortality Study were analyzed. RESULTS: After adjustment for family income, age-adjusted mortality risk increased with increasing minority residential segregation among Blacks aged 25 to 44 years and non-Blacks aged 45 to 64 years. In most age/race/gender groups, the highest and lowest mortality risks occurred in the highest and lowest categories of residential segregation, respectively. CONCLUSIONS: These results suggest that minority residential segregation may influence mortality risk and underscore the traditional emphasis on the social underpinnings of disease and death.

94. Howard G, Anderson RT, Russell G, Howard VJ, Burke GL. Race, socioeconomic status, and cause-specific mortality. *Ann Epidemiol*. 2000;10:214-223.

ID : 36

PURPOSE: Life expectancy for black Americans is five to eight years less than for Whites. The socioeconomic status (SES) of Blacks is also less than for Whites, and SES is associated with early mortality. This paper estimates the proportion of the racial difference in mortality attributable to SES by specific causes of death. METHODS: Data on 453,384 individuals in the National Longitudinal Mortality Study were used to estimate the hazard ratio associated with black race, with and without adjustment for income and education (measures of SES), in 38 strata defined by cause of death and age. RESULTS: For women, SES accounted for much (37-67%) of the black excess mortality for accidents, ischemic heart disease (ages 35-54), diabetes, and homicide; but not for hypertension, infections, and stomach cancers (11-17%). For men, SES accounted for much of the excess risk (30-55%) for accidents, lung cancer, stomach cancer, stroke, and homicide; but not for prostate cancer, pulmonary diseases, hypertension, and cardiomyopathy (0-17%). CONCLUSIONS: These results confirm those specific causes of death likely to underlie the overall excess mortality of Blacks, and identify those causes where SES may play a large role.

95. Wolfson M, Kaplan G, Lynch J, Ross N, Backlund E. Relation between income inequality and mortality: empirical demonstration. *BMJ*. 1999;319:953-955.

ID : 43

OBJECTIVE: To assess the extent to which observed associations at population level between income inequality and mortality are statistical artefacts. DESIGN: Indirect "what if" simulation by using observed risks of mortality at individual level as a function of income to construct hypothetical state level mortality specific for age and sex as if the statistical artefact argument were 100% correct. SETTING: Data from the 1990 census for the 50 US states plus Washington, DC, were used for population distributions by age, sex, state, and income range; data disaggregated by age, sex, and state from the Centers for Disease Control and Prevention were used for mortality; and regressions from the national longitudinal mortality study were used for the individual level relation between income and risk of mortality. RESULTS: Hypothetical mortality, while correlated with inequality (as implied by the logic of the statistical artefact argument), showed a weaker association with states' levels of income inequality than the observed mortality. CONCLUSIONS: The observed associations in the United States at the state level between income inequality and mortality cannot be entirely or substantially explained as statistical artefacts of an underlying individual level relation between income and mortality. There remains an important association between income inequality and mortality at state level over and above anything that could be accounted for by any statistical artefact. This result reinforces the need to consider a broad range of factors, including the social milieu, as fundamental determinants of health.

96. Rosenberg HM, Maurer JD, Sorlie PD. Quality of death rates by race and Hispanic origin: a summary of current research. *Vital Health Stat 2*. 1999;128:1-13.

ID : 88

OBJECTIVES: This report provides a summary of current knowledge and research on the quality and reliability of death rates by race and Hispanic origin in official mortality statistics of the United States produced by the National Center for Health Statistics (NCHS). It also provides a quantitative assessment of bias in death rates by race and Hispanic origin. It identifies areas for targeted research. METHODS: Death rates are based on information on deaths (numerators of the rates) from death certificates filed in the states and compiled into a national database by NCHS, and on population data (denominators) from the Census Bureau. Selected studies of race/Hispanic-origin misclassification and under coverage are summarized on deaths and population. Estimates are made of the separate and the joint bias on death rates by race and Hispanic origin from the two sources. Simplifying assumptions are made about the stability of the biases over time and among age groups. Original results are presented using an expanded and updated database from the National Longitudinal Mortality Study. RESULTS: While biases in the numerator and denominator tend to offset each other somewhat, death rates for all groups show net effects of race misclassification and under coverage. For the white population and the black population, published death rates are overstated in official publications by an estimated 1.0 percent and 5.0 percent, respectively, resulting principally from undercounts of these population groups in the census. Death rates for the other minority groups are understated in official publications approximately as follows: American Indians, 21 percent; Asian or Pacific Islanders, 11 percent; and Hispanics, 2 percent. These estimates do not take into account differential misreporting of age among the race/ethnic groups.

97. Richards H, Donaldson M. *Life and Worklife Expectancies*. 2nd ed. Tuscon, AZ: Lawyers and Judges Publishing Company; 1999.

ID : 87

98. Ng-Mak DS, Dohrenwend BP, Abraido-Lanza AF, Turner JB. A further analysis of race differences in the National Longitudinal Mortality Study. *Am J Public Health*. 1999;89:1748-1751.

ID : 41

OBJECTIVES: The purpose of this study was to investigate associations between race and specific causes of mortality among adults 25 years and older in the National Longitudinal Mortality Study. METHODS: Mortality hazard ratios between races during 9 years of follow-up were estimated with Cox proportional hazards models, with control for multiple indicators of socioeconomic status (SES) and SES-relevant variables. RESULTS: Black persons younger than 65 years were at higher risk than others for all-cause and cardiovascular mortality; the strongest effects were observed among persons aged 25 through 44 years. CONCLUSIONS: Race, independent of SES, is related to mortality in American society, but these effects vary by age and disease categories.

99. Mackenbach JP, Kunst AE, Groenhof F, Borgan JK, Costa G, Faggiano F, Jozan P, Leinsalu M, Martikainen P, Rychtarikova J, et al. Socioeconomic inequalities in mortality among women and among men: an international study. *Am J Public Health*. 1999;89:1800-1806.

ID : 40

OBJECTIVES: This study compared differences in total and cause-specific mortality by educational level among women with those among men in 7 countries: the United States, Finland, Norway, Italy, the Czech Republic, Hungary, and Estonia. METHODS: National data were obtained for the period ca. 1980 to ca. 1990. Age-adjusted rate ratios comparing a broad lower-educational group with a broad upper-educational group were calculated with Poisson regression analysis. RESULTS: Total mortality rate ratios among women ranged from 1.09 in the Czech Republic to 1.31 in the United States and Estonia. Higher mortality rates among lower-educated women were found for most causes of death, but not for neoplasms. Relative inequalities in total mortality tended to be smaller among women than among men. In the United States and Western Europe, but not in Central and Eastern Europe, this sex difference was largely due to differences between women and men in cause-of-death pattern. For specific causes of death, inequalities are usually larger among men. CONCLUSIONS: Further study of the interaction between socioeconomic factors, sex, and mortality may provide important clues to the explanation of inequalities in health.

100. Liao Y, McGee DL, Cooper RS. Mortality among US adult Asians and Pacific Islanders: findings from the National Health Interview Surveys and the National Longitudinal Mortality Study. *Ethn Dis*. 1999;9:423-433.

ID : 45

OBJECTIVES: To assess the mortality of the adult Asian and Pacific Islander population in the United States. METHODS: Cohort study using data from the National Health Interview Survey (1986 to 1994) and the National Longitudinal Mortality Study. Deaths were ascertained by matching the National Death Index with average follow-ups of 5.3 and 9 years, respectively, for the two studies. RESULTS: Respondents from the pooled National Health Interview Surveys included 532,794 non-Hispanic whites, 94,242 blacks, 52,725 Hispanics, and 16,936 Asians and Pacific Islanders, all of whom were at least 18 years of age at baseline. The National Longitudinal Mortality Study included 373,397 non-Hispanic whites, 41,262 blacks, 23,356 Hispanics, and 8,390 Asians and Pacific Islanders. Overall age-standardized mortality was the lowest in Asians/Pacific Islanders, whose risk of death was about 40% lower than whites'. Adjustment for differences in education levels had a minimal influence on the mortality advantage in Asians/Pacific Islanders. CONCLUSIONS: Longitudinal cohorts provide an important source of health status information on Asians and Pacific Islanders. These two studies from representative national samples suggest that overall mortality is substantially lower among Asians and Pacific Islanders than in all other major ethnic groups.

101. Kunst AE, Groenhof F, Andersen O, Borgan JK, Costa G, Desplanques G, Filakti H, Giraldes Mdo R, Faggiano F, Harding S, et al. Occupational class and ischemic heart disease mortality in the United States and 11 European countries. *Am J Public Health*. 1999;89:47-53.

ID : 47

OBJECTIVES: Twelve countries were compared with respect to occupational class differences in ischemic heart disease mortality in order to identify factors that are associated with smaller or larger mortality differences. METHODS: Data on mortality by occupational class among men aged 30 to 64 years were obtained from national longitudinal or cross-sectional studies for the 1980s. A common occupational class scheme was applied to most countries. Potential effects of the main data problems were evaluated quantitatively. RESULTS: A north-south contrast existed within Europe. In England and Wales, Ireland, and Nordic countries, manual classes had higher mortality rates than nonmanual classes. In France, Switzerland, and Mediterranean countries, manual classes had mortality rates as low as, or lower than, those among nonmanual classes. Compared with Northern Europe, mortality differences in the United States were smaller (among men aged 30-44 years) or about as large (among men aged 45-64 years). CONCLUSIONS: The results underline the highly variable nature of socioeconomic inequalities in ischemic heart disease mortality. These inequalities appear to be highly sensitive to social gradients in behavioral risk factors. These risk factor gradients are determined by cultural as well as socioeconomic developments.

102. Kposowa AJ. Suicide mortality in the United States: differentials by industrial and occupational groups. *Am J Ind Med*. 1999;36:645-652.

ID : 39

BACKGROUND: The objective of this study was to investigate variations in the risk of suicide by industrial and occupational groups. METHODS: Cox proportional hazards regression models were fitted to the data from the National Longitudinal Mortality Study (1979-1989). In estimating the effects of industry and occupation, controls were made for the potentially confounding effects of age, sex, marital status, education, income, and region of residence. RESULTS: It was found that persons employed in mining experienced the highest risk of suicide (RR=4.29, CI=1.59, 12.13) compared to workers in finance, insurance, and real estate. Elevated risks were also observed among business and repair services (RR=4.20, CI=1.72, 10.25), professional and related services (RR=2.92, CI=1.25,6.82), and wholesale and retail trade (RR=2.71, CI=1.17,6.25). When comparisons were made by occupational status, it was found that laborers experienced the highest risk of suicide (RR=2.12, CI=1.09,4. 12) when compared to farmers, farm managers, and farm workers. CONCLUSIONS: There are differentials in the risk of suicide among industrial groups, and the industry with the highest risk is mining. The disparities in suicide remained even after the effects of socioeconomic and other variables were controlled. Further research needs to determine if the high suicide risk observed in some industrial groups may be linked to possible depressive symptomatology in the workplace.

103. Johnson NJ, Sorlie PD, Backlund E. The impact of specific occupation on mortality in the U.S. National Longitudinal Mortality Study. *Demography*. 1999;36:355-367.

ID : 46

We compare mortality differences for specific and general categories of occupations using a national cohort of approximately 380,000 persons aged 25-64 from the U.S. National Longitudinal Mortality Study. Based on comparisons of relative risk obtained from Cox proportional-hazards model analyses, higher risk is observed in moving across the occupational spectrum from the technical, highly skilled occupations to less-skilled and generally more labor-intensive occupations. Mortality differences obtained for social status groups of specific occupations are almost completely accounted for by adjustments for income and education. Important differences are shown to exist for selected specific occupations beyond those accounted for by social status, income, and education. High-risk specific occupations include taxi drivers, cooks, longshoremen, and transportation operatives. Low-risk specific occupations include lawyers, natural scientists, teachers, farmers, and a variety of engineers.

104. Backlund E, Sorlie PD, Johnson NJ. A comparison of the relationships of education and income with mortality: the National Longitudinal Mortality Study. *Soc Sci Med*. 1999;49:1373-1384.

ID : 42

A sample of over 400,000 men and women, ages 25-64, from the National Longitudinal Mortality Study (NLMS), a cohort study representative of the noninstitutionalized US population, was followed for mortality between the years of 1979 and 1989 in order to compare and contrast the functional forms of the relationships of education and income with mortality. Results from the study suggest that functional forms for both variables are nonlinear. Education is described significantly better by a trichotomy (represented by less than a high school diploma, a high school diploma or greater but no college diploma, or a college diploma or greater) than by a simple linear function for both men (p < 0.0001 for lack of fit) and women (p = 0.006 for lack of fit). For describing the association between income and mortality, a two-sloped function, where the decrease in mortality associated with a US$1000 increase in income is much greater at incomes below US$22,500 than at incomes above US$22,500, fits significantly better than a linear function for both men (p < 0.0001 for lack of fit) and women (p = 0.0005 for lack of fit). The different shapes for the two functional forms imply that differences in mortality may primarily be a function of income at the low end of the socioeconomic continuum, but primarily a function of education at the high end.

105. Abraido-Lanza AF, Dohrenwend BP, Ng-Mak DS, Turner JB. The Latino mortality paradox: a test of the "salmon bias" and healthy migrant hypotheses. *Am J Public Health*. 1999;89:1543-1548.

ID : 44

OBJECTIVES: Relative to non-Latino Whites, Latinos have a worse socioeconomic profile but a lower mortality rate, a finding that presents an epidemiologic paradox. This study tested the salmon bias hypothesis that Latinos engage in return migration to their country of origin and are thereby rendered "statistically immortal" and the alternative hypothesis that selection of healthier migrants to the United States accounts for the paradox. METHODS: National Longitudinal Mortality Study data were used to examine mortality rates of the following groups for whom the salmon hypothesis is not feasible: Cubans, who face barriers against return migration; Puerto Ricans, whose deaths in Puerto Rico are recorded in US national statistics; and US-born individuals, who are not subject to either salmon or healthy migrant effects. RESULTS: The sample included 301,718 non-Latino Whites and 17,375 Latino Whites 25 years or older. Cubans and Puerto Ricans had lower mortality than non-Latino Whites. Moreover, US-born Latinos had lower mortality than US-born non-Latino Whites. CONCLUSIONS: Neither the salmon nor the healthy migrant hypothesis explains the pattern of findings. Other factors must be operating to produce the lower mortality.

106. Kunst AE, del Rios M, Groenhof F, Mackenbach JP. Socioeconomic inequalities in stroke mortality among middle-aged men: an international overview. European Union Working Group on Socioeconomic Inequalities in Health. *Stroke*. 1998;29:2285-2291.

ID : 48

BACKGROUND AND PURPOSE: Several studies observed that people from lower socioeconomic groups have higher chances of dying of stroke. There are reasons to expect that these differences are relatively small in southern European countries or in Nordic welfare states. This report therefore presents an international overview of socioeconomic differences in stroke mortality. METHODS: Unpublished data on mortality by occupational class were obtained from national longitudinal studies or cross-sectional studies. The data refer to deaths among men aged 30 to 64 years in the 1980s. A common occupational class scheme was applied to most countries. The mortality difference between manual classes and nonmanual classes was measured in relative terms (by rate ratios) and in absolute terms (by rate differences). RESULTS: In all countries, manual classes had higher stroke mortality rates than nonmanual classes. This difference was relatively large in England and Wales, Ireland, and Finland and relatively small in Sweden, Norway, Denmark, Italy, and Spain. Differences were intermediate in the United States, France, and Switzerland. In Portugal, mortality differences were intermediate in relative terms but large in absolute terms. In most countries, inequalities were much larger for stroke mortality than for ischemic heart disease mortality. CONCLUSIONS: Socioeconomic differences in stroke mortality are a problem common to all countries studied. There are probably large variations, however, in the contribution that different risk factors, such as tobacco and alcohol consumption, make to the stroke mortality excess of lower socioeconomic groups. Medical services can contribute to reducing socioeconomic differences in stroke mortality.

107. Kunst A. *Cross-national Comparisons of Socio-Economic Differences in Mortality*. Rotterdam: Erasmus University; 1997.

ID : 86

108. Hussey JM. The effects of race, socioeconomic status, and household structure on injury mortality in children and young adults. *Matern Child Health J*. 1997;1:217-227.

ID : 49

OBJECTIVES: Injuries are the leading killer of young persons in the United States, yet significant gaps in our understanding of this cause of death remain. By examining the independent influences of race, education, income, household structure, and residential location on injury mortality in young persons, this study addresses these gaps. METHOD: Using data from the National Longitudinal Mortality Study, survival analysis is used to examine the injury mortality risk faced by 0 to 17 year olds over a nine-year follow-up period. Separate models are estimated for homicide, suicide, unintentional injury deaths, and all injury deaths. RESULTS: Household head's education has an independent effect on youth homicide and unintentional injury mortality risk. By contrast, family income and household structure do not have independent effects on any of the injury outcomes. Finally, much of the excess homicide risk faced by young African-Americans is explained by underlying racial differentials in socioeconomic status, household structure, and residential location. CONCLUSIONS: By finding an independent effect of household head's education on youth mortality risk from homicide and unintentional injuries, this study adds to the large body of evidence linking socioeconomic differentials to inequality in life chances.

109. Howard G, Anderson R, Johnson NJ, Sorlie P, Russell G, Howard VJ. Evaluation of social status as a contributing factor to the stroke belt region of the United States. *Stroke*. 1997;28:936-940.

ID : 51

BACKGROUND AND PURPOSE: The southeastern United States has stroke mortality rates above the national average. The causes for this excess mortality are unknown; however, lower socioeconomic status (SES) is a risk factor for stroke, and the lower SES in the Southeast is a potential cause. In this report we assess the proportion of the excess stroke mortality attributable to SES. METHODS: The more than 400,000 participants in the National Longitudinal Mortality Study were categorized into three regions: the coastal plain region of North Carolina, South Carolina, and Georgia ("stroke buckle"); the remainder of these states plus five other southern states ("stroke belt"); and the remainder of the United States. The stroke mortality rates were calculated with and without adjustment for SES, and the proportion of the excess mortality attributable to SES was estimated. RESULTS: In persons between the ages of 35 and 54 years, stroke mortality in the stroke buckle is estimated to be more than twice that of the rest of the nation and 1.7 times greater for ages 55 to 74 years. For persons in the stroke belt, the stroke mortality was 1.3 times greater than that in the rest of the nation for the ages of 35 to 54 and 55 to 74 years. Less than 16% of this excess stroke morality was attributable to SES. CONCLUSIONS: SES does not appear to be a major contributor to the excess mortality in the southeastern United States. Of additional concern is the stroke buckle region, which was shown to have stroke mortality rates substantially greater than those in the traditionally recognized stroke belt.

110. Gregorio DI, Walsh SJ, Paturzo D. The effects of occupation-based social position on mortality in a large American cohort. *Am J Public Health*. 1997;87:1472-1475.

ID : 50

OBJECTIVES: Four occupation-based measures were used to derive estimates of social position's effect on all-cause mortality among men and women in a large national cohort. METHODS: The National Longitudinal Mortality Study provided information on principal occupation and 9-year follow-up for 229,851 persons aged 25 through 64 years. Cox's proportional hazards model was used to estimate the age-adjusted risk of death relative to six ordinal categories of social position. The Slope Index of Inequality described average change in death rates across categories. RESULTS: Risk of death was consistently elevated among persons at lower positions in the social hierarchy. Estimates comparing lowest with highest categories varied within a narrow range (1.47-1.92 for men and 1.23-1.55 for women). However, several discrepancies among analyses were noted. The analysis by US census groups revealed nonlinear associations, whereas those using other scales found incremental increases in risk. Effect modification by sex was observed for analyses by two of the four measures. Race/ ethnicity did not modify the underlying association between variables. CONCLUSIONS: Our analysis complements previous findings and supports, with few qualifications, the interchangeability of occupation-based measures of social position in mortality studies. Explanations for why relative risk estimates were modified by sex are offered.

111. Anderson RT, Sorlie P, Backlund E, Johnson N, Kaplan GA. Mortality effects of community socioeconomic status. *Epidemiology*. 1997;8:42-47.

ID : 52

We linked data from the National Longitudinal Mortality Study to census tract information on 239,187 persons to assess 11-year mortality risk among black and white women and women associated with median census tract income, adjusted for individual family income from the Current Population Survey. We stratified Cox proportional hazards models by ages 25-64 years and 65 years and older. We used a robust covariance matrix to obtain standard errors for the model coefficients that account for correlation among individuals in the same census tract. Both income indicators were independently related to all-cause mortality. Among persons age 25-64 years, the rate ratios (RR) for individual family income and the median census tract income, respectively, for low income relative to high income were RR = 2.10 vs. 1.49 for black men, RR = 2.03 vs 1.26 for white men; and RR = 1.92 vs 1.30 for black women and RR = 1.61 vs 1.16 for white women. Among persons age 65 years or greater, only individual family income was associated with mortality, and only for white men. Although family income has a stronger association with mortality than census tract, our results indicate that, more broadly, area socioeconomic status makes a unique and substantial contribution to mortality and should be explored in health policy and disease prevention research.

112. Sorlie PD, Johnson NJ. Validity of education information on the death certificate. *Epidemiology*. 1996;7:437-439.

ID : 53

We compared education as recorded on the death certificate with education ascertained before death from a household survey of 10,423 persons age 25 years or more who died in 1989. There was a tendency for the decedent's education to be reported at a higher level on the death certificate than at baseline. Of those who were reported as high school graduates on the death certificate, 38% reported that they had less than a high school education at baseline. The bias was more pronounced in older than younger decedents.

113. Singh GK, Yu SM. US childhood mortality, 1950 through 1993: Trends and socioeconomic diffferentials. *Am J Public Health*. 1996;86:505-512.

ID : 55

OBJECTIVES: This study examined trends and differentials in US childhood mortality from 1950 through 1993 according to sex, race/ethnicity, education, family income, and cause of death. METHODS: Log-linear, multiple regression, and Cox proportional hazards regression models were applied to the data from the National Vital Statistics System, the National Longitudinal Mortality Study, and the Area Resource File. RESULTS: Substantial declines in US childhood mortality have occurred in the past 4 decades, primarily due to decreases in mortality from unintentional injuries, cancer, pneumonia and influenza, and congenital anomalies. The overall declining trend, however, has been dampened by a twofold to threefold increase in the suicide and homicide rates among children since 1968. Male, Black, American Indian, Hawaiian, and Puerto Rican children and those in the lower socioeconomic strata were at an increased risk of death. CONCLUSIONS: Increasing trends in mortality from violence, firearm injuries, and human immunodeficiency virus/acquired immunodeficiency syndrome pose a major obstacle to continued declines in US childhood mortality. Reducing socioeconomic disparities and improving access to and use of health care may bring about further declines in overall and injury-related childhood mortality.

114. Singh GK, Yu SM. Trends and differentials in adolescent and young adult mortality in the United States, 1950 through 1993. *Am J Public Health*. 1996;86:560-564.

ID : 54

Using data from the National Vital Statistics System and the National Longitudinal Mortality Study, this study examined mortality trends and differentials from 1950 through 1993 among US adolescents and young adults according to sex, race/ethnicity, education, family income, marital status, and cause of dealth. No appreciable reduction in youth mortality has occurred, especially among men. Declines in youth mortality from accidents have been nearly ofset by increases in death rates from homicide, suicide, and firearm injuries. American Indians, Blacks, males, and those with least education and income were at increased risk of both overall and injury-specific youth mortality.

115. Elo IT, Preston SH. Educational differentials in mortality: United States, 1979-85. *Soc Sci Med*. 1996;42:47-57.

ID : 57

The paper examines educational differentials in adult mortality in the United States within a multivariate framework using data from the National Longitudinal Mortality Survey (NLMS). As a preliminary step we compare the magnitude of educational mortality differentials in the United States to those documented in Europe. At ages 35-54, the proportionate reductions in mortality for each one year increase in schooling are similar in the United States to those documented in Europe. The analyses further reveal significant educational differentials in U.S. mortality among both men and women in the early 1980s. Differentials are larger for men and for working ages than for women and persons age 65 and above. These differentials persist but are reduced in magnitude when controls for income, marital status and current place of residence are introduced.

116. Backlund E, Sorlie PD, Johnson NJ. The shape of the relationship between income and mortality in the United States. Evidence from the National Longitudinal Mortality Study. *Ann Epidemiol*. 1996;6:12-20; discussion 21-12.

ID : 56

A follow-up study based on a large national sample was used to examine differences in the well-established inverse gradient between income and mortality at different income levels. The study showed the income-mortality gradient to be much smaller at high income levels than at low to moderate income levels in the working age (25 to 64 years) and elderly (over 65 years) populations for men and women both before and after adjustment for other socioeconomic variables. In addition, a much larger gradient existed for working age women at extreme poverty levels than for those women at low to moderate income levels. The income-mortality gradient was much smaller in the elderly than in the working age population. The study also examined the ability of several different mathematic functions of income to delineate the relationship between income and mortality. The study suggested that the health benefits associated with increased income diminish as income increases.

117. Sorlie PD, Backlund E, Keller JB. US mortality by economic, demographic, and social characteristics: the National Longitudinal Mortality Study. *Am J Public Health*. 1995;85:949-956.

ID : 61

OBJECTIVES: A large US sample was used to estimate the effects of race, employment status, income, education, occupation, marital status, and household size on mortality. METHODS: Approximately 530,000 persons 25 years of age or more were identified from selected Current Population Surveys between 1979 and 1985. These individuals were followed for mortality through use of the National Death Index for the years 1979 through 1989. RESULTS: Higher mortality was found in Blacks than in Whites less than 65 years of age; in persons not in the labor force, with lower incomes, with less education, and in service and other lower level occupations; and in persons not married and living alone. With occasional exceptions, in specific sex and age groups, these relationships were reduced but remained strong and statistically significant when each variable was adjusted for all of the other characteristics. The relationships were generally weaker in individuals 65 years of age or more. CONCLUSIONS: Employment status, income, education, occupation, race, and marital status have substantial net associations with mortality. This study identified segments of the population in need of public health attention and demonstrated the importance of including these variables in morbidity and mortality studies.

118. Smith MH, Anderson RT, Bradham DD, Longino CF, Jr. Rural and urban differences in mortality among Americans 55 years and older: analysis of the National Longitudinal Mortality Study. *J Rural Health*. 1995;11:274-285.

ID : 59

Previous research on rural and urban differences in risk of mortality has been inconclusive. This article used data from the National Longitudinal Mortality Study to establish whether all-cause mortality risk among persons 55 years and older varies by degree of urbanization, controlling for the potential sociodemographic confounders of age, gender, race/ethnicity, education, income, and marital status. Using the Cox Proportional Hazards Regression Procedure, the authors found that persons living in the most rural locales and those living in rural communities in standard metropolitan statistical areas (SMSAs) have the lowest risk of mortality, while those living in SMSA central cities had the highest risk of dying during the study period. The protective effect of rural residence declines in older age cohorts.

119. Preston SH, Elo IT. Are educational differentials in adult mortality increasing in the United States? *J Aging Health*. 1995;7:476-496.

ID : 58

Two recent studies have compared the size of educational mortality differentials among adults in the 1980s to estimates for 1960. Both studies have concluded that educational differentials have increased for males. One study finds a similar increase for females. We reconsider this question by introducing a data source that is better suited to estimating recent differentials than either of the two that have been employed. We also evaluate the quality of the 1960 baseline estimates and introduce broader measures of inequality. We conclude that educational inequalities have widened for males but contracted for working-age females. For both sexes, inequality trends are more adverse for persons aged 65+ than for persons aged 25-64. The role of national health insurance in shaping these trends is briefly considered.

120. Kposowa AJ, Breault KD, Singh GK. WHITE MALE SUICIDE IN THE UNITED-STATES - A MULTIVARIATE INDIVIDUAL-LEVEL ANALYSIS. *Social Forces*. 1995;74:315-325. doi: 10.2307/2580634

ID : 2

Using data from the 1979-85 National Longitudinal Mortality Study and multivariate hazards regression analysis, the study investigates risk factors associated with suicide mortality among white males in the U.S. (ICD-9 Codes E950-E959). Results were mixed with regard to the social integration-suicide hypothesis. Divorced or separated men and those who live alone (socially isolated) have significantly higher risks of suicide mortality. However, single and widowed men do not have a significantly greater suicide risk after controlling for key social factors such as socioeconomic status (SES). The results also show that men who live in urban areas and those who are native born are at a higher risk for suicide.

121. Hoyert DL, Singh GK, Rosenberg HM. Sources of data on socio-economic differential mortality in the United States. *J Official Stat*. 1995;11:233-260.

ID : 85

122. Howard G, Russell GB, Anderson R, Evans GW, Morgan T, Howard VJ, Burke GL. Role of social class in excess black stroke mortality. *Stroke*. 1995;26:1759-1763.

ID : 60

BACKGROUND AND PURPOSE: It has been suggested that a substantial proportion of the excess stroke mortality among black Americans may be attributable to relatively lower socioeconomic status (SES) in this group. In this report we provide the first quantitative estimates of the proportion of excess black stroke mortality attributable to SES for a large population-based cohort. METHODS: We used data from the National Longitudinal Mortality Study for persons 45 years and older (73,400 white men, 87,528 white women, 6522 black men, and 8816 black women). Sex-specific proportional hazards model were used to estimate excess black stroke mortality with and without adjustment for education and income (measures of SES). The contribution of SES to the excess black stroke risk was estimated from the difference in regression coefficients for race in these models. RESULTS: In men, low SES was associated with increased stroke mortality (P < or = .0001) and accounted for 14% to 46% of the excess black stroke risk (P < .05). However, we could find no association between SES and stroke mortality in women, and SES did not account for a significant proportion of the excess stroke mortality in black women. CONCLUSIONS: Although SES proved to account for a statistically significant proportion of excess male black stroke mortality, overall SES explained less than one quarter of the observed excess between ages 45 and 65. In women, SES did not significantly reduce the estimated excess black stroke mortality. Although SES may be playing a role in excess black stroke mortality, a substantial proportion of the excess appears attributable to other sources, including cerebrovascular risk factors that are unrelated to SES, unmeasured lifestyle influences, social resources, and genetic factors.

123. Sorlie PD, Johnson NJ, Backlund E, Bradham DD. Mortality in the uninsured compared with that in persons with public and private health insurance. *Arch Intern Med*. 1994;154:2409-2416.

ID : 62

OBJECTIVE: To compare mortality in persons with employer-provided health insurance, Medicare, Medicaid, military health benefits, other private health insurance, and no health insurance, before and after adjustment for income and employment status. DESIGN: Cohort study using national survey data containing information on social, economic, and demographic factors and health insurance, with deaths identified through matching to the National Death Index resulting in a mortality follow-up period of 5 years. SETTING: Noninstitutionalized population of the United States. PARTICIPANTS: Approximately 150,000 respondents to national surveys conducted by the US Bureau of the Census (Current Population Surveys), aged 25 to 64 years. RESULTS: After adjustment for age and income, persons with Medicare and Medicaid had the highest mortality in comparison with those with employer-provided insurance, with relative risks generally greater than 2. With adjustment for age and income, persons without insurance had higher mortality than those with employer-provided insurance, with relative risks of 1.2 for white men and 1.5 for white women. These relationships held after adjustment for employment status, with the working uninsured showing mortality between 1.2 and 1.3 times higher than that of the working insured. Mortality was higher in those with lower incomes after adjustment for insurance status. Those with annual income of $10,000 or less per year had mortality about two times that of persons with incomes greater than $25,000 per year. CONCLUSION: Mortality was lowest in employed persons with employer-provided health insurance. The higher mortality in those with public insurance or with no insurance reflects an indeterminate mix of selection on existing health status and access to medical care.

124. Kposowa AJ, Singh GK, Breault KD. THE EFFECTS OF MARITAL-STATUS AND SOCIAL-ISOLATION ON ADULT MALE HOMICIDES IN THE UNITED-STATES - EVIDENCE FROM THE NATIONAL LONGITUDINAL MORTALITY STUDY. *Journal of Quantitative Criminology*. 1994;10:277-289. doi: 10.1007/bf02221213

ID : 1

With data from the 1979-1985 Longitudinal Mortality Study, we examine the effects of marital status and social isolation on adult male homicide (ICD-9 Codes E960-E978). Cox proportional hazards models were fitted to a 1979-1981 population cohort of approximately 200,000 adult men and their mortality experiences were followed until 1984-1985. Multivariate hazards regression analysis showed that marital status and social isolation are associated with significantly higher risks of homicide victimization. Controlling for age and other socioeconomic covariates, single persons were 1.9 times, and divorced, separated or widowed persons were 1.7 times, more likely to die from homicide than married persons. Socially isolated persons were 1.6 times more likely to become homicide victims. Other adult males with increased risk of homicide victimization were African Americans and those who lived in the inner city.

125. Howard G, Anderson R, Sorlie P, Andrews V, Backlund E, Burke GL. Ethnic differences in stroke mortality between non-Hispanic whites, Hispanic whites, and blacks. The National Longitudinal Mortality Study. *Stroke*. 1994;25:2120-2125.

ID : 63

BACKGROUND AND PURPOSE: Although US blacks are known to have an excess stroke mortality compared with US whites, little is known about the stroke burden of the Hispanic white population. This report will provide estimates of the relative burden of stroke mortality in the US black and Hispanic population relative to the white population and examine the consistency of this relation across age. METHODS: Data were from participants aged > 45 years from the National Longitudinal Mortality Study. There were 1844 stroke deaths among 239,734 non-Hispanic whites, 46 deaths among 12,527 Hispanic whites, and 234 deaths among 23,468 black participants. Standard statistical methods were used to examine the ethnic differences in stroke mortality. RESULTS: The hazard ratios for black men and women (relative to non-Hispanic whites) were nearly identical, at > 4.0 at age 45 but marginally < 1.0 by age 85. For both Hispanic men and women, the hazard ratios (relative to non-Hispanic whites) were approximately 1.0 at age 45 but were marginally significantly < 1.0 at older ages. The ethnic differences in stroke death rates reveal differences in age distributions of age at fatal stroke between these groups. Approximately 6% of fatal strokes for non-Hispanic whites occurred before age 60, whereas > 15% occurred in both Hispanic whites and blacks. CONCLUSIONS: These results suggest that (1) for Hispanics, stroke risk is similar to that for non-Hispanic whites at young ages but is marginally lower at older ages, (2) the excess stroke mortality in blacks mainly occurs at younger ages (between 45 and 55 years), and (3) the relation between stroke risk for blacks and Hispanics relative to whites is similar by sex. The impact of age on relative stroke mortality would argue against simple age adjustment for describing ethnic differences in stroke mortality. Finally, proportionally, more strokes occur at older ages in non-Hispanic whites than in either US blacks or Hispanic whites.

126. Sorlie PD, Backlund E, Johnson NJ, Rogot E. Mortality by Hispanic status in the United States. *JAMA*. 1993;270:2464-2468.

ID : 64

OBJECTIVE: To compare all-cause and cause-specific mortality rates between Hispanic and non-Hispanic groups and estimate the effect of family income, place of birth, and place of residence on these rates. DESIGN: Cohort study using national survey data matched to the National Death Index, with a mortality follow-up period of 9 years. SETTING: The noninstitutionalized population of the United States. PARTICIPANTS: Approximately 700,000 respondents (aged 25 years or older), including 40,000 Hispanics, to national surveys conducted by the US Bureau of the Census (Current Population Surveys). OUTCOME MEASURES: All causes and underlying cause of death, coded from the death certificate, occurring between 1979 and 1987. RESULTS: Adjusting for age, Hispanics were shown to have lower mortality from all causes compared with non-Hispanics (standardized rate ratio [SRR], 0.74 for men, 0.82 for women), lower mortality from cancer (SRR, 0.69 for men, 0.61 for women), lower mortality from cardiovascular disease (SRR, 0.65 for men, 0.80 for women), higher mortality from diabetes (SRR, 1.86 for men, 2.38 for women), and higher mortality from homicide (SRR, 3.60 for men). After adjusting for differences in annual family income, the relative mortality ratios were even lower for Hispanics than non-Hispanics. CONCLUSIONS: These data describe, in a large national cohort study, a lower mortality in Hispanics than in non-Hispanics. This mortality is particularly low after adjustment for differences in family income.

127. Sorlie PD, Rogot E, Johnson NJ. Validity of demographic characteristics on the death certificate. *Epidemiology*. 1992;3:181-184.

ID : 68

In a sample of the United States population from the Census Bureau's current Population Surveys, we compared demographic characteristics with those recorded on the death certificate for the 43,000 decedents in the samples followed from 1979 to 1985. Overall percentage agreements were: Sex 99.5, Race 99.4, Place of birth 99.4, Hispanic origin 98.7, and Veteran status 95.2. Relatively fewer American Indians and Asian/Pacific Islanders had death certificates that agreed with the baseline race (73.6% and 82.4%, respectively). The direction of disagreement suggests that current estimates of mortality rates for American Indians and Asian/Pacific Islanders are underestimated.

128. Sorlie P, Rogot E, Anderson R, Johnson NJ, Backlund E. Black-white mortality differences by family income. *Lancet*. 1992;340:346-350.

ID : 65

Death rates among US black men and women under 75 years of age are higher than for their white counterparts. The explanation for this excess risk, though attributed to socioeconomic factors, remains unclear. We calculated mortality rates by family income for blacks and whites in a representative sample of the US population (National Longitudinal Mortality Study). For persons aged less than 65 years of age, mortality rates are lower in those with higher family income for both blacks and whites, and both men and women. However, at each level of income, blacks have higher mortality than whites. Higher levels of family income are also associated with lower death rates from cardiovascular disease, cancer, and deaths from causes other than cardiovascular disease or cancer. After adjustment for income, blacks have higher death rates from each of these three general causes. For subjects below 65 years, the mortality gradient by income is larger than the gradient by race. The differences in mortality rates by race not accounted for by income may be due to other differences such as access to health care, type or quality of medical care, or behavioral risk factors that disadvantage black populations.

129. Rogot E, Sorlie PD, Johnson NJ. A Mortality Study of 1.3 Million Persons by Demographic, Social and Economic Factors: 1979-1985 Follow-up. Second Data Book. PHS D; 1992. NIH Publication No 92-3297.

ID : 84

130. Rogot E, Sorlie PD, Johnson NJ. Life expectancy by employment status, income, and education in the National Longitudinal Mortality Study. *Public Health Rep*. 1992;107:457-461.

ID : 67

Based on data from the National Longitudinal Mortality Study for 1979-85, life expectancies are estimated for white men and white women by education, by family income, and by employment status. Life expectancy varies directly with amount of schooling and with family income. Differences in life expectancy at age 25 between the highest and the lowest levels of education completed were about 6 years for white men and about 5 years for white women. For family income, differences between the highest and the lowest income groups were about 10 years for white men and 4.3 years for white women. The largest differences in life expectancy were between employment categories. At age 25, white men in the labor force lived on average about 12 more years than those not in the labor force, and white women lived on average about 9 more years. For those who were unable to work compared with those in the labor force, the difference for white men was about 20 years; for white women, 29 years. Results in this study showed much the same differentials in life expectancy for education as the earlier Kitagawa-Hauser study.

131. Rogot E, Sorlie PD, Backlund E. Air-conditioning and mortality in hot weather. *Am J Epidemiol*. 1992;136:106-116.

ID : 66

A cohort of 72,740 persons for whom information on household air-conditioning was available was monitored for mortality via the National Death Index from April 1980 through December 1985. A total of 2,275 deaths occurred among the members of this cohort. The basic question addressed was whether persons in households with air-conditioning experienced lower death rates during hot weather than persons in households without air-conditioning. This question was examined for both central and room air-conditioning. The analysis was based on a state-by-state approach, that cross-tabulated deaths by air-conditioning status (yes or no) and average temperature during the month of death (less than 21.2 degrees C (less than 70 degrees F) or greater than or equal to 21.2 degrees C (greater than or equal to 70 degrees F)). The Mantel-Haenszel and sign tests were used to summarize the data. For central air-conditioning versus no air-conditioning, statistically significant benefits (p less than 0.05, Mantel-Haenszel test) were observed for the overall total, for females, for persons not in the labor force, and for persons living in fewer than six rooms. These groups had more exposure to air-conditioning. The relative risk for the total group was 0.58, implying that in hot weather, the death rate for persons who had central air-conditioning was 42 percent lower than the rate for persons who did not have air-conditioning, after confounding variables had been controlled for. For room air-conditioning versus no air-conditioning, the odds ratio for the total group was 0.96, which was not significantly different from 1.0, suggesting that no real benefit was derived from room air-conditioning. Some reasons for the lack of a demonstrable benefit for room air-conditioning are given.

132. Sorlie PD, Rogot E. Mortality by employment status in the National Longitudinal Mortality Study. *Am J Epidemiol*. 1990;132:983-992.

ID : 69

A mortality follow-up of 452, 192 persons aged 25 years or more who were characterized with respect to employment status was conducted using the National Death Index for the years 1979 through 1983. The cohort, part of the National Longitudinal Mortality Study, was drawn from Current Population Survey samples representative of the US population using selected months during the years 1979-1983. Employed persons aged 25-64 years were found to have standardized mortality ratios from 61% to 74% of the average, depending upon their sex and race. Unemployed men had standardized mortality ratios slightly above 100, but these values were 1.6 and 2.2 times higher than those for employed white men and black men, respectively. Those classified as unable to work had very high mortality ratios, from two to seven times the average. In the older age groups, 65 years or more, very low mortality ratios were found for those who were still employed. These relations were maintained after adjustment for family income and educational level. These results 1) describe the magnitude of mortality risk for clearly defined employment categories, 2) identify segments of the population with especially high mortality requiring greater public health recognition, and 3) suggest further research into the health consequences of the various employment/nonemployment conditions.

133. Rogot E, Sorlie PD, Johnson NJ. A Mortality Study of One Million Persons by Demographic, Social and Economic Factors: 1979-1981 Follow-up. First Data Book. PHS D; 1988. NIH Publication No 88-2896.

ID : 83

134. Rogot E, Sorlie P, Johnson NJ. Probabilistic methods in matching census samples to the National Death Index. *J Chronic Dis*. 1986;39:719-734.

ID : 70

The National Death Index (NDI) of the National Center for Health Statistics is a powerful tool for identifying deaths in epidemiologic studies. The NDI will generate a list of possible matches for every input record according to the NDI matching criteria. The task of determining a true or correct match out of the list of possible matches becomes formidable when a large number of records are being investigated. In the National Longitudinal Mortality Study nearly one million Census records are being matched to the NDI, thus requiring an efficient and accurate method to screen out the false positive matches. In a pilot study to the larger mortality follow-up, Census Bureau files containing 226,000 person records were matched to the 1979 NDI. The results of this match were used to generate a probabilistic method to separate the possible matches into categories of true positives, false positives and those of questionable status requiring manual review of the Census record and the death certificate. Of the 5542 possible matches about one-third were ultimately determined to be true positives and two-thirds false positives. The probabilistic method was validated by replications on subsets of the data and promises to save considerable time in review of records in the large national study of mortality.

135. Rogot E, Sorlie P, Johnson NJ. Mortality by Cause of Death Among Selected Census Bureau Sample Cohorts for 1979-1981. Paper/Poster presented at: Proceedings of the Section on Survey Research Methods; 1985;

ID : 82

136. Johnson NJ, Rogot E, Glover C, Sorlie P, McMillen M. General Mortality Among Selected Census Bureau Sample Cohorts for 1979-1981. Paper/Poster presented at: Proceedings of the Section on Survey Research; 1985;

ID : 81

137. Makuc D, McMillen M, Feinleib M, McMillen D, Schwartz W, Rogot E. An Overview of the U.S. National Longitudinal Mortality Study. Paper/Poster presented at: Proceedings of the Section on Social Statistics; 1984;

ID : 80

138. Rogot E, Schwartz S, O'Conor K, Olsen C. The Use of Probabilistic Methods in Matching Census Samples to the National Death Index. Paper/Poster presented at: Proceedings of the Section on Survey Research Methods; 1983;

ID : 79

139. Rogot E, Feinleib M, Ockay KA, Schwartz SH, Bilgrad R, Patterson JE. On the feasibility of linking census samples to the National Death Index for epidemiologic studies: a progress report. *Am J Public Health*. 1983;73:1265-1269.

ID : 71

To test the feasibility of using large national probability samples provided by the US Census Bureau, a pilot project was initiated to link 230,000 Census-type records to the National Death Index (NDI). Using strict precautions to maintain the complete confidentiality of individual records, the Current Population Survey files of one month in 1973 and one month in 1978 were matched by computer to the 1979 NDI file. The basic question to be addressed was whether deaths so obtained are seriously underestimated when there is no Social Security Number (SSN) in the Census record. The search of the NDI file resulted in 5,542 matches of which about 1,800 appear to be "true positives" representing deaths, the remainder are "false positives." Of the deaths, 80 per cent would still have been detected without SSN in the Census record. The main reasons for missing deaths (false negatives) were discrepancies in the year of birth and in the given name. Assuming certain changes in the NDI matching algorithm, the 80 per cent figure could increase to 85 per cent or higher; however, this could also cause significant increases in the number of false positives. The National Heart, Lung and Blood Institute (NHLBI) and Census Bureau staff are currently developing a probabilistic method to eliminate false positives from the NDI output tape. The results of the pilot study indicate that a larger research project is clearly feasible.