Health Insurance and Mortality in US Adults: A Cautionary Tale

Jenny Kim, PhD and Jeffrey Milyo, PhD

Abstract

A 2009 observational study reported that private insurance status is associated with decreased mortality risk compared to no insurance. Employing the same statistical model but with more recent data, we observe a weaker and statistically insignificant relationship. However, Medicaid coverage is associated with increased mortality risk; the adjusted hazard ratio for Medicaid compared to no insurance is 1.32 (95% CI = 1.01, 1.72). These findings bolster concerns about using observational studies to understand the health consequences of insurance.

Introduction

In the midst of the recent Congressional debate over health insurance reform, this journal published an observational study by Wilper et al. (2009) which reported that the lack of health insurance in the United States is associated with about 45,000 annual excess deaths.[1] Not surprisingly, this finding received much attention from politicians and the press.

However, other research warns that observational studies are inappropriate for estimating the health consequences of insurance.[2-4] Both insurance status and health outcomes are determined in part by unobserved idiosyncratic factors, such as prudence and foresight (i.e., risk aversion and time discount rates); therefore, it is not feasible to identify the treatment effect of insurance status on health in extant observational studies. Such analyses yield upwardly biased estimates of the protective effect of private insurance.

We replicate and extend the analysis in Wilper et al. using more recent data in order to examine the broader implications of their statistical model for health insurance reform and to demonstrate the shortcomings of such observational studies.

Methods

We analyze the Third National Health and Nutrition Examination Survey (NHANES III) Linked Mortality File, which matches NHANES III records to the National Death Index through December 2006.[5] This is the same dataset utilized by Wilper et al., but with six additional years of matched mortality data and subsequent corrections.

We follow Wilper et al. by comparing the mortality risk for adults ages 17 to 64 by insurance status. Mortality risk is estimated using a Cox proportional hazard model, controlling for several demographic variables (age, education, employment, gender, poverty status and race\ethnicity)

and health variables (body mass index, exercise, smoking and drinking status, and self-rated and physician-rated health) measured at the time of the NHANES III interview.

In order to interpret these estimates, we calculate predicted deaths associated with changes in insurance status. In doing so, we again follow Wilper et al. by employing the method for excess deaths utilized by the Urban Institute.[6]

Results

Table 1 displays the baseline characteristics of our sample. In total, 10,637 persons contributed 155,037 person-years of follow-up time between 1988 and 2006; this is an increase of about 92% over the person-years included in Wilper et al. We also observe more mortality events; 6.4% of our sample observations are deceased within the study period, compared to 3.1% in Wilper et al.

We are unable to replicate exactly the results in Wilper et al., but the small differences are likely due to corrections made to the NHANES III dataset in the intervening years. For example, using "no insurance" as the reference category, the fully adjusted mortality risk for private insurance in Wilper et al. is 0.71 (95% CI = 0.54, 0.94); our replication using the same methods and timeframe yields an estimate of 0.76 (95% CI = 0.58, 1.00).

We next estimate the model using the additional matched mortality data through 2006. Full results are reported in the first column of Table 2; the estimated hazard rate for private insurance versus no insurance is 0.85 (95% CI = 0.69, 1.06).

Finally, we include individuals with Medicaid coverage in the analysis; these results are reported in the second column of Table 2. This yields no substantively important differences in the hazard estimates for the previously included variables, but the estimated hazard rate for Medicaid coverage versus no insurance is 1.32 (95% CI = 1.01, 1.72).

To illustrate the magnitude of these hazard rates we calculate the predicted change in total U.S. mortality in 2007 for hypothetical changes in population insurance status. The point estimates in column two of Table 2 suggest that lack of private health insurance accounts for 44,445 annual excess deaths, which is a similar total to that in Wilper et al. The model also predicts that moving all uninsured persons onto Medicaid increases annual excess deaths by 41,642, while moving all Americans onto Medicaid increases annual excess deaths by 264,109.

Discussion

We replicate the multivariate analysis in Wilper et al. (2009) with more recent data and find that the association between lack of health insurance and mortality is weaker than previously observed. Moreover, Medicaid coverage is strongly associated with an increased risk of mortality.

Using the same method from earlier studies, we find that Medicaid is associated with over 40,000 annual excess deaths. Similarly, a universal Medicaid reform is predicted to correspond

to about 250,000 annual excess deaths. Such findings may give pause to reform advocates who cite evidence from observational studies in support of a national health plan.[7]

We do not interpret our findings to mean that Medicaid kills or that private insurance coverage has no impact on mortality. Instead, this exercise demonstrates the pitfalls of using observational studies to estimate the health consequences of insurance. Future research should instead exploit experiments[8] or quasi-experiments.[9]

About the Authors:

Jenny Kim is a research analyst at the Economic and Policy Analysis Research Center at the University of Missouri in Columbia, MO. Jeffrey Milyo is a professor of economics and the Middlebush Chair of Social Science at the University of Missouri in Columbia, MO. Correspondence should be sent to Jenny Kim (eykim@mizzou.edu) or Jeff Milyo (milyoj@missouri.edu).

Contributors:

J. Kim performed the statistical analysis and data management. Both J. Kim and J. Milyo planned the analysis, interpreted the results, drafted the article and revised the draft. J. Milyo conceived the analysis.

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Table 1 --- Insurance and Mortality among US Adults Aged 17 to 64 Years: NHANES III (1988-1994) with Mortality Follow-Up through 2006

Characteristic	No. (weighted %)	% Uninsured (SE)	% Died (SE)
Vital Status as of December 31, 2006			
Alive	9772 (93.6)	15.2 (1.14)	0
Deceased	865 (6.4)	15.6 (1.92)	100
Insurance Status[a]			
Private Only	7235 (79.7)	0	6.08 (0.48)
Medicaid Only	926 (5.2)	0	11.6 (1.62)
Uninsured	2476 (15.2)	100	6.6 (0.73)
Gender			
Female	5770 (51.8)	13.8 (1.13)	5.7 (0.46)
Male	4867 (48.2)	16.6 (1.46)	7.2 (0.49)
Age in years			
17-24	2214 (18.4)	24.3 (2.04)	1.9 (0.50)
25-34	2840 (27.7)	18.1 (1.52)	2.4 (0.42)
35-44	2551 (26.2)	11.7 (1.29)	3.9 (0.58)
45-54	1528 (15.7)	10.3 (1.35)	9.9 (1.25)
55-64	1504 (12.1)	8.7 (1.33)	23.6 (1.94)
Race/Ethnicity			
Non-Hispanic White	3858 (75.5)	11.7 (0.91)	6.5 (0.52)
Non-Hispanic Black	3215 (11.1)	18.3 (1.84)	8.6 (0.56)
Mexican-American	3100 (5.5)	41.0 (2.01)	5.1 (0.56)
Other	464 (8.0)	26.2 (6.02)	4.2 (0.96)
Education in years			
< 12	3648 (21.3)	31.4 (2.70)	10.0 (0.83)
≥ 12	6989 (78.7)	10.8 (0.84)	5.5 (0.40)
Employment			
Unemployed[b]	769 (3.4)	97.6 (1.07)	9.1 (1.48)
All others	9868 (96.6)	12.3 (0.93)	6.3 (0.43)
Poverty income ratio[c]			
0-1	2447 (12.0)	38.3 (2.73)	9.5 (1.14)
1-3	4781 (40.5)	21.1 (1.69)	6.4 (0.52)
> 3	3409 (47.6)	4.4 (0.54)	5.7 (0.56)
Smoking history			
Current smoker	3259 (33.2)	19.8 (1.61)	10.1 (0.61)
Former smoker[d]	2046 (22.0)	9.8 (1.10)	7.3 (0.81)
Nonsmoker	5332 (44.9)	14.4 (1.36)	3.3 (0.38)
Drinking status, alcoholic drinks/wk			
< 6	8613 (79.4)	14.3 (1.16)	6.1 (0.48)
≥ 6	2024 (20.6)	18.5 (1.55)	7.9 (0.84)
Exercise intensity, METs/mo			
≥ 100	6607 (41.7)	13.4 (1.13)	5.7 (0.46)
< 100	4030 (58.3)	16.5 (1.26)	7.0 (0.58)
Self-rated health			
Excellent	1952 (23.2)	8.6 (1.19)	3.0 (0.43)
Very good	2846 (33.8)	11.4 (0.90)	4.0 (0.52)
Good	3908 (32.0)	19.1 (1.73)	7.2 (0.56)
Fair or poor	1931 (11.0)	29.5 (2.35)	18.9 (1.70)
Physician-rated health			
Excellent	5344 (53.7)	15.9 (1.30)	3.2 (0.42)
Very good	2594 (24.3)	12.5 (1.08)	6.2 (0.94)
Good	2243 (18.8)	16.2 (1.48)	11.4 (1.06)
Fair or poor	456 (3.3)	17.1 (3.84)	32.7 (2.93)
Measured Body Mass Index (BMI)			
< 18.5	254 (2.8)	18.1 (3.24)	8.2 (2.10)
18.5-25	4407 (46.7)	15.3 (1.22)	4.8 (0.38)
> 25 - < 30	3328 (29.9)	14.3 (1.32)	6.6 (0.84)
≥ 30	2648 (20.5)	15.8 (1.70)	9.7 (0.87)

Notes: BMI = body mass index (weight in kg divided by height in meters squared); METs = metabolic equivalents; SE = standard error; and NHANES = National Health and Nutrition Examination Survey.

[a] For those with complete data for all characteristics; excludes those covered by Medicare, military insurance, or multiple types of insurance (n=10,637).
[b] Actively looking for a job, laid off, or unemployed.
[c] Income divided by Federal Poverty Line at time of interview.
[d] Smoked more than 100 cigarettes in lifetime at time of interview.

Table 2 --- Adjusted Hazards for Mortality among US Adults Aged 17 to 64 Years: NHANES III, 1988-2006

Characteristics	Cox Proportional Hazard Ratios (95% CI)	
	Private Insurance and Uninsured (n=9,711)	Private Insurance, Medicaid and Uninsured (n=10,637)
Insurance Status[a]		
Uninsured (REF)	1.00	1.00
Private Only	0.85 (0.69, 1.06)	0.86(0.69, 1.07)
Medicaid Only		1.32(1.01, 1.72)
Gender		
Female (REF)	1.00	1.00
Male	1.35 (1.16, 1.56)	1.41(1.22, 1.62)
Age[b]	1.07 (1.06, 1.08)	1.07(1.06, 1.08)
Race/Ethnicity		
Non-Hispanic White (REF)	1.00	1.00
Non-Hispanic Black	1.23 (1.01, 1.51)	1.20(0.99, 1.45)
Mexican-American	0.85 (0.66, 1.09)	0.80(0.63, 1.01)
Other	0.63 (0.41, 0.97)	0.72(0.51, 1.01)
Education in years		
≥ 12 (REF)	1.00	1.00
< 12	0.95 (0.90, 1.01)	1.03(0.84, 1.27)
Employment		
Not unemployed (REF)	1.00	1.00
Unemployed[c]	1.25 (0.94, 1.67)	1.29(0.97, 1.72)
Poverty income ratio[d]	0.95 (0.90, 1.01)	0.96(0.91, 1.01)
Smoking status		
Nonsmoker (REF)	1.00	1.00
Current smoker	2.14 (1.96, 2.61)	2.17(1.81, 2.61)
Former smoker[e]	1.45 (1.18, 1.79)	1.39(1.15, 1.67)
Drinking status, alcoholic drinks/wk		
< 6 (REF)	1.00	1.00
≥ 6	1.35 (1.11, 1.64)	1.38(1.16, 1.65)
Self-rated health		
Excellent (REF)	1.00	1.00
Very good	1.12 (0.82, 1.51)	1.14(0.85, 1.53)
Good	1.55 (1.18, 2.05)	1.56(1.20, 2.03)
Fair or poor	2.50 (1.82, 3.43)	2.33(1.72, 3.16)
Physician-rated health		
Excellent (REF)	1.00	1.00
Very good	1.08 (0.87, 1.34)	1.07(0.88, 1.30)
Good	1.28 (1.04, 1.56)	1.30(1.08, 1.56)
Fair or poor	3.10 (2.44, 3.94)	2.80(2.23, 3.52)
Exercise, METs/mo		
≥ 100 (REF)	1.00	1.00
< 100	0.89 (0.77, 1.03)	0.92(0.81, 1.04)
Measured BMI		
< 18.5	1.26 (0.79, 2.01)	1.34(0.78, 1.11)
18.5-25 (REF)	1.00	1.00
> 25 - < 30	0.92 (0.76, 1.12)	0.93(0.78, 1.11)
≥ 30	1.02 (0.84, 1.24)	1.00(0.83, 1.21)

Notes: BMI = body mass index (weight in kg divided by height in meters squared); CI = confidence interval; METs = metabolic equivalents; NHANES = National Health and Nutrition Examination Survey; and REF = reference category.

[a] For those with complete data for all characteristics; excludes those covered by Medicare, military insurance, or multiple types of insurance.
[b] Age at time of interview; hazard ratio represents change for one year increase in age.
[c] Actively looking for a job, laid off, or unemployed.
[d] Income divided by Federal Poverty Line at time of interview; hazard ratio represents change for one unit increase in the income-poverty ratio.
[e] Smoked more than 100 cigarettes in lifetime at time of interview.