

Health Insurance Coverage and the Risk of Decline in Overall Health and Death Among the Near Elderly, 1992–2002

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Background: Although individuals' health insurance coverage changes frequently, previous analyses have not accounted for changes in insurance coverage over time.

Objective: We sought to determine the independent association between lack of insurance and the risk of a decline in self-reported overall health and death from 1992 to 2002, accounting for changes in self-reported overall health and insurance coverage.

Methods: We analyzed data from the Health and Retirement study, a prospective cohort study of a national sample of community-dwelling adults age 51–61 years old at baseline. Major decline in self-reported overall health and mortality was determined at 2-year intervals.

Results: People who were uninsured at baseline had a 35% (95% confidence interval [CI] 12–62%) higher risk-adjusted mortality from 1992 to 2002 compared with those with private insurance. However, when we analyzed outcomes over 2-year intervals, individuals who were uninsured at the start of each interval were more likely to have a major decline in their overall health (pooled adjusted relative risk 1.43, 95% CI 1.28–1.63), but they were equally likely to die (pooled adjusted relative risk 0.96, 95% CI 0.73–1.27). Of the 1512 people who were uninsured at baseline, 220 (14.6%) died; of those who died, only 70 (31.8%) were still uninsured at the HRS interview prior to death.

Conclusions: Death does not appear to be a short-term consequence of being uninsured. Instead, higher long-term mortality among the uninsured results from erosion in this population's health status over time and the attendant higher mortality associated with this. Most deaths among the uninsured occur after individuals have gained either public or private health insurance.

Key Words: health insurance, mortality, health status, outcome studies

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More than 43 million Americans currently lack health insurance.^{1–3} Uninsured individuals use fewer health care services⁴ and are more likely to die than individuals with private insurance coverage.^{5–14} Lack of insurance also has adverse effects on health status and physical functioning. Baker and colleagues reported that adults in late middle-age who were uninsured in 1992 and 1994 were more likely than those with continuous private insurance to have a major decline in their self-reported overall health and more likely to develop a new difficulty with physical functioning.¹⁵ Two longitudinal studies also found that individuals who lost their insurance coverage reported poorer general health status^{16–18} and worse blood pressure control^{17,18} than a control group who did not lose coverage.

Individuals' health insurance coverage changes frequently over the course of time.^{1,19–25} As a result, 82 million people were uninsured for all or part of 2002–2003, 1 of 3 people younger than the age of 65.¹ At least one quarter of older adults will be uninsured at some point during the decade leading up to age-eligibility for Medicare.²⁵ However, most previous studies examining health outcomes for the uninsured measured health status and health insurance coverage only once at the start of a study period. Because health insurance coverage changes frequently,^{1,19–24} this may lead to bias in estimates of the effect of lack of insurance on health. It is important to understand the dynamics of changes in health, changes in insurance coverage, and the relationship of these to the higher mortality rates seen for the uninsured. To address these issues, we analyzed data from the Health and Retirement Study (HRS) to examine changes in overall health and mortality rates between each of the HRS study interviews (eg, the 2-year intervals from 1992 to 1994, 1994 to 1996, etc.) using health insurance coverage at the start of each 2-year interval as our main independent variable.

METHODS

Study Population

Analyses were conducted using publicly available data files from the HRS; the Northwestern University Institutional Review Board therefore exempted this study from review. The HRS is a nationally representative, longitudinal data collection effort designed to increase understanding of the economic and health causes and consequences of retirement and aging.²⁶ The target population for the initial wave of the HRS included all community-dwelling adults in the

contiguous United States ages 51–61 in 1992 (born between the years 1931–1941). A multistage area probability design was used to sample U.S. households, with oversampling of black subjects, Hispanic subjects, and Florida residents. The household had to include at least one age-eligible person. Non-age-eligible spouses or partners also were interviewed regardless of age; however, they are not included in our analyses because they are not representative of the general U.S. population. A total of 82% of those eligible participated in the baseline interview. Follow-up interviews were conducted every 2 years. The HRS determined vital status at each wave through interviews with other household members and by matching participants to the National Death Index.

Insurance Status

The HRS asked detailed questions to determine whether participants were covered by employer-sponsored insurance, individually purchased policies, and government insurance programs, including Medicaid, Medicare, the Veterans' Administration, or CHAMPUS. Health outcomes were similar for participants with employer-sponsored and individually purchased health insurance, so these categories were combined into a single category called "private" insurance. Similarly, we combined individuals enrolled in Medicaid, Medicare, the Veterans' Administration, and CHAMPUS into a single category called "public" insurance. Individuals with both private and public health insurance were classified as privately insured to reflect the more generous benefits and access to care available for those with private insurance. Respondents were classified as uninsured if they said that they were not covered by private insurance, Medicare, Medicaid, or other Federal programs at the time of their interview. Starting in 1996, the HRS asked a confirmatory question of people who did not report any form of insurance in the first set of questions; HRS then obtained correct insurance information from those who denied being uninsured.

Covariates

Covariates were specified a priori and included in all multivariate models regardless of statistical significance. These included age, gender, race, marital status, years of school completed, household income (measured as the ratio of total household income to the official U.S. poverty line in 1993, adjusted for family size), past or current smoking, number of drinks of alcohol per day, the number of positive responses (0, 1, ≥ 2) on the CAGE (a 4-item questionnaire to measure problem drinking behaviors),²⁷ body-mass index (weight in kilograms divided by height in meters squared), the number of chronic conditions reported in HRS (including hypertension, diabetes, heart disease, chronic lung disease, cancer, arthritis, stroke, and visual difficulties), and the number of difficulties walking or climbing stairs (scores ranged from 0 to 4).

Dependent Variables

We identified deaths between each 2-year study interval (eg, 1992–94) and for the overall 10-year interval (ie, 1992–2002). For changes in overall health, we restricted our analyses to changes between HRS interviews (ie, changes over a

two-year interval). Self-reported overall health was measured at each interview with the question, "Would you say your health is excellent, very good, good, fair, or poor?" As has been done in other studies, we defined a variable "major decline in self-reported health" (yes/no) as either a decline from (1) excellent, very good, or good health at the start of a follow-up period to fair or poor health at the end of the follow-up period or (2) a decline from fair to poor health (eg, 1992 to 1994, 1994 to 1996, etc). We also used the method reported by Diehr and colleagues to analyze a combined outcome of death and overall health as a continuous variable.²⁸ These results were similar to our main analyses, so they are not presented here.

Statistical Analyses

All analyses were conducted using Stata release 8 (Stata Corporation, College Station, TX). All results were adjusted for study weights and the complex survey sampling design of the HRS using the Stata survey modules. We employed several analytic strategies to better understand the complex relationships between overall health, insurance coverage, and mortality. First, we analyzed crude differences in mortality from 1992 to 2002 for individuals with private insurance or no insurance coverage (ie, neither public or private insurance) in 1992 using χ^2 tests. We then determined the independent effect of lack of insurance coverage on the likelihood of death using logistic regression, adjusting for participant characteristics in 1992 (see the list of covariates above). Individuals with only public insurance are likely to have health problems that are not captured adequately by the HRS questions (eg, unmeasured confounders such as blindness, end-stage renal disease, or other disabilities that qualify individuals for Medicaid and Medicare before age 65). Therefore, as in previous studies,^{15,16} the results for individuals with public insurance are not shown.

Second, we analyzed both mortality and major decline in self-reported overall health during the 2 years between study interviews using similar methods. Over long periods of time, insurance status can change because of health declines, for example, individuals who are uninsured can gain Medicaid or Medicare as a result of a decline in health or development of a disability. Conversely, individuals who are privately insured may lose their job and their coverage because of a health decline. For these reasons, we only used patient characteristics at the start of each interval to predict 2-year health outcomes and did not analyze results using repeated measures with time-dependent covariates. Specifically, we estimated separate models of the probability of (1) death at $t+2$ or (2) major decline in overall health at $t+2$ based upon health insurance coverage and other individual characteristics at time t_0 (eg, being dead in 1994 was predicted using 1992 health insurance coverage and other 1992 covariates).

Third, data from all the 2-year intervals were combined to give a single, pooled estimate of the relationship of lack of health insurance to health outcomes using the method described by D'Agostino and colleagues.²⁹ For this method, data from each 2-year interval are thought of as a mini-follow-up study. A subject is at risk at the beginning of a wave if no event was observed during the previous wave, and

an individual may therefore have multiple observations with the dataset. A single set of parameter estimates is obtained and interpreted as the effect on outcome of the associated covariate at the beginning of the wave. This method does not account for individuals with more than one event. We tested the robustness of this method by pooling data using 3 alternative methods: meta-analysis of results from the 5 time intervals,³⁰ pooled logistic regression with generalized estimating equations,^{30–32} and pooled logistic regression with mixed models.^{33,34} The results were similar and we present only the results from the primary method. Odds ratios were converted to relative risks using published formulas.³⁵ All statistical tests were two-sided, and a *P* value of 0.05 was used to determine statistical significance.

RESULTS

A total of 9759 patients were eligible for this study. The study population and differences in baseline characteristics between individuals with private insurance and those who are uninsured has been described in detail elsewhere.^{15,16} Briefly, the average age of participants was 56.0 years, 51.9% were women, 81.7% were white, and 75.1% had a high school education or greater. At baseline in 1992, 13.6% of participants were uninsured; between 1992 and 2000, 24.8% of participants who completed the entire study were uninsured at the time of at least one interview. Follow-up information on health status was available at 1 or more points between 1992 and 2002 for 9442 (96.7%) participants; 317 (3.3%) participants had no follow-up information because they were permanently lost to follow-up between 1992 and 1994 and were not dead at the end of the study period. Loss to follow-up (other than by death) was higher among English-speaking Hispanics, those without a college education, and those in poor health at baseline (*P* < 0.05 for all).

Mortality From 1992 to 2002

At baseline, 1512 participants (13.6%) were uninsured, representing an estimated 3.2 million Americans. The crude, weighted mortality rate between 1992 and 2002 was 14.8% for those who were uninsured at baseline and 8.4% for those who had private insurance (Table 1; *P* < 0.001). After adjusting for differences in 1992 demographics, socioeconomic status, health behaviors, health status, and chronic

TABLE 1. Mortality Rates and Crude and Adjusted Relative Risks of Death from 1992 to 2002 According to Insurance Coverage in 1992*

	Insurance Coverage in 1992	
	Private	Uninsured
Died, N/N eligible (%)	638/7267 (8.4)	220/1512 (14.8)
Crude relative risk (95% CI)	Ref	1.77 (1.50–2.07)
Adjusted relative risk (95% CI)	Ref	1.35 (1.12–1.62)

*The dependent variable was being deceased by 2002. The independent variables in the multivariate model included participant characteristics in 1992 only, including health insurance coverage, age, gender, race/ethnicity, income, education, self-reported overall health and physical difficulties, chronic conditions, current and past tobacco use, current alcohol use and history suggestive of alcohol abuse, and obesity.

Ref indicates reference.

diseases, the adjusted relative risk of death was 1.35 (95% confidence interval [CI] 1.12–1.62) for the uninsured compared with individuals who were privately insured at baseline in 1992. The results were almost identical when we analyzed the relationship between insurance coverage in 1994 and mortality from 1994 to 2002 (adjusted relative risk 1.34; 95% CI 1.10–1.62).

Mortality Over 2-Year Intervals

In contrast to the aforementioned results for 10-year mortality, individuals who were uninsured at the start of each 2-year interval did not have higher mortality compared with individuals who were privately insured, with the exception of 1992 to 1994 (Table 2). The pooled analysis of all of the 2-year intervals showed an adjusted relative risk of death of 0.96 (95% CI 0.73–1.27) for individuals who were uninsured at the start of each two-year period compared with individuals who were privately insured (Table 2).

Major Decline in Self-Reported Overall Health Over 2-Year Intervals

Individuals who were uninsured at the start of a 2-year interval tended to have a higher risk of a major decline in overall health compared with participants with private insurance at the start of each interval (Table 3). The adjusted relative risk of a major decline in overall health for the uninsured compared with the privately insured ranged from

TABLE 2. Two-Year Mortality Rates and Adjusted Relative Risks (ARR) of Death According to Insurance Coverage at the Start of Each Two-Year Interval

	Insurance Coverage at Start of Interval	
	Private	Uninsured
1992–1994*		
Died, N/N eligible (%)	82/6747 (1.1)	30/1347 (2.4)
ARR of death (95% CI)†	Ref	1.53 (0.89–2.60)
1994–1996		
Died, N/N eligible (%)	108/6374 (1.6)	25/990 (2.2)
ARR of death (95% CI)†	Ref	0.75 (0.44–1.26)
1996–1998		
Died, N/N eligible (%)	92/5779 (1.6)	21/864 (2.2)
ARR of death (95% CI)†	Ref	0.91 (0.50–1.62)
1998–2000		
Died, N/N eligible (%)	89/5071 (1.8)	17/654 (2.6)
ARR of death (95% CI)†	Ref	1.01 (0.50–2.00)
2000–2002		
Died, N/N eligible (%)	94/4418 (2.1)	9/458 (2.2)
ARR of death (95% CI)†	Ref	0.74 (0.33–1.64)
Pooled analysis		
ARR of death (95% CI)†	Ref	0.96 (0.73–1.27)

*Of the 9759 age-eligible participants in 1992, 109 (1.1%) did not provide information on their insurance coverage and are not shown.

†Adjusted for participant characteristics at the start of each interval (eg, 1992 characteristics for the interval 1992–1994), including health insurance coverage, age, gender, race/ethnicity, income, education, self-reported overall health and physical difficulties, chronic conditions, current and past tobacco use, current alcohol use and history suggestive of alcohol abuse, and obesity.

TABLE 3. Two-Year Incidences and Adjusted Relative Risks (ARR) of a Major Decline in Self-Reported Overall Health According to Insurance Coverage at the Start of Each Two-Year Interval

	Insurance Coverage at Start of Interval	
	Private	Uninsured
1992–1994*		
Major decline, N/N eligible (%)	506/6411 (7.2)	230/1176 (17.1)
ARR of major decline (95% CI) [†]	Ref	1.55 (1.22–1.96)
1994–1996		
Major decline, N/N eligible (%)	480/6049 (7.4)	135/845 (16.1)
ARR of major decline (95% CI) [†]	Ref	1.55 (1.21–1.98)
1996–1998		
Major Decline, N/N eligible (%)	641/5507 (10.9)	157/755 (20.3)
ARR of major decline (95% CI) [†]	Ref	1.25 (0.97–1.59)
1998–2000		
Major decline, N/N eligible (%)	362/4772 (7.1)	102/565 (14.8)
ARR of major decline (95% CI) [†]	Ref	1.48 (1.15–1.88)
2000–2002		
Major decline, N/N eligible (%)	408/4172 (9.1)	62/400 (12.8)
ARR of major decline (95% CI) [†]	Ref	0.92 (0.66–1.29)
Pooled analysis		
ARR of major decline (95% CI) [†]	Ref	1.43 (1.28–1.63)

*Of the 9759 age-eligible participants in 1992, 109 (1.1%) did not provide information on their insurance coverage and are not shown.

[†]Adjusted for participant characteristics at the start of each interval (eg 1992 characteristics for the interval 1992–94), including health insurance coverage, age, sex, race/ethnicity, income, education, self-reported overall health and physical difficulties, chronic conditions, current and past tobacco use, current alcohol use and history suggestive of alcohol abuse, and obesity.

0.92 (95% CI 0.66–1.29) for the interval from 2000 to 2002 to 1.55 (95% CI 1.21–1.98) for the interval from 1994 to 1996 (Table 3). The pooled adjusted relative risk of a major decline in overall health for the uninsured over all of the 2-year intervals combined was 1.43 (95% CI 1.28–1.63).

Changes in Overall Health and Subsequent Risk of Death

The aforementioned analyses suggest that the higher 10-year mortality rate for the uninsured results from their higher rate of decline in overall health and not from a higher short-term mortality rate because of being uninsured. Because this chain of events leading from a decline in overall health to death may take place over several years, someone who is uninsured at the time of a major decline in overall health may gain private or public insurance prior to death, obscuring the association between lack of insurance and higher mortality rates. To explore this, we examined insurance coverage at the HRS interview immediately preceding death for the 220 HRS participants who were uninsured at baseline (1992) and who died during the 10-year follow up (Fig. 1). Only 70 (31.8%) of these participants died during a period when they were uninsured; 101 (45.9%) died during a period when they had public insurance, and 49 (22.3%) died during a period when the participant had private insurance or unknown insurance coverage.

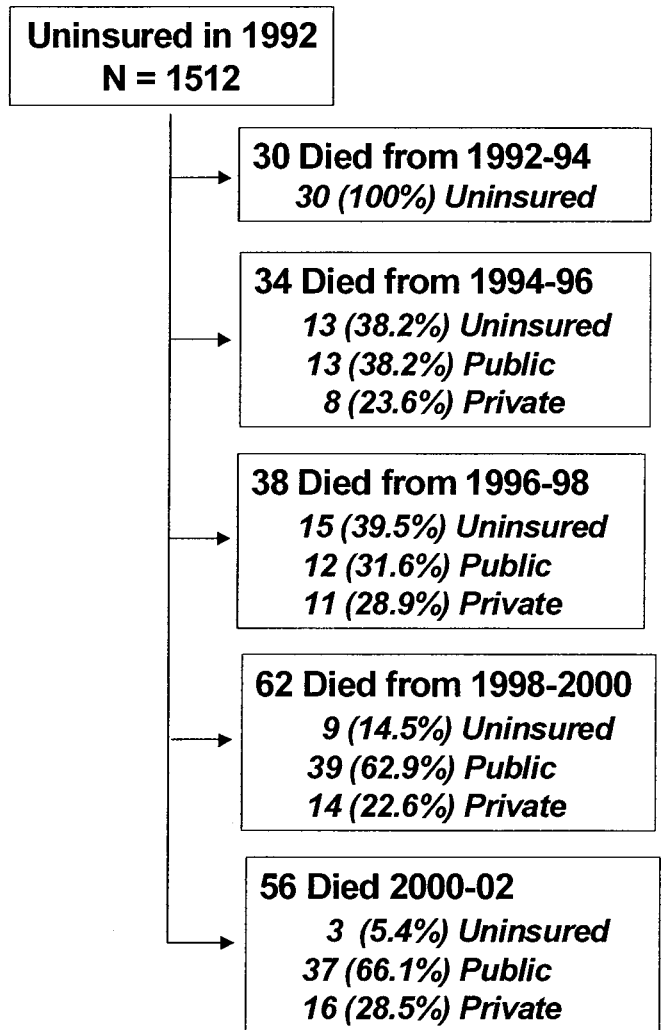


FIGURE 1. Timing of deaths and insurance coverage immediately prior to death among participants who were uninsured in 1992 (n = 1512).

DISCUSSION

Between 1992 and 2002, individuals who were uninsured at baseline had a 35% higher adjusted mortality rate. Our findings are consistent with a previous study that used a different methodology to analyze data from the HRS (ie, a propensity-score method to adjust for the likelihood of being uninsured) and found that the uninsured had a 43% higher adjusted mortality rate from 1992 to 2000.¹⁴ Our estimate is also similar to that of Franks and colleagues, who reported the uninsured had a 25% higher adjusted mortality rate over the 10-year follow-up period compared with individuals with private health insurance,¹² and from Sorlie and colleagues, who reported a 20% higher mortality rate for uninsured white men and a 50% higher mortality for white women compared with insured whites.¹³

These previous studies used only baseline health insurance coverage in their multivariate mortality models. They did not examine changes in insurance coverage over time, changes in health status, and the relationship of these to the

risk of death. To accomplish this, we analyzed the relationship between insurance coverage and health outcomes over the course of 5 discrete 2-year intervals between HRS interviews. Our results suggest that, in the short term (ie, the 2-year intervals between interview), there is no association between lack of health insurance and a higher risk of death. However, these short-term analyses revealed that lack of health insurance was consistently associated with a higher risk of a decline in self-reported overall health. Because worse self-reported overall health is a powerful predictor of future death,^{36,37} our findings suggest that the higher risk-adjusted mortality among the uninsured in this study and others results from the adverse effects of uninsurance on overall health. This slow, stepwise path linking uninsurance and death is important to recognize because it means that many of the uninsured will have time to transition to public insurance prior to their death, with taxpayers picking up the cost of care for the previously uninsured. Among the participants who were uninsured at baseline who died during follow-up ($n = 220$), almost half died at a time when they had gained public insurance coverage, and one quarter died after gaining private insurance. As expected, transitions onto Medicare were particularly common among this study population of the near-elderly. This provides further evidence to support the conclusions of the Institute of Medicine that uninsurance has important adverse economic effects for all members of society.³⁸

Our findings suggest that the cost of expanding insurance coverage may be less than previously thought. Hadley and Holahan³⁹ estimated that it would cost an additional \$48 billion per year to provide universal health insurance coverage in the United States. This figure is based on the cost of increasing health care utilization for the uninsured up to the same level as the insured population, as has been done in previous studies.⁴⁰ However, if universal health insurance coverage improves the health status of the population, it would reduce future health care spending. For example, the average annual health care expenditures in 2001 for someone ages 51 to 61 years was \$12,578 for those in poor health and \$6938 for those in fair health (unpublished data from the 2001 Medical Expenditure Panel Survey). In contrast, the average annual total health care costs were \$3922 for older adults in good health and \$1791 for those in excellent health. Therefore, even modest reductions in the number of uninsured individuals who transition to fair or poor health should yield substantial long-term reductions in healthcare costs that could partially offset the cost of covering the uninsured. Improving the health of the near elderly would also have direct economic benefits. An Institute of Medicine report found that the diminished health and shorter life spans of Americans who lack health insurance are worth \$65–130 billion per year.^{41,42}

Our study has several limitations. A total of 16.6% of participants were lost to follow-up over the course of the 10-year follow-up, and another 8.1% completed follow-up but missed at least 1 HRS interview. If loss to follow-up was related to health decline (ie, people who suffered a major

health problem were more likely to not complete an interview or to drop out completely), this could bias our results. However, health-related loss to follow-up is likely to be more common among individuals with low income and fewer resources available who might be forced to disconnect their phone or move if a catastrophic health problem occurred. Such differential loss to follow-up would likely lead us to underestimate the association between uninsurance and the risk of a major decline in health. In addition, our estimate of the independent effect of lack of health insurance on health outcomes relied on multivariate models, so it is possible that the observed association was actually due to an unmeasured characteristic that was much more common among the uninsured and was the true cause of their worse health outcomes. However, previous instrumental variable analyses designed to adjust for unmeasured confounders suggest that the true independent effect of uninsurance on health is likely to be even larger than that estimated from standard multivariate models.^{43,44}

Another limitation is that the HRS did not validate that individuals were uninsured until 1996, at which time they began asking respondents who reported neither private or public insurance whether they were truly uninsured. Between 7% and 11% of participants in the 1996, 1998, and 2000 HRS were reclassified as having some form of insurance as a result of the validation question. Therefore, we estimate that approximately 9% of the people we classified as being uninsured in 1992 and 1994 actually had some form of insurance. This would lead to a spuriously low adjusted relative risk of death and decline in overall health for the uninsured because misclassified individuals are not actually at risk from being uninsured. In addition, misclassification would lead to a spuriously high rate of gaining health insurance coverage over time because these individuals would presumably be correctly classified as having insurance coverage during later HRS interviews. However, because of the low rate of misclassification and the fact that misclassification occurred for only 2 of the 5 HRS interviews analyzed, these effects are likely to be small.

Our finding that many of the uninsured transition to public insurance prior to their death should increase the attractiveness of expanding health insurance coverage for near-elderly individuals.^{20,45–47} The situation appears to be one of “Pay me now or pay me later”: pay for expanded coverage of the near elderly or pay higher costs later when people enter Medicaid or Medicare coverage in worse health than they would have been. Hadley and Waidmann⁴⁴ estimated that Medicare and Medicaid would spend approximately \$19 billion less on care for newly enrolled aged beneficiaries over their first 5 years of coverage if they were continuously insured over the 8 years prior to entering Medicare, even after accounting for the fact that more of the uninsured would live to reach Medicare. Our results suggest that the health benefits of expanding coverage for the near elderly may be greater than previously thought, and the subsequent reductions in Medicare spending are likely larger than previous estimates.

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