Why are Recessions Good for your Health?

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by Doug Miller, Marianne E. Page, Ann Stevens and Mateusz Filipski

Introduction

A series of influential papers by Christopher Ruhm (2000, 2003, 2005) documents that recessions are "good for your health" – or more specifically, that state-level mortality rates are strongly procyclical. The magnitude of the correlation is economically meaningful: a typical estimate from the literature suggests that a one percentage point increase in a state's unemployment rate is associated with a 0.54% *reduction* in that state's mortality rates. If this reflects a causal relationship that is also valid at the national level, then a one percentage point increase in the unemployment rate would translate (based on 2004 mortality rates) into about 12,000 fewer deaths per year. These findings are frequently interpreted as resulting from the rising opportunity cost of time that accompanies better labor market opportunities, and some empirical support exists for this interpretation. For example, Ruhm (2000) shows that obesity and smoking also exhibit a pro-cyclical pattern, and that diet and exercise improve when the unemployment rate rises—patterns that are consistent with changes in the value of time associated with working. On the other hand, research linking individual job displacements to individuals' own mortality find that individuals who experience a job loss have higher probabilities of dying (Sullivan and von Wachter, 2007). These results would be at odds with those based on state-level analyses unless the increase in state level mortality rates that corresponds to improvements in the economy is driven by factors other than changes in individuals' own labor supply and health behaviors.

The purpose of this study is to advance our understanding of the mechanisms that are most likely to contribute to the pro-cyclical relationship between macroeconomic conditions and mortality rates. In particular, we aim to distinguish between health changes resulting from changes in an individual's own work and health behaviors and health changes that are related to "externalities" associated with the business cycle. While some of these possibilities have been explored in Ruhm's earlier work, we bring additional light to bear on the question by focusing on more detailed mortality rate decompositions by age, sex, race and cause of death and by investigating the relationship between a particular demographic group's mortality and the unemployment rate of that group relative to the unemployment rates of other demographic groups.

Data and Methodology

Our basic regression equation follows Ruhm (2000) and takes the following form:

(1)

where H is the natural log of the mortality rate in state j and year t, X is a vector of state-year demographic controls, α_t is a vector of year fixed effects, and S_j controls for time-invariant state characteristics. State-specific time trends, S_jT , are also included. The main indicator of a state's economic health, *U*, is the state unemployment rate. We have replicated Ruhm's (2000) analysis, which is based on data from 1972-1991, and then build on his work by utilizing several additional sources of data and extending the analysis through 2004. In order to get a consistent measure of the unemployment rate over time, most of our analyses begin with 1978. Our basic model incorporates mortality data from CDC Multiple Cause of Death Data, and population denominator data from NHIS Cancer-SEER. We also use the Cancer-SEER data to create control variables for fraction of the population aged 0-4, 5-17, 18-30, and 65+, and for the fraction black. Monthly CPS data is used to create measures of the state's Hispanic population and education. Our regressions are weighted by population, and we cluster our standard errors at the state level. Finally, we estimate most of our models using a Poisson count data model because when we analyze subgroups we sometimes have cells with zero mortality counts. Taken as a whole, these extensions/changes have a very limited impact on the estimated association between macroeconomic conditions and health. Our preferred specification suggests that a one percentage point increase in the unemployment rate leads to a 0.43 decrease in the mortality rate, compared to Ruhm's estimate of 0.54.

Decompositions by Age and Cause

Next, we begin to investigate the relative importance of "own" vs. "other" factors by estimating the Poisson analogue to equation (1) separately by single year of age. Figure 1 shows the estimated coefficients on the unemployment rate and their associated confidence intervals for each age. Echoing Ruhm's earlier work, we find that young adults have the most cyclical mortality rates. However, the figure also makes three additional points. First, perhaps because we use more recent years of data, the typical semi-elasticity in the 20-44 year old age range is much less than 2 percent (Ruhm's previous estimate). Second, the strong pro-cyclical pattern among young adults is mostly driven by those at the younger end of the 20 to 44 year old age range. Indeed, those aged 35-44 have, on average, positive coefficient estimates. Finally, the larger magnitude of the cyclicality among young adults extends to children as well. Since children are unlikely to be working, this finding suggests that the large coefficient estimates among young adults may result from something beyond the direct effect of their own employment experiences. Our estimates also confirm Ruhm's finding that the elasticity of the mortality rate with respect to the unemployment rate is lower (in absolute value) among those most likely to be retired. Among those older than 60, the estimated coefficient on the unemployment rate is negative but generally much smaller than the estimates for younger age groups.

FIGURE 1 HERE

Table 1 shows the weighted averages of the age-specific coefficient estimates from Figure 1 for each of 11 age groups, where we weight by the total number of deaths in each age cell. We also show the total number of deaths in each age group in 2004, and the total increase in deaths that would be predicted from a one percent increase in the unemployment rate. As suggested by Figure 1, the largest coefficient estimates are for those age groups that are unlikely to be working. The average coefficient estimate for those under age 15 is -0.015, but drops to -0.005 or less during the prime working ages of 35-65. The coefficient estimates increase slightly for those over age 65, another group that has limited labor force participation.

TABLE 1 HERE

The relationship between the age-specific coefficient estimates and changes in the overall mortality rate depends on the number of deaths in each age group. Even though the coefficient estimates are largest among the young, they may not contribute much to overall mortality fluctuations because deaths among children and adolescents are rare. To explore this issue further, we utilize the estimates from Figure 1, along with 2004 mortality data, to answer the question of how many “pro-cyclical deaths” there are for each year of age. We do so by multiplying the estimated semi-elasticity for each year of age by the number of 2004 deaths for that age. We then aggregate these numbers for various age groups to assess the relative importance of each group in explaining aggregate mortality fluctuations; these results are shown in column 2 of Table 1.

The top line of Table 1 shows that there were 2,397,269 deaths in the United States in 2004. The overall average semi-elasticity is -0.0047, and we estimate that a 1 percent rise in the unemployment rate would lead to approximately 12,000 additional deaths in the population. The bulk of those additional deaths, however, would occur among those with relatively weak labor force attachment: only 7% of the additional deaths from an increase in the unemployment rate would occur among those between the ages of 25 and 64. In contrast, 71% of the additional deaths are predicted to occur to those over age 80. The fact that the vast majority of deaths occur among those unlikely to be working suggests that individuals' own labor market involvement is not the key mechanism behind pro-cyclical fluctuations in the overall mortality rate. While work, leisure, and health behaviors over the business cycle may play some role in generating pro-cyclical mortality, the concentration of most of these "cyclical" deaths outside of typical working ages suggests that other factors, perhaps reflecting business cycle externalities, must also be very important.

Another clue to the mechanisms driving pro-cyclical mortality comes from disaggregating the relationship according to the cause of death. Table 2 shows the results of estimating equation (1) separately by cause of death. Like Ruhm, we find that the largest estimated coefficient, by far, is that for motor vehicle accidents, (the weighted average estimate is -0.029). Focusing on the number of additional deaths generated by a reduction in the unemployment rate, cardiovascular causes make up the largest category, with more than 4000 additional deaths, or more than one-third of total deaths. The large coefficient on motor vehicle accidents is consistent with mechanisms other than individual work or leisure choices playing a prominent role in overall pro-cyclicality. In contrast, (as has been emphasized in earlier work by Ruhm) the fact that more than one-third of the cyclically induced deaths are due to cardiovascular factors could point towards work-related stress or other time allocation choices as a key part of the story.

TABLES 2 and 3 HERE

Looking more closely at the distribution of cardiovascular deaths, however, casts doubt on the role of individual work and health behaviors for overall cyclicality. Specifically, we have estimated equation 1 by age and cause of death. In Table 3, we summarize the number of predicted deaths for each of the top six causes of death (from Table 2) by age group and cause. Note that among prime working-age individuals only a trivial number of cardiovascular deaths are induced by business cycle changes. The age-specific pattern of cardiac deaths does not support the notion that such deaths result from work-related stress, or from substitution between work and health-related behaviors: 96% of the additional cardiac deaths that are related to the business cycle occur among those over age 65.

Tables 2 and 3 provide additional hints as to which mechanisms may be most important among working-age adults. Among this group, motor vehicle accidents account for the bulk of the cyclicality in mortality. This could reflect either changes in individual behavior, or externalities associated with increased economic activity (there are likely to be more cars on the road). However, the fact that the estimated coefficient on motor vehicle accidents is of similar magnitude across age groups points to the latter explanation. The other major contributor to cyclical deaths among working age individuals is the category of “other.” Future work will investigate more fully the nature of this residual category, which accounts for a relatively large number of additional deaths (approximately 1300) among working age individuals.

Direct estimation of “own” and “other” effects

We continue to investigate the relative importance of "own" vs. "other" behaviors by estimating equation (1) for specific demographic subgroups, and adding to each regression the subgroup's own unemployment rate along with the state average. If most of the changes in the mortality rate are driven by changes in individuals' "own" behaviors, then we would expect the estimated coefficient on the group unemployment rate to be large and negative relative to the estimated coefficient on the state average. This exercise is similar in spirit to that undertaken by Miller and Paxson (2006), who focus on cross-sectional and (1980-1990) decadal-change variation.

Table 4 shows the results of this exercise for subgroups defined by 5 year age windows. Each column corresponds to a regression in which the age-adjusted mortality rate for that age group is regressed on all of the controls included in the previous tables, along with measures of the business cycle defined for both the group itself and the overall labor market. Most of the estimated coefficients on own-group unemployment rates are in the opposite direction from what one would predict if the pro-cyclical mortality pattern were generated by individuals taking on less healthy behaviors and none of the estimated coefficients are both in the expected direction and statistically different from zero. While the lack of statistical significance of many of the own group coefficients could be due to measurement error, this would not explain the change in signs, or the positive and significant coefficients for certain age groups. In contrast, all of the coefficient estimates on the overall state average continue to be negative, and many are statistically significant. The estimated effects of the overall unemployment rate are particularly strong among the elderly, who have relatively weak labor force attachment. Because unemployment rates may not be the best measure of labor market activity for the elderly, we have repeated this exercise using employment-to-population ratios to capture the business cycle, and get qualitatively similar results.

Conclusion

This paper begins to explore mechanisms behind the pro-cyclical mortality pattern that is observed in the United States. Two conclusions emerge that should guide future work in this area. First, it seems unlikely that changes in individuals' own labor force status, work, or health behaviors are the key determinants of aggregate mortality changes across the business cycle: the primary causes of death contributing to mortality fluctuations among working-age adults are not typically associated with stress levels or health behaviors. Cyclical changes in mortality among working-age individuals stem mostly from additional motor vehicle accidents. Second, decompositions by age (and by cause and age) make clear that understanding pro-cyclical mortality requires understanding mortality patterns among the elderly. Among the elderly, own work behavior seems less likely to be an important mechanism. Other factors, including pollution changes and changes in the quality, quantity and nature of health care inputs over the business cycle, form an important target for future research.

[dlm needs to make (or ask Jed to make) a journal-friendly format for Figure 1. This can wait till later.]

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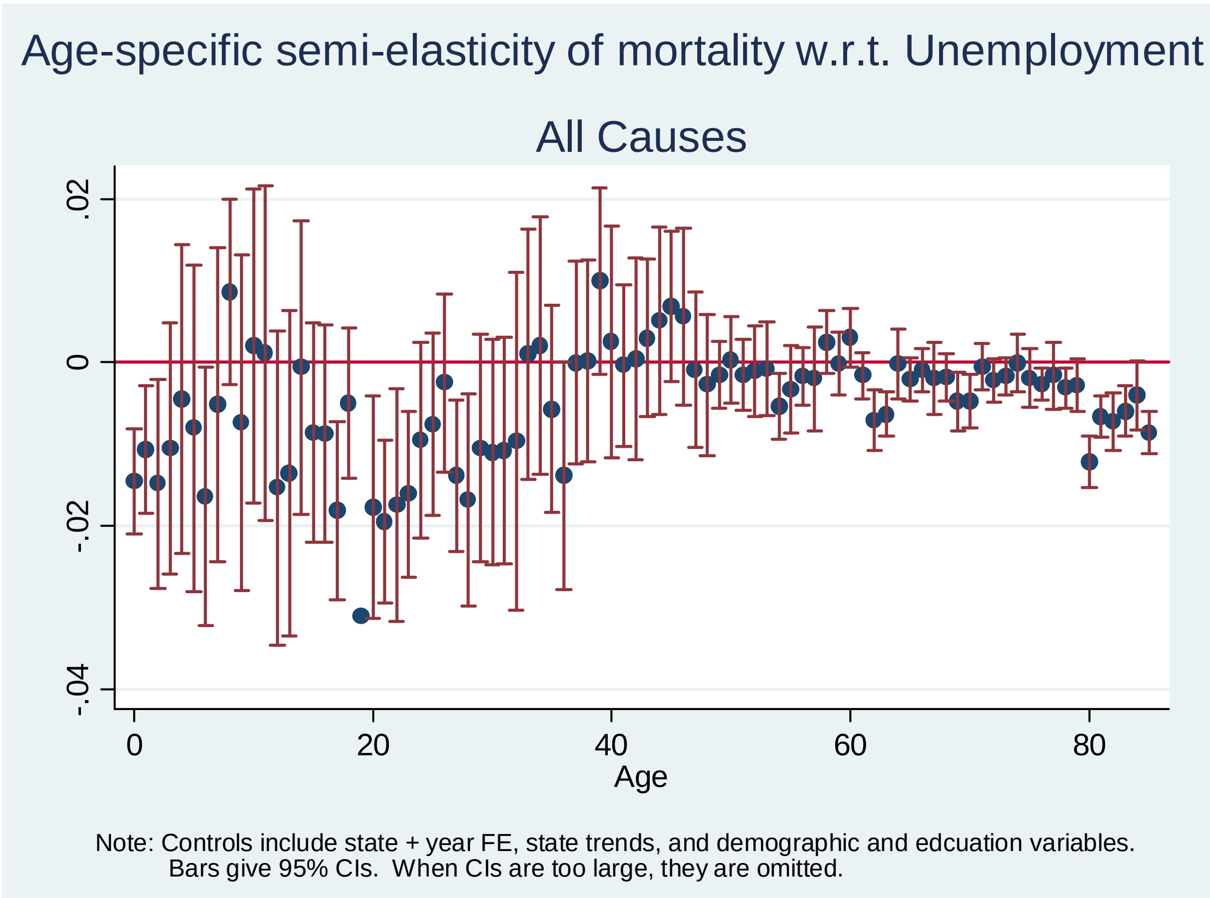
Figure 1



Age-specific semi-elasticity of mortality w.r.t. Unemployment
All Causes
.02
0
-.02
-.04
0
20
40
60
80
Age
Note: Controls include state + year FE, state trends, and demographic and edcuation variables.
Bars give 95% CIs. When CIs are too large, they are omitted.

Table 1
Estimated Relationship between Unemployment and Age-Specific Mortality - All Causes

	All		
Age	Beta	Predicted Additional Deaths	Total Deaths 2004
0-85	-0.0047	-11803	2397269
0-0	-0.0146	-407	27936
1-17	-0.0095	-173	18068
18-24	-0.0167	-451	26972
25-34	-0.0076	-300	40868
35-44	0.0006	92	85362
45-54	-0.0005	-87	177697
55-64	-0.0018	-476	264697
65-69	-0.0024	-407	171984
70-74	-0.0018	-392	227682
75-79	-0.0024	-761	310746
80-84	-0.0072	-2668	373484
85-85	-0.0086	-5773	671773

(Note that Ruhm's (2000) age groups are 20-44, 45-64, 65+)

Table 2
Estimated Relationship between Unemployment and Cause-Specific Mortality

Cause of Death	Beta	Predicted Additional Deaths	Total Deaths 2004
All Causes	-0.0047	-11803	2397615
Cardiovascular	-0.0047	-4260	865863
Cancer	0.0019	1019	567468
Respiratory	-0.0118	-2771	229076
Infections	-0.02	-1453	78531
Degenerative Brain	-0.0166	-2686	148397
Kidney	-0.0153	-683	43244
Motor Vehicle Accidents	-0.0294	-1285	44933
Other Accidents	-0.0103	-603	67079
Suicide	0.0168	641	32439
Homicide	-0.0162	-290	17729
VS other	-0.0138	-1587	120365
Ntrn, Birth Defects, Gastro.	-0.0046	-832	182491
All non-Motor Vehicle Accident	-0.0043	-10755	2352682

Table 3
Estimated Relationship between Unemployment and Mortality by Cause of Death and Age
Predicted Additional Deaths from a 1 percentage point increase in the unemployment rate

Age	Cardiovascular	Respiratory	Infections	Deg. Brain	Motor Vehicle	VS Other	Nutrition, Birth Def, Gstro.
0-85	-4260	-2771	-1453	-2686	-1285	-1587	-832
0-0	-3	-16	-25	5	-6	-190	-123
1-17	6	-4	0	0	-92	-50	-25
18-24	3	-5	-2	1	-298	-88	-4
25-34	-4	-17	-67	2	-252	-171	-47
35-44	11	-4	-156	-9	-217	-456	-65
45-54	-9	-111	-183	-27	-177	-587	-76
55-64	-177	-205	-18	-54	-85	-48	-194
65-69	-197	-150	-35	16	-52	64	24
70-74	-246	-216	-37	-64	-32	54	15
75-79	-409	-274	-144	-161	-40	97	-14
80-84	-1087	-495	-281	-362	-29	4	-95
85	-2147	-1276	-506	-2032	-6	-216	-229

TABLE 4

Dependent Variable: Log of Age-adjusted Death Rate Per 100,000

Subsample	25_29	30_34	35_39	40_44	45_49	50_54	55_59
	(7)	(8)	(9)	(10)	(11)	(12)	(13)
group urate	0.0039	0.0006	-0.0010	0.0081**	0.0029*	-0.0016	0.0019**
	(0.0041)	(0.0050)	(0.0049)	(0.0038)	(0.0016)	(0.0014)	(0.0008)
state urate	-0.0147**	-0.0058	-0.0008	-0.0040	-0.0011	-0.0010	-0.0022
	(0.0070)	(0.0090)	(0.0083)	(0.0060)	(0.0035)	(0.0020)	(0.0016)

Subsample	60_64	65_69	70_74	75_79	80_84	85+
	(14)	(15)	(16)	(17)	(18)	(19)
group urate	-0.0008	0.0000	-0.0002	0.0004**	-0.0001	0.0001
	(0.0006)	(0.0005)	(0.0002)	(0.0002)	(0.0001)	(0.0001)
state urate	-0.0020*	-0.0024***	-0.0017*	-0.0024***	-0.0072***	-0.0084***
	(0.0012)	(0.0009)	(0.0009)	(0.0008)	(0.0009)	(0.0013)