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THE LABOR FORCE PARTICIPATION OF OLDER AMERICANS IN 1900: FURTHER RESULTS

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ABSTRACT

Data from the public use sample of the 1900 census are used to study the proper labor force classification of older male Americans experiencing 6 months or more of unemployment in the previous year ("long-term unemployed"). In terms of their personal characteristics, the long-term unemployed were similar in many respects to persons with a gainful occupation. Because the probability of re-employment, conditional on unemployment, appears to have declined with age, the probability of experiencing long-term unemployment rose as persons aged. Census data are consistent with the view that the older an individual was upon entering the status of long-term unemployment, the greater the likelihood the person would leave the labor force in a short period of time. I conclude, however, that this is insufficient reason to exclude the long-term unemployed from the count of gainful workers in 1900, as has recently been advocated.

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1.0 Introduction

The conventional view of the history of retirement in the United States is that the labor force participation rate of elderly males (ages 60 and over) was relatively high in the late nineteenth century by comparison with the post-World War Two period. Recent work by Ransom and Sutch (1986), however, suggests that the "gainful worker" definition of the labor force -- the only one that can be applied to pre-1940 census data -- may substantially understate the extent of retirement around 1900.[1] Critical to Ransom and Sutch's argument is their exclusion of the "long-term unemployed" (those reporting 6 or more months of unemployment) from the count of gainful workers in 1900.[2] Moen (1987, p. 764; see also Rotondo 1989) has challenged this particular revision, arguing there is no basis in the instructions to census enumerators for excluding the long-term unemployed and that, in any case, the Census Bureau could not (and did not) systematically use unemployment data for this purpose (for a reply to Moen, see Ransom and Sutch 1989).

This paper extends previous historical work on retirement by considering the labor force classification of the long-term unemployed from the standpoint of their personal characteristics. Using data from the public use sample of the 1900 census (Center for Studies in Demography and Ecology 1980), I demonstrate that the long-term unemployed were similar, in many respects, to persons in the labor force. Because the probability of becoming

re-employed, conditional on unemployment, appears to have declined with age, while the probability of becoming unemployed increased with age, the probability of long-term unemployment rose as persons aged. Census data are consistent with the view that the older an individual was upon entering the status of long-term unemployment, the greater the likelihood the person would retire in a relatively short period of time. For many older Americans at the turn of the century, long-term unemployment appears to have been a prelude to retirement. I conclude, however, that this is no reason to exclude the long-term unemployed from the gainful worker count.

2.0 The Characteristics of the Long-term Unemployed

Ransom and Sutch (1986, p. 11) excluded the long-term unemployed from the labor force in 1900 on the grounds that such persons were unlikely to be engaged in "productive" employment which, they argue, was implicit in the instructions to census enumerators for the recording of a gainful occupation.[3] One implication is that the long-term unemployed and those out of the labor force ought to be "look-alikes" -- statistically indistinguishable from each other, or at least not distinguishable in ways that suggest that the long-term unemployed were similar to persons acknowledged to be in the labor force.[4]

Table 1 reports the results of two logit regressions. In the

first regression, the dependent variable takes the value 1 if the individual reported 6 or more months of unemployment, 0 otherwise. The sample, drawn from the public use tape of the 1900 census, consists of males ages 60 and over who either did not report a gainful occupation (were out of the labor force) or were long-term unemployed, as designated by Ransom and Sutch. The independent variables were constructed from those available on the 1900 census tape.

In certain dimensions -- region, marital status, household size, and homeownership -- the long-term unemployed were statistically indistinguishable from persons out of the labor force. The same cannot be said, however, for race, age, relationship to the household head, residence on a farm or in an unrban area. Blacks, persons between the ages of 60 and 64, heads of households, farm or urban residents were more likely to be permanently unemployed than out of the labor force.[5]

In the second regression, the sample consists of males ages 60 and over either (1) out of the labor force or (2) in the labor force as indicated by a gainful occupation. The long-term unemployed are excluded. The dependent variable takes the value 1 if the person was in the labor force (reported a gainful occupation), 0 otherwise. The quantitative significance of Ransom and Sutch's adjustment is revealed upon comparing the participation rate for this sample with a sample including the long-term unemployed and counting them as out of the labor force. If the long-term unemployed are excluded from the sample, the

participation rate is 73.2 percent. If the long-term unemployed are included but counted out of the labor force, the participation rate is 66.9 percent.

Labor force participation among elderly males was a function of race, age, household structure, education, farm residence, and location.[6] Compared with whites, black men (and other racial minorities, primarily Asians) were more likely to report a gainful occupation, but there was no difference in participation between foreign and native-born. Participation was less likely among persons aged 65 to 69 than persons aged 60 to 64, and fell off sharply after age 70. Literacy and household headship were positively associated with participation, while ownership of a home was negatively associated, presumably a wealth effect. Compared with the Northeast, participation rates were lower in the Midwest but higher in the South. Farm and urban residents were more likely to hold a gainful occupation than nonfarm or rural residents.

Comparison across the two regressions suggests that, in many respects -- but by no means all -- the long-term unemployed were similar to elderly persons in the labor force.[7] Moen (1987, p. 764; see also Rotondo 1989, pp. 12-13) suggested that long-term unemployment might have been a consequence of seasonality in the demand for labor in certain occupations. To test Moen's hypothesis, Table 2 reports a logit regression of long-term unemployment; the sample consists of all males ages 40 and over reporting a gainful occupation. The results confirm Moen's

argument. Compared with agriculture (the left-out occupational category), long-term unemployment was more prevalent among unskilled laborers, the building trades, and to a lesser extent, in manufacturing, trade, and transportation. But it is also clear that the probability of long-term unemployment rose with age, after controlling for occupation.[8] The greater prevalence of long-term unemployment among older Americans cannot be explained by disproportionate participation in seasonally-sensitive occupations.

3.0 Age, Unemployment, and "Retirement"

The previous section documented that the chances of long-term unemployment increased with age, especially as a person entered their late fifties and early sixties. This section develops a simple procedure for inferring from turn-of-the-century census data estimates of conditional probabilities of entering and leaving unemployment (<u>hazard</u> rates).[9] The results show that the increased probability of long-term unemployment was primarily the consequence of a decline in probability of re-employment as persons aged and, to a lesser extent, an increase in the probability of becoming unemployed.

The 1900 census reported the number of months of unemployment experienced in the year prior to the census date (June 1, 1899 to May 31, 1900). Let F = fraction of persons experiencing <u>some</u> unemployment in the previous year, u(0) = the

unemployment rate at the start of the year prior to the census date, and P = probability that an employed worker at the start of the year would become unemployed during the year. By definition:

$$F = u(0) + (1-u(0))P \qquad [1]$$

Following Keyssar (1986, p. 357) I assume (1) two labor force states, employment and unemployment (2) the labor force was constant in size over the year (3) the labor market was in steady-state equilibrium.[10] I also assume that the hazard rates (from employment to unemployment, and vice versa) were time invariant constants.[11] It follows that:

$$P = 1 - \exp(-\beta) \qquad [2]$$

$$u(0) = u = \beta/(\beta+\delta) \qquad [3]$$

where β = cumulative annual entry hazard from employment to unemployment, δ = cumulative annual exit hazard from unemployment to employment, and u = steady state unemployment rate. Although the steady-state unemployment is not given by the census, it can be estimated from information on F and on the average number of months of unemployment, conditional on experiencing unemployment (see Keyssar 1986, p. 357)[12]:

$$u = mF/12 \qquad [4]$$

The average monthly entry and exit hazards are $\beta/12$ and $\delta/12$.

Figures 1 and 2, respectively, show estimates of the monthly entry and exit hazards using the above method, for single years of age between ages 25 and 65.[13] The entry hazard declined slightly with age, increasing when a person entered his late fifties. The exit hazard also declined with age (after age 40) but in a more pronounced fashion, especially after age 57.[14]

Even under the simple assumptions made above, the probability of long-term unemployment is an extremely complicated function of β and δ, and it cannot be evaluated analytically. Numerical techniques, however, can be used to illustrate the sensitivity of the probability to the values of the entry and exit hazards (see the appendix). Table 3 shows the estimated probability of long-term unemployment for ages 51 to 65, using the values of β and δ in Figures 1 and 2. If so asked by the census, between 6 and 10 percent of the labor force in this age group should have reported six or months of unemployment in the previous year, depending on the estimated entry and exit hazards (which vary with age). The estimated probability rose as persons entered their late fifties, and was generally higher thereafter than in the early fifties. It is also worth noting that, while small in absolute value, the estimated probability is a substantial percentage of F, the fraction all persons experiencing unemployment (F). For example, using the estimated hazard rates in Table 3 and equations [1]-[3], the predicted value of F is 0.138 at age 51. Thus the long-term unemployed are

predicted to account for 42 percent (= 0.058/0.138) of all persons experiencing unemployment. At age 63, 49 percent of the predicted value of F (0.193) is accounted for by the long-term unemployed.[15]

To illustrate the sensitivity of the probability of long-term unemployment to the exit hazard, it is useful to compare the estimates for age 55 and age 63. The entry hazards were the same for both ages (0.0086) but the exit hazard at age 63 (0.073) was slightly more than half (56 percent) of the exit hazard at age 55 (0.1301). The reduction in the exit hazard caused the estimated probability of long-term unemployment to increase by 51 percent between ages 55 and 63 (= 0.095/0.063 - 1). The elasticity of the probability of long-term unemployment with respect to the exit hazard is -0.9 (= -0.51/0.56).

To illustrate the sensitivity of the probability to the entry hazard, it is useful to compare the estimates for ages 58 and 60. The exit hazards were approximately the same for both ages but the entry hazard at age 60 was 19 percent (= 0.0126/0.0106 - 1) higher than at age 58. The increase in the entry hazard caused the probability of long-term unemployment to increase by 16 percent between ages 58 and 60 (= 0.101/0.087-1). The elasticity of the probability with respect to the entry hazard is 0.84 (= 0.16/0.19).

Thus the increase in the probability of long-term unemployment as persons aged was the consequence of a rising probability of entering unemployment and a decreasing probability

of escaping unemployment. Because the increase in the entry hazard was concentrated in a short age span (ages 58 to 61) while the decline in the exit hazard was more continuous, it is the decline in the exit hazard that is primarily responsible for the increased incidence of long-term unemployment among older Americans.

If a person entered long-term unemployment in middle age, say age 40, permanent withdrawal from the labor force (retirement) was generally not a feasible or socially acceptable option. Retirement became more feasible over age 65 and, given the concurrent decline in the probability of re-employment (the exit hazard), a more probable path out of unemployment than re-employment. The hypothesis, then, is that long-term unemployment hastened the likelihood of retirement as persons aged.

Remarkably, it is possible to test this hypothesis using the 1900 census sample. Enumerators were instructed to collect information on unemployment in the previous year for "each person having a gainful occupation" but ambiguities in the instructions apparently caused information on unemployment to be recorded with some frequency for persons without a gainful occupation or who reported their occupation as "retired".[16] Table 4 shows the percent listing a gainful occupation for persons aged 55 to 80 reporting six or more months of unemployment, and for all males in this age interval. Among the long-term unemployed the percent gainfully occupied declined with age, as was true among the general population. It is difficult to believe that the

relationship between age and gainful occupation among the long-term unemployed was a consequence of systematic enumerator error.[17] Rather, a more plausible interpretation is that long-term unemployment increased the chances that an elderly person would choose to leave the labor force, sooner rather than later.[18] That is, persons listing "retired" or no occupation but reporting six or more months of unemployment had probably left the labor force very recently.

If long-term unemployment increased the chances of retirement, should the long-term unemployed be counted out of the labor force, or at least distinguished from other gainful workers? If the goal is to identify which persons at a given age were likely to retire in the near future, a case can be made for separately distinguishing the long-term unemployed within the class of gainful workers.[19] But if the goal is to measure the size of the labor force as a basis for long-term comparisons, the standard gainful worker definition is the only consistent way to do so for the majority of census dates prior to 1940 (Moen 1988). Removing the long-term unemployed from the labor force simply makes the 1900 figure noncomparable with those for surrounding census dates, as Moen (1987) emphasizes.

4. Conclusion

This paper has considered the labor force classification of older male Americans in 1900 who experienced six months or more

of unemployment in the year prior to the census. The long-term unemployed were statistically distinguishable from elderly persons out of the labor force. The chances of falling into long-term unemployment increased with age. Long-term unemployment, in turn, enhanced the chances an elderly person would leave the labor force. In this respect, long-term unemployment was no different than any other factor that might have subsequently hastened the retirement of persons reporting a gainful occupation to the census. It is no reason to remove the long-term unemployed from the gainful worker count in 1900.

5.0 Appendix

This appendix describes the calculation of the probability of long-term unemployment (Table 3). Let t = the number of months of unemployment in the previous year. The problem is to determine all possible ways in which t could occur -- that is, the density function, f(t). Under the assumptions of constant hazard rates, Coleman (1989, p. 9) derives f(t):

$$f(t) = e^{-\delta t-\beta(S-t)}\{(\delta\beta/\delta+\beta)\sum_{n=0}[\delta t\beta(S-t)]^n/(n!)^2 + ((\delta\beta^2 t + \delta^2\beta(S-t))/(\delta+\beta)\sum_{n=0}[\delta\beta t(S-t)^n/[n!(n+1)!]\} \quad [5]$$

with mass points $f(0) = (1-u)e^{-\beta S}$ and $f(S) = ue^{-\delta S}$. The term n

is the number of distinct spells of unemployment and n! is n factorial (n! = n x (n-1) x ... 1). In my application, S = 12 (months). The probability an individual experiences between t_1 and t_2 months of unemployment is:

$$P(t_1,t_2) = \int_{t_1}^{t_2} f(x)dx \qquad [6]$$

In theory, the summation terms in f(t) are taken over n from zero to infinity. In practice, however, Coleman (1989, p. 10) reports that f(t) converges rapidly for small n. Even with this simplication, integral [6] cannot be evaluated analytically, and numerical methods must be used. The procedure NINTEGRATE in Mathematica (Wolfram 1991) was used to evaluate [6] with t_1 = 6 and t_2 = 11 assuming a maximum of n=4 (four spells of unemployment). The mass point at 12 months was added to this sum.[20]

NOTES

1. See Moen (1988) for a detailed discussion of the gainful worker definition.

2. Ransom and Sutch made a number of other revisions to the 1900 data but, as Moen (1987) shows, these revisions have no substantive effect on their conclusions.

3. See Moen (1987) for a critique of the alleged distinction between productive and gainful employment.

4. Heckman and Flinn (1983) use similar logic to argue that unemployment and "out of the labor force" were distinct labor force categories for young males ca. 1970. A similar issue of labor force classification arises in the case of WPA workers in the 1930s; see Margo (1988).

5. The substantive conclusion that the long-term unemployed are statistically distinguishable from persons out of the labor force is unaffected by changes in the definition of long-term unemployment to 8-12 months of unemployment, 10-12 months, or 12 months. Moreover, the same variables -- age, household headship, urban-rural status -- remain statistically significant.

6. See Whaples (1990, pp. 382-426) for a multivariate analysis of the retirement decision in 1910, using a somewhat different specification.

7. The fact that the long-term unemployed are statistically distinguishable from persons in the labor force is consistent with other studies showing that certain characteristics (eg, age, occupation, industry, literacy, marital status, homeownership, family size) affected the probability of experiencing unemployment around the turn of the century (and hence the chances of long-term unemployment); see Keyssar (1986) and Goldin and Margo (1991).

8. The effect of age on long-term unemployment is unchanged if additional variables (as in Table 1) are included. Ransom and Sutch (1989) also noted that the probability of long-term unemployment increased with age but did not control for other variables affecting the probability.

9. For further discussion of this method of estimating hazard rates and applications to historical unemployment data, see Margo (1990) and Goldin and Margo (1991).

10. Assumptions (2) and (3) are necessary because there is no information on fluctuations in labor force size within the year nor on unemployment rates by month in the 1900 census.

11. The assumption that the hazard rates were time-invariant constants is necessary in order to estimate the probability of long-term unemployment; see the appendix and Coleman (1989, p. 9).

12. The census data on months unemployed can be interpreted as twelve non-independent monthly samples of employment status (see Murphy and Topel 1987, p. 29). The log-likelihood function for u

is Σ [n_i ln u + (T-n_i)ln(1-u)] where n_i is the number of months unemployed for person i and T = 12 months. Maximizing LL with respect to u gives:

u = Total months unemployed/Total Labor force months

Dividing numerator and denominator by the number of persons in the sample produces eq. 4 in the text.

13. Estimates are not shown for ages over 65 because a third labor force state -- retirement -- becomes an option chosen by a non-trivial fraction of the population. However, if the retirement option is ignored the estimated exit hazard declines continuosly with age after age 65.

14. The fact that the exit hazard declines with age implies that the mean length of an employment spell (= $1/\delta$) increases with age. Modern studies also find that older workers nearing retirement age have longer unemployment spells; see the discussion in Quinn, Burkhauser, and Myers (1990, p. 116).

15. Ransom and Sutch (1986, ftn. 27) appear to argue that, if census enumerators had followed the instructions to the unemployment question, no one should have reported 12 months of unemployment because such persons could not have been "'ordinarily engaged in gainful labor'". The estimated hazard rates are inconsistent with this point of view. For example, at age 51, I estimate that 0.7 of the labor force should have reported 12 months of unemployment (the equation for the percent

with 12 months of unemployment is given in the appendix). More generally, any finite exit hazard will produce some individuals with 12 months of unemployment, in a large enough population.

16. According to paragraph 221 of the instructions to enumerators, the unemployment question (column 20 on the census form) was to be left blank "for those who have no gainful occupation." But according to paragraph 223, a return in column 20 "[was] required for each and every person 10 years of age and over who was engaged in gainful labor during any part of the census year ... or who is ordinarily occupied in renumerative work but during the census year was unable to secure labor of any kind." One interpretation of paragraph 223 is that it overrided paragraph 221 for persons who had recently retired; that is, such persons had no gainful occupation at the time of the census but had worked in the previous year, so a return was required in column 20. The 1900 enumerator instructions are reproduced in Center for Studies in Demography and Ecology (1980, pp. 14-38).

17. It is possible that the census understated the number of persons out of the labor force who experienced long-term unemployment in the previous year, but there is no reason to believe that the census did so differentially by age.

18. Modern studies also show that unemployment increases the chances of retirement among older workers; see Bould (1980), Rones (1983), Diamond and Hausmann (1984), Shapiro and Sandell (1987), and Herz and Rones (1989).

19. Such a procedure would be in the spirit of Ransom and Sutch's (1986) life-cycle approach to occupational choice and retirement. In this regard, there is little justification for distinguishing long-term unemployment and not other factors (eg. illness of a spouse, unexpected capital gains) that might have been associated with early retirement.

20. This procedure assumes that the respondents rounded up to 12 months if they experienced more than 11 months of unemployment.

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Table 1

Logit Regressions: Long-Term Unemployment and Labor Force Participation, Males Ages 60 and Over

	LTERM = 1			INLF = 1		
	Mean	ß	t-stat	Mean	ß	t-stat
Constant		-0.807	-2.208		-0.312	-1.068
Race:						
Black	0.052	0.673	1.682	0.089	1.449	4.970
Other	0.009	-13.673	-0.007	0.004	2.230	2.007
Foreign	0.386	-0.089	-0.524	0.373	-0.044	-0.378
Age:						
65-69	0.230	-0.519	-2.579	0.277	-0.631	-4.334
70-74	0.238	-1.315	-5.896	0.188	-1.602	-10.728
75-79	0.156	-1.333	-5.082	0.099	-1.904	-10.766
>=80	0.162	-1.832	-6.116	0.076	-2.898	-13.910
Marital Status:						
Married	0.560	-0.334	-1.020	0.702	-0.225	-0.989
Widowed/ Divorced	0.305	-0.206	-0.630	0.237	-0.320	-1.422
Head of Household	0.577	1.078	4.936	0.785	1.994	13.868
Literate	0.816	-0.067	-0.304	0.833	0.586	3.540
Family Size	3.820	-0.012	-0.372	3.990	0.036	0.129
Children Present	0.543	0.175	0.812	0.659	0.037	0.383
Residence:						
Owned	0.566	-0.033	-0.153	0.623	-0.263	-2.131
Farm	0.217	0.445	1.959	0.419	1.830	12.911
Region:						
Midwest	0.431	-0.304	-1.692	0.372	-0.393	-3.132
South	0.160	-0.181	-0.691	0.264	0.319	1.890
West	0.059	-0.119	-0.358	0.064	0.318	1.388
Urban (city size):						
>=25,000	0.254	0.500	2.400	0.202	0.327	2.184
10-25,000	0.063	0.988	3.173	0.048	0.648	2.589
2-10,000	0.100	0.548	2.163	0.093	0.402	2.217
N		1,056			2,940	
Dep. var. mean		0.258			0.733	
-2xLogLik		-528.7			-1,183.7	
X^2		147.6			1,044.3	

Note: LTERM sample consists of all persons ages 60 and over either out of the labor force or long-term unemployed (6 or more months of unemployment), dependent variable =1 if person is permanently unemployed, 0 otherwise; INLF sample consists of all persons ages 60 and over either out of the labor force or in the labor force (long-term unemployed are excluded), dependent

variable =1 if person is in the labor force (reports a gainful occupation), 0 otherwise.

Source: public use sample of 1900 census

Table 2

Logit Regression of Long-Term Unemployment: Gainfully-Occupied Males, Ages 40 and Over

	Mean	ß	t-stat
Constant		-4.135	-32.326
Age:			
40-44	0.075	-0.288	-1.355
45-49	0.213	0.077	0.568
50-54	0.173	0.229	1.654
60-64	0.096	0.893	6.276
65-69	0.066	1.009	6.370
70-74	0.035	1.015	4.980
75-79	0.016	1.038	3.610
>=80	0.007	1.530	4.165
Occupation:			
Professional	0.040	0.132	0.410
Laborer	0.129	1.746	13.136
Transportation/ Trade	0.156	0.384	2.183
Building Trades	0.066	2.191	15.197
Manufacturing	0.188	1.371	10.452
Mean value, dep. var.	0.055		
N	10,703		
-2xloglik		4,549.6	

Note: sample consists of all male persons, ages 40 and over reporting a gainful occupation. Dependent variable takes the value 1 if the person experienced 6 or more months of unemployment, 0 otherwise. Left-out age dummy is 55 to 59. Left-out occupational dummy is agriculture. Occupational classification is based on 1900 occupational codes.

Source: public use sample of 1900 census.

Table 3

Estimated Probabilities of Long-Term Unemployment By Age

Age	Entry Hazard ($\beta/12$)	Exit Hazard ($\delta/12$)	Probability of Long-Term Unemployment
51	0.0082	0.1586	0.058
52	0.0095	0.1272	0.069
53	0.0107	0.1601	0.075
54	0.0078	0.1341	0.056
55	0.0086	0.1301	0.063
56	0.0099	0.1698	0.070
57	0.0091	0.1325	0.066
58	0.0106	0.1034	0.087
59	0.0096	0.1088	0.076
60	0.0126	0.1052	0.101
61	0.0105	0.1091	0.083
62	0.0084	0.0987	0.072
63	0.0086	0.0730	0.095
64	0.0088	0.1369	0.063
65	0.0084	0.0817	0.084

Source: see text and appendix (section 5.0).

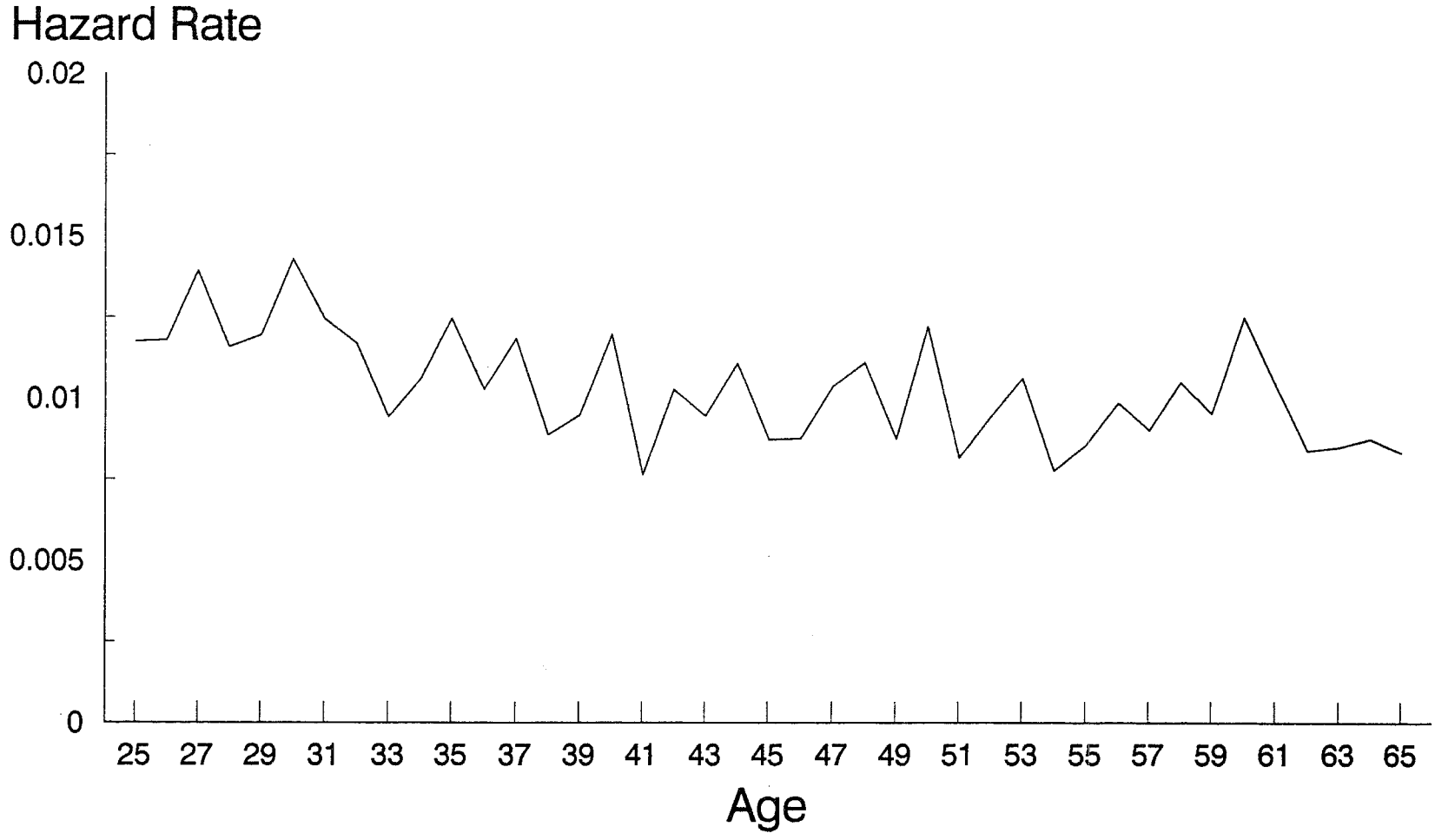
Table 4

Percent Gainfully Occupied, By 5-Year Age Group

	Long-Term Unemployed	All Males
55-59	95.1%	92.3%
60-64	91.3	88.4
65-69	87.2	82.1
70-74	77.8	63.5
75-79	57.1	52.9

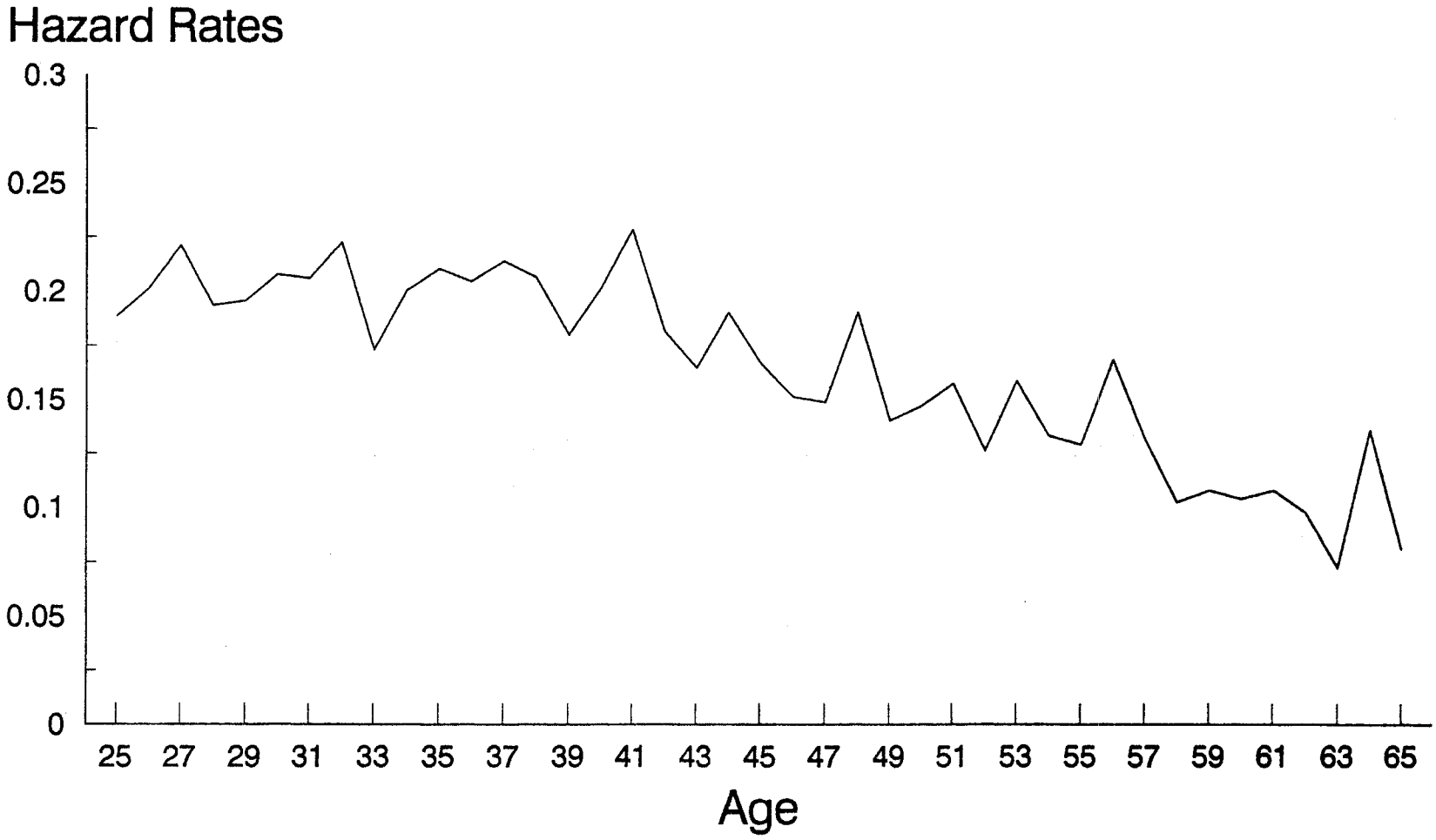
Note: "All Males" includes long-term unemployed.
Source: 1900 census sample

Figure 1
Monthly Hazard Rates, Employment to Unemployment: By Age



Source: see text

Figure 2
Monthly Hazard Rates, Unemployment to Employment: By Age



Source: see text