

**GAO**

Report to the Chairman, Subcommittee  
on Human Resources, Committee on  
Ways and Means, House of  
Representatives

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March 2006

# UNEMPLOYMENT INSURANCE

## Factors Associated with Benefit Receipt





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Highlights of [GAO-06-341](#), a report to the Chairman, Subcommittee on Human Resources, Committee on Ways and Means, House of Representatives

### Why GAO Did This Study

Unemployment Insurance (UI), established in 1935, is a complex system of 53 state programs that in fiscal year 2004 provided \$41.3 billion in temporary cash benefits to 8.8 million eligible workers who had become unemployed through no fault of their own. Given the size of the UI program, its importance in helping workers meet their needs when they are unemployed, and the little information available on what factors lead eligible workers to receive benefits over time, GAO was asked to determine (1) the extent to which an individual worker's characteristics, including past UI benefit receipt, are associated with the likelihood of UI benefit receipt or unemployment duration, and (2) whether an unemployed worker's industry is associated with the likelihood of UI benefit receipt and unemployment duration. Using data from a nationally representative sample of workers born between 1957 and 1964 and spanning the years 1979 through 2002, and information on state UI eligibility rules, GAO used multivariate statistical techniques to identify the key factors associated with UI benefit receipt and unemployment duration.

In its comments, the Department of Labor stated that while there are certain qualifications of our findings, the agency applauds our efforts and said that this report adds to our current knowledge of the UI program.

[www.gao.gov/cgi-bin/getrpt?GAO-06-341](http://www.gao.gov/cgi-bin/getrpt?GAO-06-341).

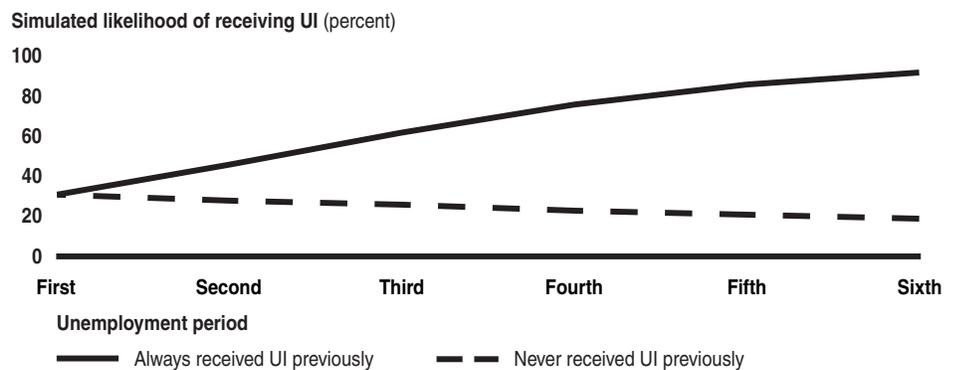
To view the full product, including the scope and methodology, click on the link above. For more information, contact Sigurd Nilsen at (202) 512-7215 or nilsens@gao.gov.

### What GAO Found

Certain characteristics are associated with the likelihood of receiving UI benefits and unemployment duration. UI-eligible workers that GAO studied are more likely to receive UI benefits if they have higher earnings prior to becoming unemployed, are younger, have more years of education, or if they have a history of past UI benefit receipt when compared with otherwise similar workers. GAO found that past experience with the UI program has a particularly strong effect on the future likelihood of receiving UI benefits. However, some characteristics, such as receiving a higher maximum weekly UI benefit amount, are not associated with a greater likelihood of receiving UI benefits. UI-eligible workers who receive UI benefits have longer unemployment duration than workers with similar characteristics. Also, UI-eligible workers are more likely to experience longer unemployment duration if they have lower earnings before becoming unemployed or have fewer years of education. Other characteristics associated with longer unemployment duration include being African-American, female, or not belonging to a union. GAO found no relationship between past UI benefit receipt and subsequent unemployment duration.

UI-eligible workers from certain industries are more likely than similar workers in other industries to receive UI benefits and experience shorter unemployment duration. Specifically, GAO's simulations show that the likelihood of receiving UI benefits during a first period of unemployment is highest among workers from the mining and manufacturing industries. Furthermore, the likelihood of receiving UI benefits when unemployed increases with each previous period of UI receipt across all industries, and the most notable increase occurs in public administration. First-time unemployed workers from construction and manufacturing experience significantly shorter unemployment duration than workers from other industries.

**Simulated UI Benefit Receipt Rates for UI-Eligible Workers during Successive Periods of Unemployment, by Past UI Receipt Status**



Source: GAO simulations based on GAO analysis of NLSY79 data.

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### **Abbreviations**

BLS	Bureau of Labor Statistics
BPE	base period earnings
CPI-U	Consumer Price Index for All Urban Consumers
CPS	Current Population Survey
HQE	high quarter earnings
NLSY79	National Longitudinal Survey of Youth 1979
OLF	out of the labor force
SIC	Standard Industrial Classification
SMSA	Standard Metropolitan Statistical Area
SOC	Standard Occupational Classification
UI	Unemployment Insurance
WBA	weekly benefit amount

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United States Government Accountability Office  
Washington, DC 20548

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March 7, 2006

The Honorable Wally Herger  
Chairman, Subcommittee on Human Resources  
Committee on Ways and Means  
House of Representatives

Dear Mr. Chairman:

Unemployment Insurance (UI), established in 1935, is a complex system of 53 programs that provide temporary cash benefits to eligible workers who become unemployed through no fault of their own.<sup>1</sup> Eligibility for UI benefits, benefit amounts, and the length of time benefits are available are determined by state law, within broad federal guidelines. Benefits are financed through federal and state employer payroll taxes. In fiscal year 2004, employers paid about \$39.3 billion in UI taxes, and 8.8 million workers received UI benefits totaling \$41.3 billion.

Decades of program experience and administrative data have resulted in a firm understanding of the composition of UI caseloads and the overall cost of the program. However, this understanding of the UI program has been based on snapshots of the UI beneficiary population at any given time. Additional research has provided limited information on the types of workers who are likely to receive UI benefits and on how UI requirements and benefits affect individuals' movement into and out of the workforce, including how UI receipt affects the duration of unemployment. However, because of the difficulty of tracking the same workers over time, the circumstances that give rise to individual workers' use or nonuse of the UI program and how this may, in turn, affect individuals' patterns of unemployment over the course of their entire working careers are still not well understood.

In 2005, we reported on the results of our analysis of a unique database that tracked a single group of individuals over time.<sup>2</sup> Examining this

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<sup>1</sup>UI programs are administered by the 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands.

<sup>2</sup>GAO, *Unemployment Insurance: Information on Benefit Receipt*, [GAO-05-291](#) (Washington, D.C.: Mar. 17, 2005).

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database, we found that 85 percent of a nationally representative sample of late baby boom workers (workers born between 1957 and 1964) had experienced unemployment at least once between 1979 and 2002. Workers who experienced unemployment were unemployed an average of five times over this 23-year period. Moreover, we found that of those who were eligible for UI benefits at least once, only 38 percent at some point received UI benefits. About half of the workers receiving UI benefits received them more than once. Finally, we reported that the rate at which unemployed workers received UI benefits varied across industries.

As Congress reviews the ability of labor programs to meet the needs of the workforce in the new century, it will be important to understand why fewer than half of workers eligible for UI benefits receive them and the other half do not, as well as what factors cause workers in some industries to seek benefits multiple times over the course of their careers. In this context, you asked us to determine (1) the extent to which characteristics of individual workers, including a history of past UI benefit receipt, are associated with the likelihood of UI benefit receipt and unemployment duration, and (2) whether an unemployed worker's industry is associated with UI benefit receipt or unemployment duration.

To answer these questions, we analyzed data from the National Longitudinal Survey of Youth 1979 (NLSY79). This survey provides information that is not typically available from other data sources. The dataset contains information from ongoing periodic interviews with a nationally representative sample of individuals who were born between 1957 and 1964. At the time of our analysis, the database contained information from interviews conducted between 1979 and 2002. There were 12,686 individuals in the sample in 1979. The survey provides a wide range of detailed information about these individuals, including their work histories, income, family composition, and education. Using the dataset, we analyzed a single birth cohort over time; therefore, our findings do not represent the experience of workers of all ages during this time period.

Using this survey information and information on states' UI program eligibility rules for each year from 1978 through 2002,<sup>3</sup> we estimated

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<sup>3</sup>We considered an individual to be UI-eligible if that individual experienced an involuntary job loss, reported receiving a minimum amount of wages over a minimum period of time as defined by the state where the individual lived, and was actively looking for new employment. Our method of estimating eligibility tends to overestimate the number of UI-eligible individuals. For a more complete discussion of our methodology, see appendix I.

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whether individuals from the sample were eligible for UI benefits following a job separation. We identified 5,631 workers who met the conditions for UI eligibility—a group that we refer to as “UI-eligible workers”—who collectively experienced 15,506 separate periods of unemployment during the study period (1979-2002).

We used a multivariate statistical model to identify the key factors associated with UI benefit receipt and unemployment duration for our subsample of UI-eligible workers. The model allowed us to isolate the effect of a particular characteristic by statistically controlling for a number of other characteristics. In this report, we refer to the results for individual characteristics in comparison with “otherwise similar workers.” By this phrasing, we intend to show that we have controlled for all other characteristics that may be related to the characteristic being studied. For example, the test of the effect of age on benefit receipt was conducted while controlling, for example, for earnings and education—two characteristics that are correlated with age. In addition, we modeled UI benefit receipt and unemployment duration together to control for the likely correlation that exists between these two outcomes.

To illustrate how changes in different characteristics affect the likelihood of UI receipt and unemployment durations, we used the results of our multivariate statistical model to simulate how changes in observable characteristics affect the likelihood of UI receipt and unemployment duration. The simulated results are calculated from our statistical model estimates, holding selected characteristics constant, as noted throughout the report. For example, to understand how changes in workers’ education affect their likelihood of receiving UI benefits, we set the number of years of education at the same value for all workers in our sample and then used the model estimates to simulate the likelihood of UI receipt for each worker. We then calculated the average likelihood of receiving UI benefits. We repeated this process for different years of education. Unless otherwise noted, simulated likelihoods of UI receipt and simulated unemployment duration are for workers experiencing unemployment for the first time. See appendix I for a more complete discussion of our methodology, including limitations of our analysis.

We assessed the reliability of the NLSY79 dataset and found it to be sufficient for our analysis. Our work was conducted from May 2005 through February 2006 in accordance with generally accepted government auditing standards.

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## Results in Brief

Certain characteristics are associated with the likelihood of receiving UI benefits and unemployment duration. Based on our analysis of workers during the first half of their working lives, UI-eligible workers are more likely than other workers to receive UI benefits if they have higher earnings, are younger or have more years of education, or, most notably, if they received UI benefits in the past. In particular, UI-eligible workers who received UI benefits before are more likely than other workers to receive UI benefits again and this likelihood increases each time they are unemployed and receive UI. Other factors, including a high local unemployment rate, increase the likelihood of receiving UI. UI-eligible workers who receive UI benefits have longer periods of unemployment than workers who do not receive benefits. Similarly, workers who have fewer years of education, lower earnings, or no union membership experience longer unemployment than workers who do not have these characteristics. Workers who received UI benefits in the past, however, were unemployed about as long as similar workers who had not received UI in the past.

UI-eligible workers from certain industries are more likely than other workers to receive UI benefits and experience shorter unemployment duration, although no clear industry trend emerged. Specifically, our simulations show that

- The likelihood of receiving UI benefits during a first period of unemployment is highest among workers from mining and manufacturing. Furthermore, the likelihood of receiving UI benefits when unemployed increases with each previous period of UI receipt across all industries, and the most notable increase occurs for workers from the public administration sector.
- The unemployment duration for first-time unemployed workers from construction and manufacturing is significantly shorter than the unemployment duration experienced by workers from other industries. While unemployment duration varies across all industries, this variation is not affected by whether workers were unemployed in the past, or whether they received UI in the past.

In its comments, the Department of Labor stated that, while there are certain qualifications of our findings, Labor applauds our efforts and said that this report adds to our current knowledge of the UI program. Labor also provided technical comments, which we incorporated where appropriate.

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## Background

The UI program was established in 1935 and serves two primary objectives: (1) to temporarily replace a portion of earnings for workers who become unemployed through no fault of their own and (2) to help stabilize the economy during recessions by providing an infusion of consumer dollars into the economy. UI is made up of 53 state-administered programs that are subject to broad federal guidelines and oversight. In fiscal year 2004, these programs covered about 129 million wage and salary workers and paid benefits totaling \$41.3 billion to about 8.8 million workers.

Federal law provides minimum guidelines for state programs and authorizes grants to states for program administration. States design their own programs, within the guidelines of federal law, and determine key elements of these programs, including who is eligible to receive state UI benefits, how much they receive, and the amount of taxes that employers must pay to help provide these benefits. State unemployment tax revenues are held in trust by the Department of Labor (Labor) and are used by the states to pay for regular weekly UI benefits, which typically can be received for up to 26 weeks. During periods of high unemployment, the Extended Benefits program, funded jointly by states through their UI trust funds and by the federal government through the Unemployment Trust Fund, provides up to 13 additional weeks of benefits for those who qualify under state program rules. Additional benefits, funded by the federal government, may be available to eligible workers affected by a declared major disaster or during other times authorized by Congress.

To receive UI benefits, an unemployed worker must file a claim and satisfy the eligibility requirements of the state in which the worker's wages were paid. Although states' UI eligibility requirements vary, generally they can be classified as monetary and nonmonetary. Monetary eligibility requirements include having a minimum amount of wages and employment over a defined base period, typically, about a year before becoming unemployed, and not having already exhausted the maximum amount of benefits or benefit weeks to which they would be entitled because of other recent unemployment. In addition to meeting states' monetary eligibility requirements, workers must satisfy their states' nonmonetary eligibility requirements. Nonmonetary eligibility requirements include being able to work, being available for work, and becoming unemployed for reasons other than quitting a job or being fired for work-related misconduct. In all states, claimants who are determined to be ineligible for benefits are entitled to an explanation for the denial of benefits and an opportunity to appeal the determination.

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Since UI was introduced, researchers and those responsible for overseeing the program have monitored the size, cost, and structure of the program and its effects on individuals' movement into and out of the workforce, including which types of workers receive UI benefits. Much of what is known about the dynamics of the UI program has been based on snapshots of the UI beneficiary population at any given time. Labor regularly gathers UI program data from the states, including each state's eligibility requirements, employers' UI tax rates, program revenues and costs, and numbers of claims received and approved. An extensive amount of research has been devoted to the effect of UI benefit receipt on unemployment duration. Specifically, researchers have found that receiving UI benefits increases unemployment duration. Much of this research is focused on measuring how changes in the amount of UI benefits increase the amount of time that an unemployed worker takes to find a new job.<sup>4</sup> Although much is known about UI caseloads and about the relationship between UI benefits and unemployment duration, less is known about the patterns of UI receipt among individual workers over their entire working careers.

What is known about the patterns of UI benefit receipt over an extended period for individual workers comes from a few studies that are fairly limited in scope. In one study, researchers analyzed 1980-1982 survey data and found that among unemployed workers who were eligible for UI, younger or female workers were less likely to receive UI benefits, while union workers, workers from large families, or those with more hours of work from their previous jobs were more likely to receive UI.<sup>5</sup> In another study, using UI administrative data from five states, researchers found that between 36 and 44 percent of UI claims from 1979 to 1984 were from workers who had received UI benefits more than once and that middle-aged workers and workers with higher earnings were more likely to be repeat UI recipients.<sup>6</sup> Another study, based on survey data from the NLSY79, found that 16 percent of young adults had received UI benefits

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<sup>4</sup>Alan B. Krueger and Bruce D. Meyer, "Labor Supply Effects of Social Insurance," NBER Working Paper 9014 (Cambridge, Massachusetts: National Bureau of Economic Research, 2002).

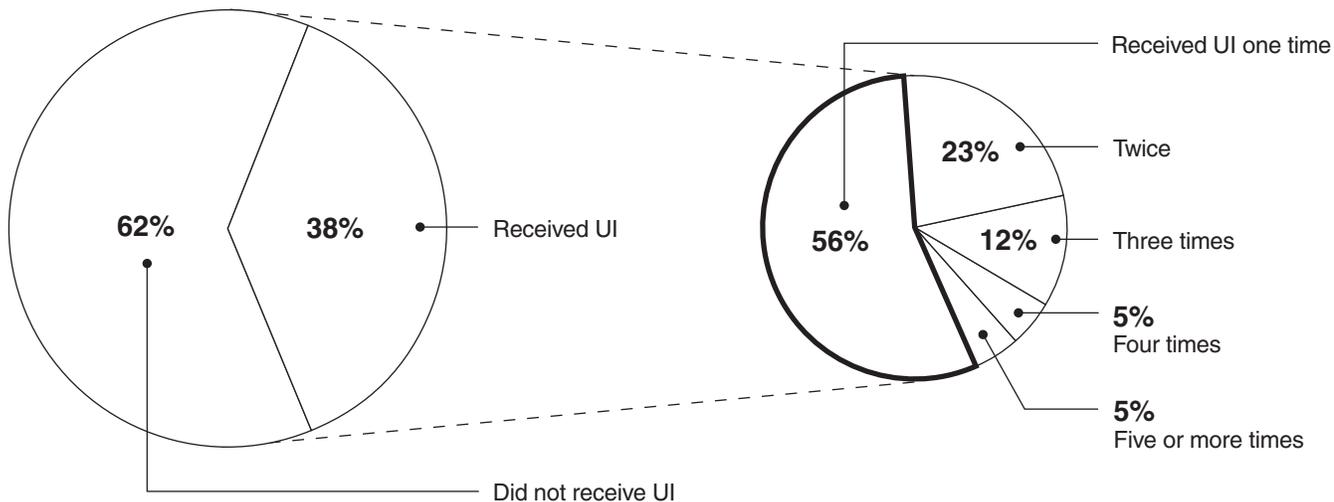
<sup>5</sup>Rebecca M. Blank and David E. Card, "Recent Trends in Insured and Uninsured Unemployment: Is There an Explanation?" *The Quarterly Journal of Economics*, vol. 106, no. 4 (1991).

<sup>6</sup>Bruce D. Meyer and Dan T. Rosenbaum, "Repeat Use of Unemployment Insurance," NBER Working Paper 5423 (Cambridge, Massachusetts: National Bureau of Economic Research, 1996), p. 20.

more than once between 1978 and 1991 and that as many as 46 percent of those who received UI were repeat recipients.<sup>7</sup> This study also found that workers who were women or Hispanic or whose fathers had more years of education were less likely to become repeat recipients than workers who were men or non-Hispanic or whose fathers had fewer years of education.

In 2005, we analyzed the NLSY79 to determine the extent to which individual workers received UI benefits during their early working lives.<sup>8</sup> We found that 38 percent of workers born between 1957 and 1964 received UI at least once between 1979 and 2002, with almost half of these individuals receiving UI benefits more than once. (See fig. 1.) We also found that the rate at which unemployed workers received UI benefits varied across industries, but we did not control for any of the other factors that may have helped to explain this variation.

**Figure 1: Incidence of UI Benefit Receipt from 1979 through 2002, for Workers Born between 1957 and 1964**



Source: GAO analysis of NLSY79 data.

Note: Sampling errors were within plus or minus 5 percentage points at the 95 percent confidence level.

<sup>7</sup>See Brian P. McCall, "Repeat Use of Unemployment Insurance," in Laurie J. Bassi and Stephen A. Woodbury, editors, *Long-Term Unemployment and Reemployment Policies* (Stamford, Connecticut: JAI Press, Inc., 2000).

<sup>8</sup>GAO-05-291.

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## Certain Characteristics Are Associated with UI Benefit Receipt and Unemployment Duration

Earnings, age, education, and most notably past UI benefit receipt are all associated with the likelihood of receiving UI benefits for UI-eligible workers. Education, earnings, and union membership, and current UI benefit receipt, are associated with unemployment duration.

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### Unemployed Workers with Higher Earnings, Younger Workers, Workers with More Education, or Those Who Received UI in the Past Are More Likely to Receive UI Benefits

Unemployed workers are more likely to receive UI benefits if they have higher earnings prior to becoming unemployed, are younger or have more years of education, or have a history of past UI benefit receipt, when compared to workers with similar characteristics.<sup>9</sup> We found that past experience with the UI program has a particularly strong effect on the future likelihood of receiving UI benefits. In addition, UI-eligible workers are more likely to receive UI when the local unemployment rate is high. However, some characteristics, such as the weekly UI benefit amount that a worker is eligible to receive, are not associated with a greater likelihood of receiving UI benefits.

### Unemployed Workers Who Have Higher Earnings or Are Younger or Have More Years of Education Are More Likely to Receive UI

Unemployed workers who have higher earnings or are younger or who are more educated are more likely to receive UI benefits than otherwise similar workers. With respect to earnings,<sup>10</sup> our simulations show that the likelihood of receiving UI tends to increase as the amount earned in the year prior to becoming unemployed increases (see fig. 2). For example, a UI-eligible worker with earnings between \$10,000 and \$11,999 in the year before becoming unemployed has a 36 percent likelihood of receiving UI, whereas a worker who earned roughly twice as much (between \$20,000 and \$24,999) has a 45 percent likelihood of receiving UI.<sup>11</sup> The likelihood of receiving UI is lowest among workers with the lowest earnings (i.e., less

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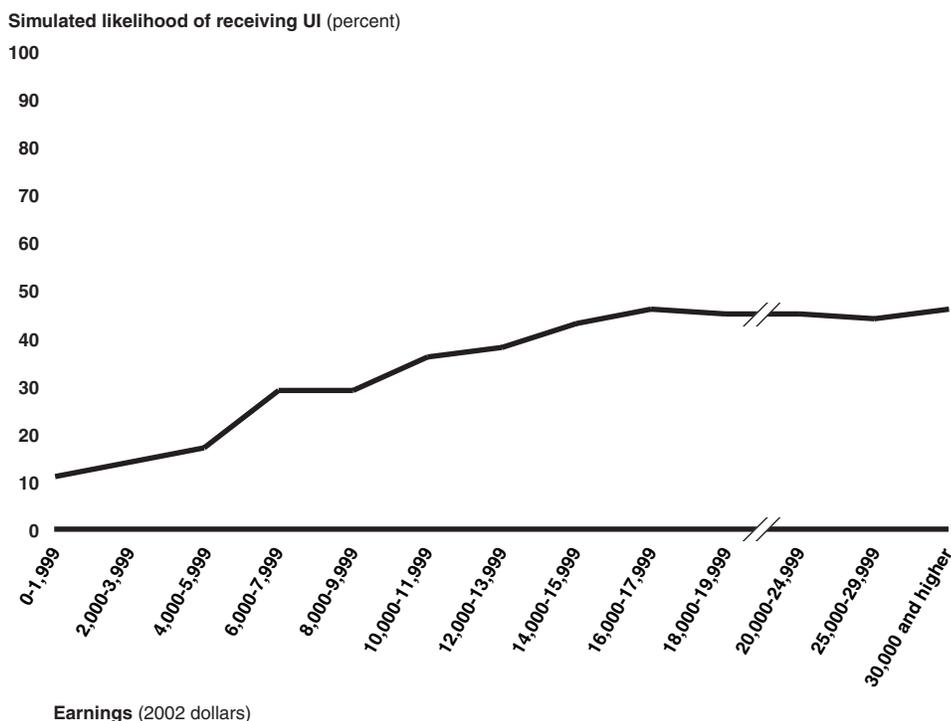
<sup>9</sup>The results described in this report are statistically significant at the 95 percent confidence level, unless otherwise noted. For a complete list of findings from our multivariate statistical model of the key factors associated with UI benefit receipt, see table 8 in appendix I.

<sup>10</sup>Earnings refers to base period earnings, which we define as the amount of earnings received during the first four of the last five full calendar quarters before a worker becomes unemployed. This definition is consistent with the time frame states generally use to determine eligibility.

<sup>11</sup>The average and maximum earnings for the unemployed workers in our sample are \$15,524 and \$597,950, respectively.

than \$10,000 in the year before becoming unemployed). There is generally little difference in the likelihood of receiving UI among workers earning \$18,000 or more.

**Figure 2: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers, by Prior-Year Earnings**



Source: Simulations based on GAO analysis of NLSY79 data.

Note: Simulations are for the average likelihood of receiving UI during first-time unemployment at different levels of earnings. The overall average likelihood of receiving UI during first-time unemployment is 33 percent. See appendix I for methodology and estimation results.

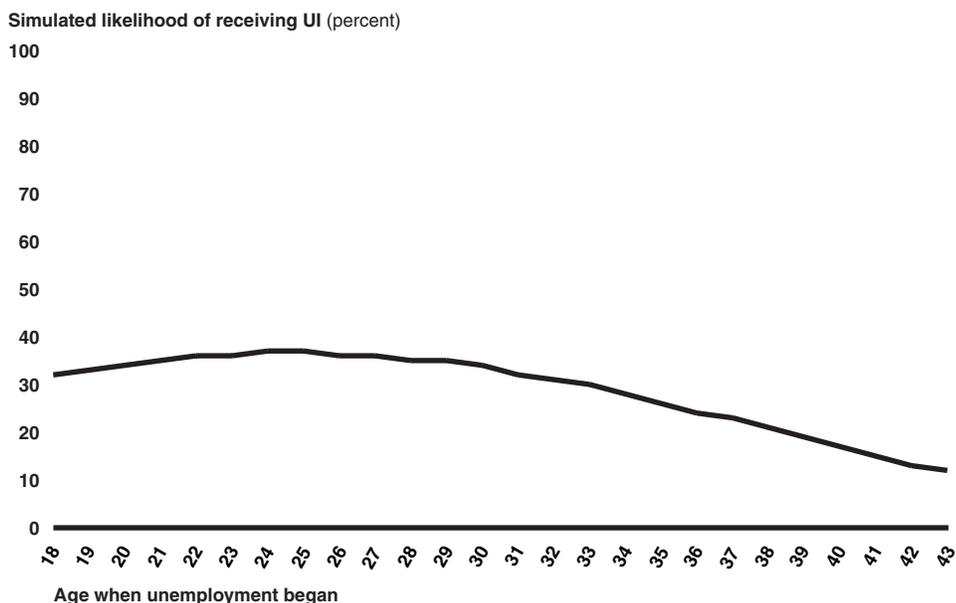
This result confirms our 2000 finding that low-wage workers are less likely to receive UI benefits than workers with higher earnings even when they have worked for the same amount of time.<sup>12</sup> Our current result also controls for other worker differences, such as which industries the workers were employed in or whether they were ineligible for benefits, which we had not previously been able to rule out as explanations for the variation in likelihood of receiving UI. The relationship between higher

<sup>12</sup>GAO, *Unemployment Insurance: Role as Safety Net for Low-Wage Workers Is Limited*, GAO-01-181 (Washington, D.C.: Dec. 29, 2000).

earnings and a higher likelihood of receiving UI benefits is also consistent with economic theory that predicts that workers with higher earnings prior to becoming unemployed will be more reluctant to accept lower reemployment wages and are therefore more likely to take advantage of UI benefits as a way to subsidize their job search efforts.<sup>13</sup>

Concerning age, our simulations show that the likelihood of receiving UI peaks at about age 25 and decreases thereafter (see fig. 3). More specifically, a 25-year-old unemployed worker who is eligible for UI is more than twice as likely to receive UI as an otherwise similar 40-year-old unemployed worker.

**Figure 3: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers, by Age**



Source: Simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during first-time unemployment at different ages. The overall average likelihood of receiving UI during first-time unemployment is 33 percent. See appendix I for methodology and estimation results.

<sup>13</sup>For economic theory concerning the relationship between job search and unemployment insurance, see Dale T. Mortensen, “Unemployment Insurance and Job Search Decisions,” *Industrial and Labor Relations Review*, vol. 30, no. 4 (1977).

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Previous studies have found that younger workers are less likely to receive UI benefits than older workers.<sup>14</sup> However, these previous studies did not include as much information about workers' past unemployment and UI benefit receipt histories as our current analysis. Therefore, because older workers have more of this experience than younger workers, it is possible that our analysis has controlled for the effect of this past experience more completely than these previous studies, resulting in a more precise estimate of the effect of age. We are unable to explain why younger workers are more likely to receive UI benefits than otherwise similar older workers. However, it is possible that older workers, who have had more time to accumulate financial assets, may have more private resources available to help them cope with unemployment than younger workers.<sup>15</sup> Alternatively, younger workers may be less optimistic about how long it will take for them to become reemployed.

Unemployed workers with more years of education are more likely to receive UI benefits than otherwise similar workers with fewer years of education. Specifically, our simulations show that the likelihood of receiving UI increases for each additional year of schooling that a UI-eligible worker has completed before becoming unemployed (see fig. 4). For example, a UI-eligible worker with a college education (one who has completed 16 years of schooling) when he or she becomes unemployed is almost one-fifth more likely to receive UI than a UI-eligible worker with a high school education (12 years of schooling).<sup>16</sup>

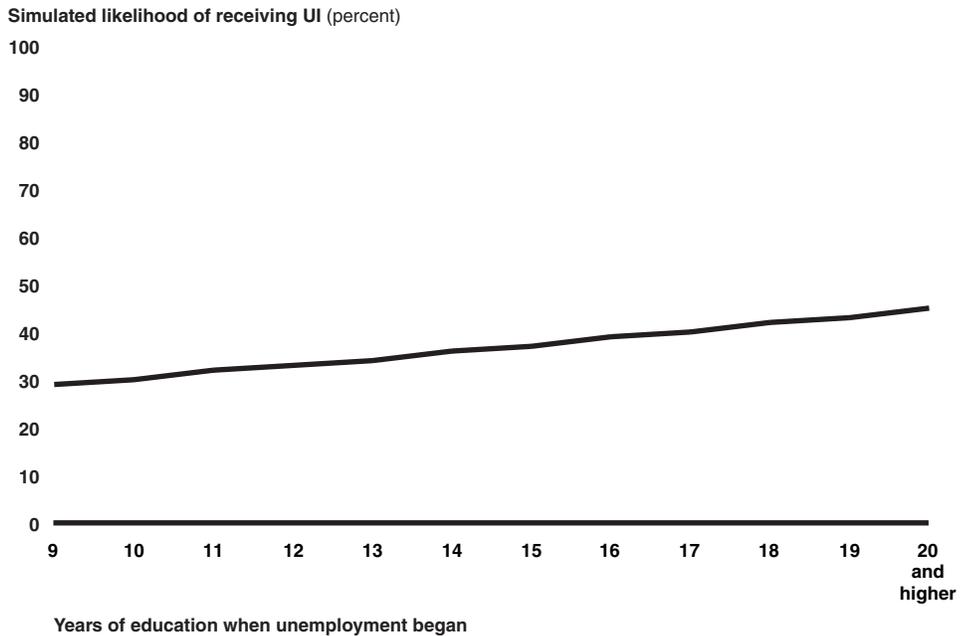
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<sup>14</sup>See Blank and Card, and McCall.

<sup>15</sup>See Jonathan Gruber, "The Wealth of the Unemployed," October 2001, *Industrial and Labor Relations Review*, vol. 55, no. 1.

<sup>16</sup>The average number of years of schooling completed by UI-eligible workers, at the time when they became unemployed, is 12 years.

**Figure 4: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers, by Education Level**



Source: Simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during first-time unemployment at different education levels. The overall average likelihood of receiving UI during first-time unemployment is 33 percent. See appendix I for methodology and estimation results.

Although the impact of education on the likelihood of receiving UI benefits has been analyzed in other research, this research found no significant education effect.<sup>17</sup> However, to the extent that workers with more years of education are better able to access and understand UI program rules, they may also be more likely to know when they are entitled to benefits and to have the information that they need to file successful benefit claims.

Other factors, including gender, marital status, job tenure, and the local unemployment rate are also associated with UI benefit receipt. Controlling for all other characteristics among this UI-eligible group,

- a woman is 29 percent more likely to receive UI benefits than a man,

<sup>17</sup>See Blank and Card, p. 1185.

- 
- a married worker is 13 percent more likely to receive UI than an unmarried worker,
  - a longer tenured worker is more likely to receive UI—for example, a worker with 4 years of tenure at his or her most recent job is 12 percent more likely to receive UI than a worker with 1 year of job tenure, and
  - being in an area with high unemployment raises the likelihood that an unemployed worker will receive UI—for example, a worker living in an area with an unemployment rate of 9 percent is 10 percent more likely to receive UI than a worker living in an area with an unemployment rate of 5 percent.

Our finding that women are more likely to receive UI benefits than otherwise similar men differs from the results of previous research, which generally found no statistically significant differences. Nevertheless, our analysis controls for more worker characteristics than these previous studies, and it is likely that we have more carefully isolated the effect of gender from that of other characteristics related to gender, such as workers' occupations or industries. It is not immediately clear why women are more likely to receive UI benefits, however. We are likewise unable to explain why married workers are more likely to receive UI benefits than otherwise similar unmarried workers.<sup>18</sup>

Our findings on job tenure are consistent with previous research. However, the higher likelihood of UI benefit receipt associated with more years of job tenure is likewise difficult to explain. It might be that workers with longer job tenures have acquired more skills that are not as easy to transfer to another employer, relative to workers with less job tenure, and anticipate longer job searches.

The higher likelihood of receiving UI benefits among workers living in areas with higher unemployment is likely due to the higher number of unemployed workers relative to available jobs, which may make workers more willing to apply for UI benefits as they engage in what are likely to be longer job searches.

In contrast to our findings above, a key UI program element, the weekly UI benefit amount that UI-eligible workers are entitled to, is not associated

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<sup>18</sup>We specifically tested for the effect of spousal income on the likelihood of receiving UI to determine whether marital status was masking some underlying effect of additional family income, and found this not to be the case.

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Unemployed Workers Who Received UI in the Past Are More Likely to Receive UI during Subsequent Unemployment

with a greater likelihood of receiving UI benefits. Using our model estimates, we simulated increases in weekly UI benefit amounts of 10 percent and 25 percent and a decrease of 10 percent and found that these changes had no effect on the likelihood of UI benefit receipt. This finding is consistent with the work of others, who have found that increases in the weekly benefit amount have mixed, but generally small effects on UI benefit receipt.<sup>19</sup> Collectively, these results suggest that UI benefit levels have modest effects on individuals' decisions about whether or not to receive UI benefits, after controlling for other factors.

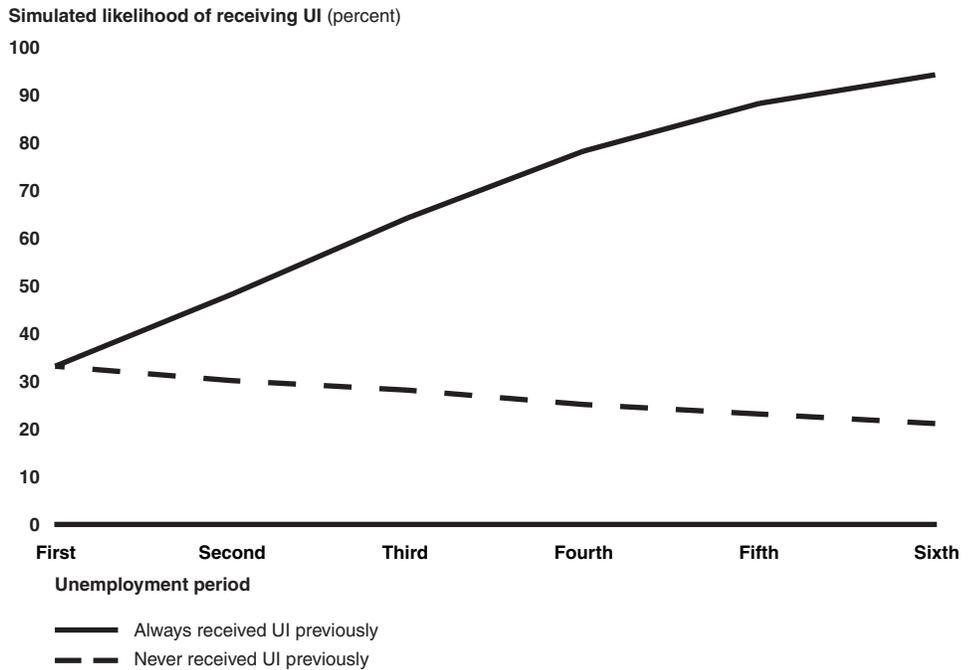
Unemployed workers who have received UI benefits during a prior period of unemployment are more likely to receive UI benefits during a current period of unemployment than otherwise similar workers who never received UI benefits (see fig. 5). For example, when workers experience their first UI-eligible period of unemployment, their likelihood of receiving UI is 33 percent. During a second UI-eligible period of unemployment, the likelihood of receiving UI is 48 percent for workers who received UI during the first unemployment period but only 30 percent for workers who did not receive UI. Furthermore, the likelihood that these UI-eligible workers will receive UI benefits during successive periods of unemployment increases each time that they receive UI benefits and decreases each time that they do not.<sup>20</sup>

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<sup>19</sup>See David E. Card and Phillip B. Levine, "Unemployment Insurance Taxes and the Cyclical and Seasonal Properties of Unemployment," *Journal of Public Economics*, vol. 53, no. 1 (1994); Patricia M. Anderson and Bruce D. Meyer, "The Effect of Unemployment Insurance Taxes and Benefits on Layoffs Using Firm and Individual Data," NBER Working Paper No. 4960, December 1994; and Robert H. Topel, "On Layoffs and Unemployment Insurance," *American Economic Review*, vol. 73, no. 4 (1983).

<sup>20</sup>As noted above, relatively few UI-eligible workers who receive UI benefits receive them multiple times. See [GAO-05-291](#) for a more complete discussion of the incidence of repeat UI benefit receipt.

**Figure 5: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers during Successive Periods of Unemployment, by Past UI Receipt Status**



Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during a current unemployment period for two extreme cases: (1) workers who always received UI benefits during previous unemployment and (2) workers who never received UI during previous unemployment. The average likelihood of receiving UI during first-time unemployment for all UI-eligible workers is 33 percent. See appendix I for methodology and estimation results.

This finding suggests that a worker’s first unemployment experience has a lasting and self-reinforcing effect. To the extent that workers know about the UI program and whether or not they are eligible, receiving or not receiving UI benefits may be a personal choice based on unobserved worker characteristics or preferences. Alternatively, if workers do not have good information about UI, those who receive UI benefits may know more about the UI program than those who do not receive UI, and their knowledge about the program could make it easier to apply for and receive benefits during a subsequent period of unemployment.

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## Receiving UI Benefits, along with Other Factors, Is Associated with Unemployment Duration

Overall, unemployed workers who receive UI benefits have longer unemployment duration than otherwise similar workers who do not receive UI benefits.<sup>21</sup> Several other characteristics are also associated with unemployment duration. Specifically, UI-eligible workers are more likely to experience longer unemployment duration if they have lower earnings before becoming unemployed or have fewer years of education. Other characteristics associated with longer unemployment duration, after controlling for other factors, include being African-American or female or not belonging to a union. We found no relationship between past UI benefit receipt and subsequent unemployment duration.

## Receiving UI Benefits Is Associated with Longer Unemployment Duration

Whether or not an unemployed worker receives UI during a specific period of unemployment has the strongest effect on how long that period of unemployment is likely to last. Overall, UI-eligible workers who receive UI benefits during a period of unemployment remain unemployed for about 21 weeks on average, whereas otherwise similar workers who do not receive UI remain unemployed for about 8 weeks. This result is consistent with economic theory that predicts that receiving UI benefits reduces the costs associated with unemployment and allows workers to engage in longer job searches.<sup>22</sup> That is, an unemployed worker who receives UI benefits faces less pressure to accept the first job offer they receive and can search longer for a more desirable job than an unemployed worker who does not receive UI. Another possible explanation for the strong association between UI receipt and longer unemployment duration may be that workers who expect to experience longer unemployment may be more likely to apply for UI than those who expect to return to work quickly.

## Unemployed Workers with Lower Earnings and Less Education Tend to Have Longer Unemployment Duration

Unemployed workers with lower earnings tend to have longer unemployment duration than otherwise similar workers with higher earnings. This finding holds for workers who are receiving UI benefits, and for workers who are not receiving UI benefits. Specifically, our simulations show that UI-eligible workers who receive UI benefits and have relatively high earnings (\$30,000 and higher) in the year prior to becoming unemployed have unemployment duration that is as much as

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<sup>21</sup>For the parameter estimates of these and other variables included in our multivariate statistical model of the key factors associated with unemployment duration, see table 9 in appendix I. The variables reported here are those that were statistically significant at the 95 percent confidence level.

<sup>22</sup>See Mortensen.

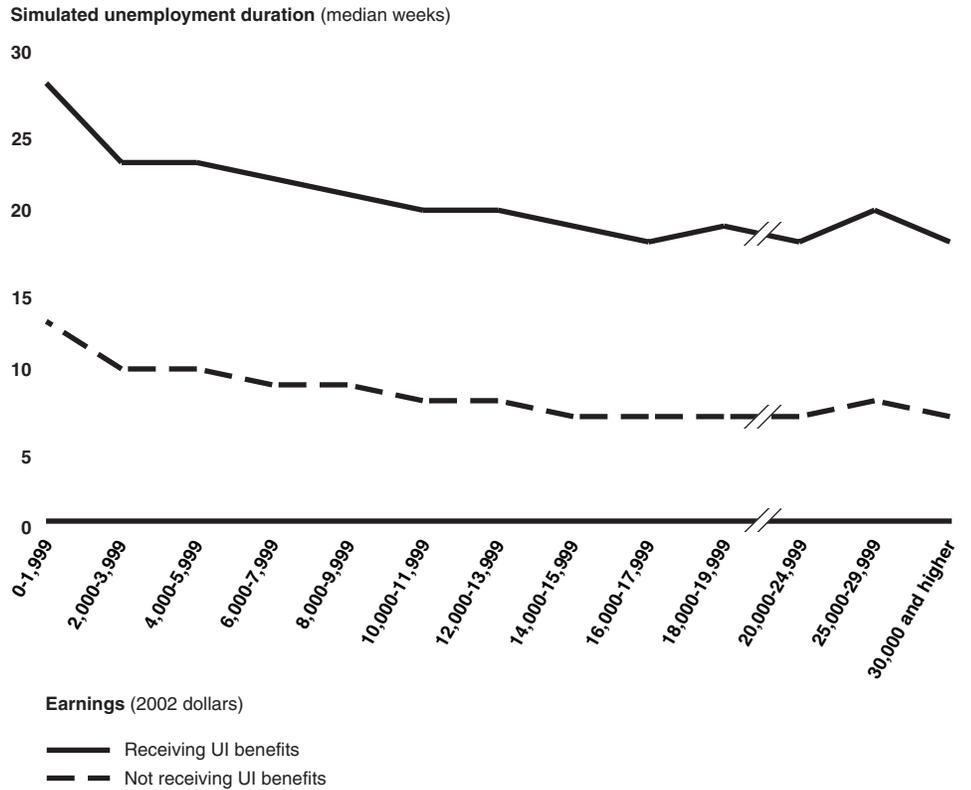
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9 weeks shorter than workers with earnings that are below \$16,000.<sup>23</sup> The results are similar for UI-eligible workers who do not receive UI benefits (see fig. 6).

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<sup>23</sup>The average prior-year earnings amount for this sample is \$15,524.

**Figure 6: Simulated Unemployment Duration for UI-Eligible Workers, by Prior-Year Earnings and UI Receipt Status**



Source: Simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment. Overall average duration is 21 weeks for UI-eligible workers receiving UI benefits and 8 weeks for UI-eligible workers not receiving UI benefits. See appendix I for methodology and estimation results.

Our result is consistent with other research that has found that higher previous earnings tend to reduce unemployment duration.<sup>24</sup> Researchers have suggested that the association between higher earnings and shorter unemployment duration may be due, in part, to the higher cost of unemployment for workers with higher earnings, relative to the cost for workers with lower earnings.<sup>25</sup> Specifically, the cost of unemployment in

<sup>24</sup>See Karen E. Needels and Walter Nicholson, *An Analysis of Unemployment Durations Since the 1990-1992 Recession*, UI Occasional Paper 99-6, prepared for the Department of Labor, 1999, p. 94.

<sup>25</sup>See Bruce D. Meyer, "Unemployment Insurance and Unemployment Spells," *Econometrica*, vol. 58, no. 4 (1990), p. 771.

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terms of lost wages is greater for workers with higher earnings, because they forego a higher amount of potential earnings in exchange for the time they spend on unpaid activities, such as job search, home improvement, or recreation.

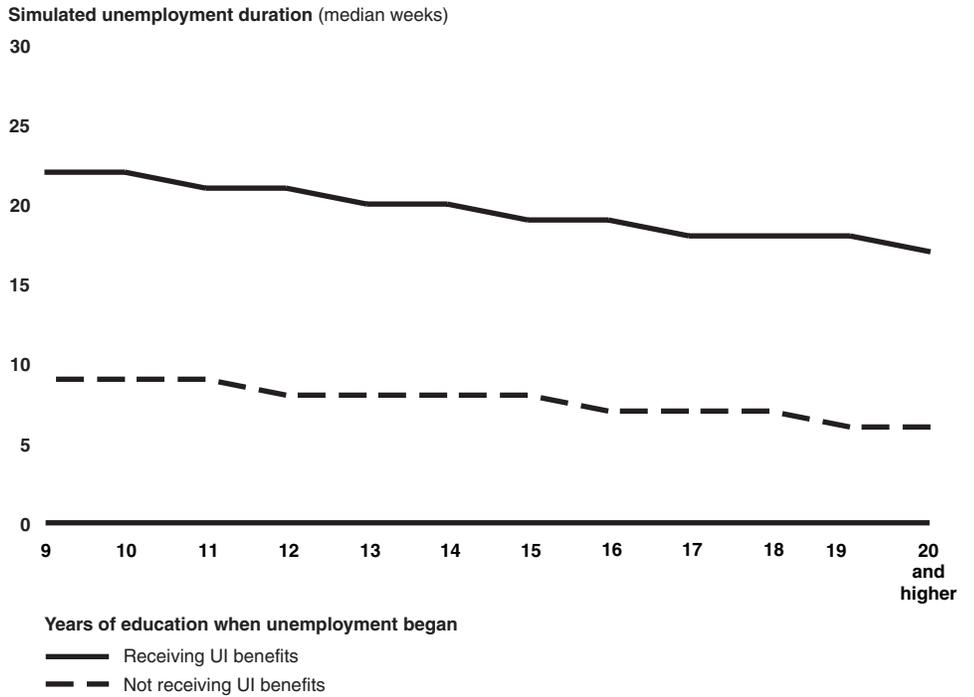
Our model estimates also indicate that unemployed workers who have more education tend to have shorter unemployment duration than otherwise similar workers with less education. For example, simulations show that on average, UI-eligible workers with a 4-year college education (16 years of schooling) who receive UI benefits remain unemployed about 2 weeks less than workers with a high school education (12 years of schooling).<sup>26</sup> (See fig. 7.) The results are similar for UI-eligible workers who do not receive UI benefits. This finding is consistent with past research indicating that less education is associated with longer unemployment duration, because workers with less education have fewer work-related skills.<sup>27</sup>

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<sup>26</sup>The average number of years of schooling completed by UI-eligible workers, at the time when they became unemployed, is 12 years.

<sup>27</sup>Needels and Nicholson, p. 6.

**Figure 7: Simulated Unemployment Duration for UI-Eligible Workers, by Education Level and UI Receipt Status**



Source: Simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment. Overall average duration is 21 weeks for UI-eligible workers receiving UI benefits and 8 weeks for UI-eligible workers not receiving UI benefits. See appendix I for methodology and estimation results.

Unemployed workers' race or ethnicity, gender, union membership status, and length of most recent job tenure are also associated with unemployment duration. Specifically, simulations show that UI-eligible workers who are African-American or women, who do not belong to labor unions, or who have less years of job tenure before becoming unemployed tend to have longer unemployment duration than otherwise similar workers. As seen in table 1, these associations exist whether or not workers receive UI benefits.

**Table 1: Simulated Unemployment Duration for UI-Eligible Workers by Current UI Receipt Status and Other Characteristics**

Worker characteristics	Unemployment duration (median weeks)	
	Receiving UI benefits	Not receiving UI benefits
<b>Race or ethnicity</b>		
White	19	8
Hispanic	21	8
African-American	25	11
<b>Gender</b>		
Male	20	8
Female	22	9
<b>Union membership status</b>		
Union member	19	8
Not a union member	21	9
<b>Tenure at most recent job<sup>a</sup></b>		
10 years	20	8
1 year	21	8
<b>Overall average duration</b>	<b>21</b>	<b>8</b>

Source: Simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment. See appendix I for methodology and estimation results.

<sup>a</sup>Simulated decreases in median weeks of unemployment are less than 1 week per additional year of tenure at most recent job, regardless of whether workers received UI or not.

Our findings are generally consistent with prior research. In particular, longer unemployment durations have been found to be associated with being African-American, female, or not belonging to a union.<sup>28</sup> Two possible explanations for the differences in employment outcomes for African-American workers include labor market discrimination, and limited access to social networks that may enable these workers to find jobs more quickly.<sup>29</sup> Likewise, longer unemployment duration among female workers may be due to labor market discrimination, or to

<sup>28</sup>See Needels and Nicholson.

<sup>29</sup>See Antoni Calvó-Armengol, and Matthew O. Jackson, “The Effects of Social Networks on Employment and Inequality,” *The American Economic Review*, Vol. 94, No. 3, (2004) for a discussion of the effects of individuals’ social networks on employment outcomes.

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differences in how they value paid work versus nonemployment activities, relative to men.<sup>30</sup> Likewise, the associations between shorter unemployment duration and union membership or longer job tenure may reflect the greater access of these workers to reemployment opportunities than otherwise similar workers or because of a greater likelihood of being recalled to their previous jobs.<sup>31</sup>

### Unemployment Duration Is Not Associated with Past UI Receipt

Past UI receipt has no significant effect on subsequent unemployment duration. Although receiving UI during a current period of unemployment is associated with longer unemployment duration, past UI receipt does not affect current unemployment duration. Specifically, simulations show that unemployment duration tends to decrease by about the same amount (typically, 1 week or less) from one unemployment period to the next, regardless of whether a worker received UI benefits in the past or not, and regardless of whether or not the worker receives UI benefits in the current period.

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### Certain Industries Are Associated with UI Benefit Receipt and Unemployment Duration

Unemployed workers in certain industries are more likely to receive UI benefits and experience shorter unemployment duration than otherwise similar workers from other industries. Simulations show that first-time unemployed workers from mining and manufacturing are more likely to receive UI than workers from other industries. Moreover, the strength of the association between past and current UI benefit receipt varies across industries. The increase in the likelihood of receiving UI from one unemployment period to the next is highest for public administration and is lowest for agriculture and construction. Furthermore, simulations indicate that UI-eligible workers from industries with higher proportions of unemployment periods that result in UI receipt are no more likely to become repeat UI recipients than workers from other industries. With respect to unemployment duration, UI-eligible workers from construction and manufacturing have shorter unemployment duration than workers from other industries.

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<sup>30</sup>See Needels and Nicholson, and GAO, *Women's Earnings: Work Patterns Partially Explain Differences between Men's and Women's Earnings*, [GAO-04-35](#) (Washington, D.C.: Oct. 31, 2003).

<sup>31</sup>See Needels and Nicholson. We did not control for the likely effect of an expected job recall.

## Unemployed Workers from Mining and Manufacturing Are More Likely to Receive UI Benefits

Unemployed workers from mining and manufacturing are more likely to receive UI than otherwise similar workers from other industries. For example, first-time unemployed workers from the manufacturing industry are about two-thirds more likely to receive UI benefits than workers from the professional and related services industry (see table 2). Although UI-eligible workers from mining are more likely to receive UI benefits than workers from other industries, just 2 percent of the unemployment periods that result in UI benefit receipt come from the mining industry. (See fig. 8.)<sup>32</sup>

**Table 2: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers from Different Industries**

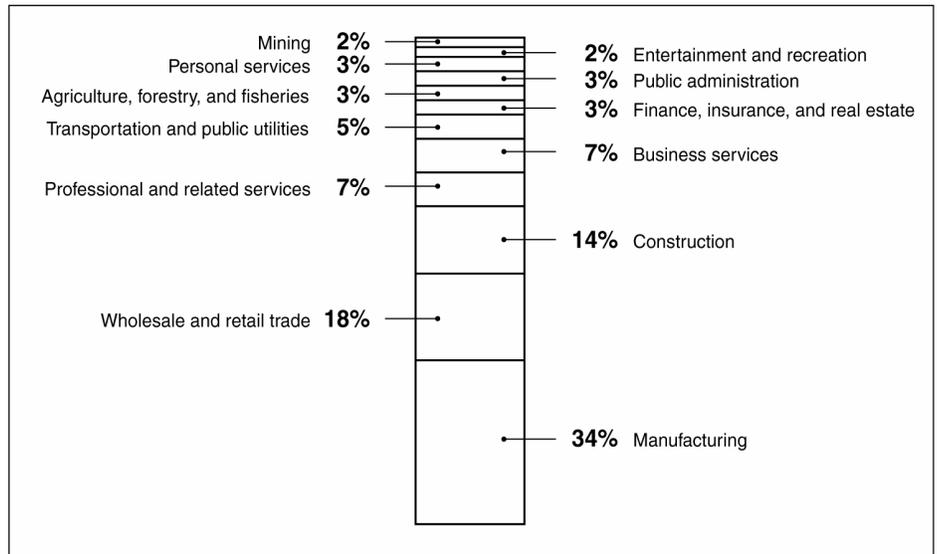
Industry	Simulated likelihood of receiving UI benefits (percent)
Mining	46
Manufacturing	40
Public administration	37
Wholesale and retail trade	35
Agriculture, forestry, and fishing	34
Business services	31
Construction	31
Finance, insurance, and real estate	31
Transportation and public utilities	29
Entertainment and recreation services	26
Professional and related services	24
Personal services	23
<b>All industries</b>	<b>33</b>

Source: Simulations based upon GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during first-time unemployment for workers from different industries. The parameter estimates for the mining, manufacturing, public administration, wholesale and retail trade, agriculture, forestry, and fishing, business services, and construction industries are statistically significant relative to the professional and related services industry at the 95 percent confidence level. See appendix I for methodology and estimation results.

<sup>32</sup>The percentages in table 2 and figure 8 are not comparable. The percentages in table 2 represent an individual worker's likelihood of receiving UI when UI-eligible unemployment occurs, whereas the percentages in figure 8 compare the relative proportions of unemployment spells with UI benefit receipt coming from different industries.

**Figure 8: Distribution of All Periods of UI Benefit Receipt across Industries**



Source: GAO analysis of NLSY79 data.

Note: Total does not equal 100 percent due to rounding.

### The Relationship between Past and Current UI Receipt Is Strongest for Public Administration

Unemployed workers who have received UI benefits in the past are more likely to receive UI benefits during a current period of unemployment than otherwise similar workers who never received UI benefits, across each industry (see table 3). However, the increase in the likelihood of receiving UI benefits associated with past UI benefit receipt is not the same across all industries. Specifically, this effect is strongest for workers from public administration and is weakest for workers from agriculture and construction.<sup>33</sup>

<sup>33</sup>Although the association between past UI receipt and current UI receipt is statistically significant for all industries combined, differences in this association among industries were statistically significant only for public administration, agriculture, and construction.

**Table 3: Simulated Likelihood of Receiving UI Benefits during Different Periods of UI-Eligible Unemployment for Workers with Past UI Receipt, by Industry**

Industry	Simulated likelihood of receiving UI benefits during current UI-eligible unemployment period, given past UI receipt (percent)		
	First unemployment period <sup>a</sup>	Second unemployment period	Third unemployment period
Mining	46	57	69
Manufacturing	40	52	65
Public administration	37	68	91
Wholesale and retail trade	35	52	70
Agriculture, forestry, and fishing	34	42	50
Business services	31	48	66
Construction	31	40	51
Finance, insurance, real estate	31	64	91
Transportation and public utilities	29	46	66
Entertainment and recreation services	26	45	67
Professional and related services	24	39	58
Personal services	23	38	56
<b>All industries</b>	<b>33</b>	<b>48</b>	<b>64</b>

Source: Simulations based upon GAO analysis of NLSY79 data.

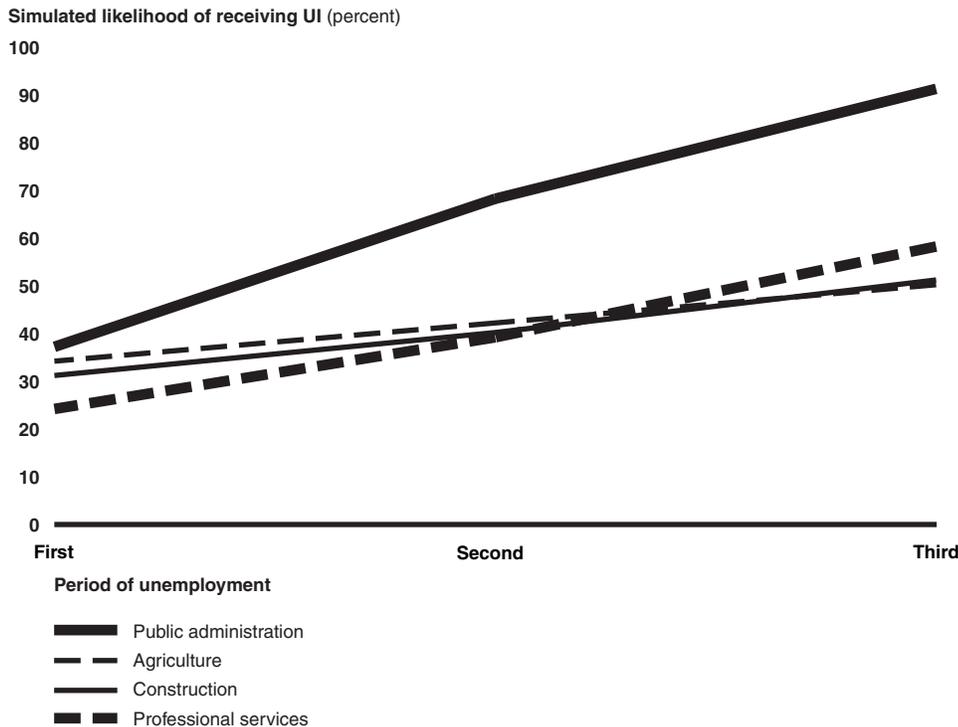
Note: Simulations are the average likelihood of receiving UI during a first unemployment period, a second unemployment period with UI receipt during the prior unemployment period, and a third unemployment period with UI receipt during both prior unemployment periods. The positive effect that each prior UI receipt period has on the likelihood of current UI receipt is statistically significantly larger for the public administration industry relative to the professional and related services industry at the 95 percent confidence level, and smaller for the agriculture and construction industries. The simulations also incorporate the industry effects and the industry interactions with the number of prior periods of unemployment. See appendix I for methodology and estimation results.

<sup>a</sup>Workers experiencing their first period of unemployment did not have past UI receipt.

These results show that although UI-eligible workers in some industries are more likely to receive UI benefits when they experience unemployment for the first time, their likelihood of receiving UI benefits again when they become unemployed a second or third time is not necessarily higher than it is for workers from other industries. For example, the likelihood of receiving UI benefits for workers from the manufacturing industry who are unemployed for the first time is relatively high—about 40 percent. This likelihood increases to 52 percent during a second period of unemployment for workers who have already received UI benefits, and to 65 percent during a third period of unemployment for workers who received UI each time they were unemployed. By comparison, the increase in the likelihood of receiving UI between the first

and third periods of unemployment is higher for most other industries, especially public administration. Specifically, the likelihood of receiving UI benefits for public administration workers who are unemployed for the first time is 37 percent. This likelihood increases to 69 percent during a second period of unemployment for workers who have already received UI, and to 92 percent during a third period of unemployment for workers who received UI each time they were unemployed. (See fig. 9.)

**Figure 9: Simulated Effect of Past UI Benefit Receipt on the Likelihood of Receiving UI in Subsequent Periods of Unemployment, for Selected Industries**



Source: Simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during a first unemployment period, second unemployment period with UI receipt during the prior unemployment period, and a third unemployment period with UI receipt during both prior unemployment periods. The positive effect that each prior UI receipt period has on the likelihood of current UI receipt is statistically significantly larger for the public administration industry relative to the professional and related services industry at the 95 percent confidence level, and smaller for the agriculture and construction industries. The simulations also incorporate the industry effects and the industry interactions with the number of prior periods of unemployment. See appendix I for methodology and estimation results.

Administrative unemployment insurance data have shown that repeat UI recipients tend to be from industries that are more seasonal, such as manufacturing and construction. Our results, however, suggest that this is

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not because workers with past UI receipt from these industries are more likely to receive UI benefits when they become unemployed than otherwise similar workers from other industries. Rather, it may be that workers from such seasonal industries are unemployed more often on average than workers from other industries, or that a larger proportion of unemployed workers from such industries have collected UI previously.

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### Unemployed Workers from Construction and Manufacturing Have Fewer Weeks of Unemployment

Unemployed workers from construction and manufacturing have shorter unemployment duration than otherwise similar workers from other industries. (See table 4.) Furthermore, simulations based on our model estimates show that differences in unemployment duration across industries exist whether or not UI benefits are received. Specifically, UI-eligible workers from construction who receive UI benefits have the fewest weeks of unemployment on average (17 weeks), when compared with workers from other industries. Likewise, UI-eligible workers from construction who do not receive UI benefits also have the fewest weeks of unemployment, on average (6 weeks).

**Table 4: Simulated Unemployment Duration for UI-Eligible Workers, by Industry and UI Receipt Status**

Industry	Simulated unemployment duration (median weeks)	
	Receiving UI benefits	Not receiving UI benefits
Construction	17	6
Mining	17	6
Business services	18	7
Manufacturing	19	7
Finance, insurance, and real estate	21	8
Wholesale and retail trade	22	9
Public administration	23	9
Professional and related services	24	10
Entertainment and related services	24	10
Personal services	24	10
Agriculture, forestry, and fishing	26	11
Transportation and public utilities	27	12
<b>Overall average duration</b>	<b>21</b>	<b>8</b>

Source: Simulations based upon GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment. The parameter estimates for the construction and manufacturing industries are statistically significant relative to the professional and related services industry at the 95 percent confidence level. See appendix I for methodology and estimation results.

### Certain Occupations Are Associated with UI Benefit Receipt and Longer Unemployment Duration

The likelihood of receiving UI benefits varies across occupations, but generally not as much as it does across industries. Specifically, UI-eligible managers are about one-fifth more likely to receive UI than otherwise similar transportation equipment operators, and one-half more likely to receive UI than professional and technical workers (see table 5).

**Table 5: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers from Different Occupations**

<b>Occupation</b>	<b>Simulated likelihood of receiving UI benefits (percent)</b>
Managers and administrators	39
Farmers, farm laborers, and foremen	38
Machine operators (nontransportation)	38
Craftsmen	35
Laborers (nonfarm)	34
Transportation equipment operators	33
Clerical and unskilled workers	33
Service workers (excluding private household)	28
Sales workers	28
Professional and technical workers	25
<b>Overall average</b>	<b>33</b>

Source: Simulations based upon GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during first-time unemployment for workers from different occupations. The parameter estimates for managers and administrators, farmers, farm laborers, and foremen, machine operators, craftsmen, laborers, transportation equipment operators, and clerical and unskilled workers are statistically significant relative to professional and technical workers at the 95 percent confidence level. See appendix I for methodology and estimation results.

UI-eligible workers who have received UI benefits in the past are more likely to receive UI benefits during a current period of unemployment than UI-eligible workers who never received UI benefits, across each occupation. Specifically, this effect is strongest for sales and service workers and weakest for transportation equipment operators and craftsmen (see table 6).<sup>34</sup>

<sup>34</sup>Although the association between past UI receipt and current UI receipt is statistically significant for all occupations combined, differences in this association among occupations were statistically significant only for sales and service workers, and for transportation equipment operators and craftsmen.

**Table 6: Simulated Likelihood of Receiving UI Benefits during Different Periods of UI-Eligible Unemployment for Workers with Past UI Receipt, by Occupation**

Occupation	Simulated likelihood of receiving UI benefits during current UI-eligible unemployment period, given past UI receipt (percent)		
	First unemployment period <sup>a</sup>	Second unemployment period	Third unemployment period
Managers and administrators	39	52	65
Farmers, farm laborers, and foremen	38	54	70
Machine operators (nontransportation)	38	50	62
Craftsmen	35	46	56
Laborers (nonfarm)	34	45	58
Transportation equipment operators	33	42	51
Clerical and unskilled workers	33	53	73
Service workers (excluding private household)	28	50	74
Sales workers	28	66	94
Professional and technical workers	25	39	56
<b>Overall average</b>	<b>33</b>	<b>48</b>	<b>64</b>

Source: Simulations based upon GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during a first unemployment period, a second unemployment period with UI receipt during the prior unemployment period, and a third unemployment period with UI receipt during both prior unemployment periods. The positive effect that each prior UI receipt period has on the likelihood of current UI receipt is statistically significantly larger for sales workers and service workers relative to professional and technical workers at the 95 percent confidence level, and smaller for transportation equipment operators and craftsmen. The simulations also incorporate the occupation effects and the occupation interactions with the number of prior periods of unemployment. See appendix I for methodology and estimation results.

<sup>a</sup>Workers experiencing their first period of unemployment did not have past UI receipt.

Unemployment duration also varies across occupations. UI-eligible professional and technical workers have longer unemployment duration than otherwise similar workers from other occupations. Specifically, professional and technical workers have unemployment duration that is 5 weeks longer than average for workers receiving UI and 3 weeks longer than average for workers not receiving UI (see table 7).<sup>35</sup> Past experience with UI benefit receipt has no significant effect on unemployment duration, regardless of a worker's occupation.

<sup>35</sup>The largest differences between industries in median weeks of unemployment are 10 weeks for workers receiving UI and 5 weeks for workers not receiving UI.

**Table 7: Simulated Unemployment Duration for UI-Eligible Workers, by Occupation and UI Receipt Status**

Occupation	Simulated unemployment duration (median weeks)	
	Receiving UI benefits	Not receiving UI benefits
Craftsmen	16	6
Sales workers	18	7
Machine operators (nontransportation)	19	7
Transportation equipment operators	20	8
Laborers (nonfarm)	20	8
Service workers (excluding private household)	23	9
Managers and administrators	23	9
Clerical and unskilled workers	23	10
Farmers, farm laborers, and foremen	26	11
Professional and technical workers	26	11
<b>Overall average duration</b>	<b>21</b>	<b>8</b>

Source: Simulations based upon GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment for workers from different occupations. The parameter estimates for craftsmen and machine operators are statistically significant relative to professional and technical workers at the 95 percent confidence level. See appendix I for methodology and estimation results.

## Concluding Observations

Although the UI program has existed for over 70 years and serves millions of workers each year, little is known about workers who receive UI benefits on a recurring basis or about workers who are eligible for UI benefits but never receive them. We found that UI-eligible workers during the first half of their working lives with certain demographic characteristics and from certain industries have a greater likelihood of receiving UI benefits multiple times and experiencing longer unemployment durations than otherwise similar workers. Although our results are generally consistent with past research, our analysis includes additional information about workers' past experiences that provides new insight into the factors that distinguish workers who receive UI benefits from those who do not. In fact, the single most important factor associated with eligible workers receiving benefits is whether or not they received benefits during previous unemployment, suggesting that a worker's perception of UI when they are faced with unemployment is key to whether that worker will ever use the program. Moreover, it does not

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appear that previous UI recipients from industries where UI benefit receipt is more likely, such as construction and manufacturing, are any more likely to receive benefits if unemployed again than similar workers from other industries. Rather, it appears that workers from these industries are simply more likely to face the choice of whether or not to file for UI benefits more often than their counterparts in other industries. In addition, while the patterns for UI receipt and unemployment duration we identified for this group during the first half of their working lives may not change significantly as they enter the second half of their working lives, it remains to be seen whether the issues they face in the years leading up to their retirement will reshape their use of the UI program.

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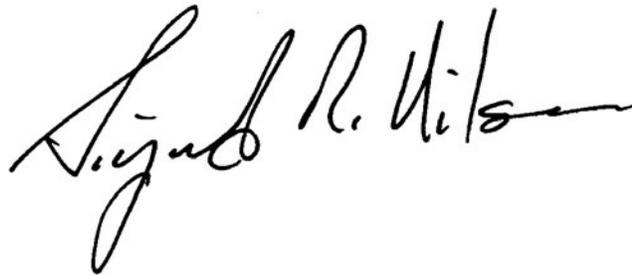
## Agency Comments

We provided a draft of this report to Labor officials for their review and comment. Labor applauded GAO's efforts to determine the extent to which an individual worker's characteristics are associated with the likelihood of UI benefit receipt and with unemployment duration and noted that the study adds to current knowledge of the UI program, particularly with regard to the impact of past UI benefit receipt on current UI receipt. However, Labor also noted that there are several issues related to our methodology that may limit the utility of our findings for policymaking. While we agree that there are limitations inherent in our methodology, we believe that these limitations have been noted throughout the report, and that they do not compromise the overall validity of our results. Nevertheless, we have provided additional clarifications, as appropriate, to address Labor's technical comments.

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As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from its date. At that time, we will send copies of this report to relevant congressional committees, the Secretary of Labor, or other interested parties. We will also make copies available to others upon request. The report will be available at no charge on GAO's Web site at <http://www.gao.gov>. If you or members of your staff have any questions about this report, please contact me at (202) 512-7215. Other major contributors are listed in appendix III.

Sincerely yours,

A handwritten signature in black ink, reading "Sigurd R. Nilsen". The signature is written in a cursive style with a long, sweeping underline.

Sigurd R. Nilsen, Director  
Education, Workforce and  
Income Security Issues

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# Appendix I: Analysis of UI Benefit Receipt and Unemployment Duration

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## Overview

We analyzed the factors affecting unemployment insurance (UI) benefit receipt by statistically modeling the determinants of UI benefit receipt and unemployment durations simultaneously. We model UI benefit receipt in conjunction with unemployment durations to allow for correlations that may exist between the two outcomes for a given individual. For example, an unemployed person anticipating a lengthy unemployment period might be more likely to receive UI benefits than a person expecting a short unemployment period. Alternatively, the receipt of UI benefits may lengthen an unemployment period by allowing an individual to spend more time looking for new employment. In addition, our model controls for a number of observable factors about each unemployed worker's situation, including recent employment experience, prior unemployment and UI benefit receipt experience, information about UI program factors, including benefit levels, and demographic characteristics. The model was developed and estimated by Dr. Brian McCall, Professor of Human Resources and Industrial Relations, University of Minnesota, under contract to GAO.

This appendix describes (1) the data used in the analysis, including how the data were prepared, (2) the econometric model that was estimated, (3) the results from two specifications of the econometric model, and (4) the limitations inherent in the analysis.

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## Data Used

We used the Bureau of Labor Statistics' (BLS) National Longitudinal Survey of Youth 1979 (NLSY79) for our analysis. The NLSY79 is an ongoing longitudinal survey of individuals who were between the ages of 14 and 22 in 1979, the first year of the survey.<sup>1</sup> A primary focus of the NLSY79 is on individuals' labor force patterns, and the data are collected at a very detailed level. This detail allows us to track the weekly employment, unemployment, and earnings histories of the individuals in the sample. The NLSY79 also contains less detailed information about individuals' UI receipt during unemployment.<sup>2</sup> The NLSY79 does not contain direct information about an individual's UI eligibility status, which is a function of previous employment and earnings, among other things, and varies by

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<sup>1</sup>NLSY79 data begin in 1978. Interviews for the NLSY79 were conducted annually until 1994, and biennially beginning in 1996. We used data through 2002, which were the most recent NLSY79 data available.

<sup>2</sup>UI receipt information is provided on a monthly basis in the NLSY79. Because this information is only given on a monthly basis, it cannot be used to accurately measure the number of weeks of UI receipt during unemployment.

state of employment.<sup>3</sup> We estimate an unemployed individual's UI eligibility status using data that are available in the NLSY79.

There are three main reasons why the NLSY79 database provides the most suitable data for our analysis. First, the longitudinal nature and level of detail of the data allow us to control for an individual's history of unemployment and UI receipt, which is a major contribution of this work. Second, respondents were first surveyed at a young age, which reduces the likelihood that we do not observe periods of unemployment and UI receipt early in a person's working career. Third, the detailed data allow us to estimate an individual's UI eligibility status, allowing us to focus our analysis on unemployed individuals whom we estimated to be eligible for UI benefits while also reasonably controlling for differences in UI program rules across states. A few limitations to the NLSY79 database should be mentioned. First, the sample began with 12,686 individuals in 1979, but has decreased in size over time due to attrition.<sup>4</sup> Second, the data are self-reported and thus subject to recall error. We assessed the reliability of the NLSY79 data by interviewing relevant BLS officials, reviewing extensive NLSY79 documentation, and performing electronic tests of the NLSY79 data for missing or corrupt information that might negatively affect our analysis. On the basis of these reviews and tests, we determined that the data were sufficiently reliable to be used in our analysis.

We considered using administrative state UI data as an alternative to the NLSY79. Although such administrative data could provide information about all UI recipients in a state, these data could not provide information about UI-eligible unemployed workers who did not receive benefits. Also, because these data are not designed for research purposes, there is limited information available about individuals that can be used to control for differences, such as demographic characteristics. Finally, there is also no nationally representative data source for administrative UI data.

For each individual in the NLSY79 database, we created a detailed weekly history of employment and unemployment, including whether UI benefits

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<sup>3</sup>State UI programs determine eligibility using a number of criteria, including the following conditions: (1) the unemployment must be the result of a job loss that was not caused by the individual, (2) the individual must have earned a specified amount of money during the time preceding the unemployment, and (3) the individual must be actively looking for new employment.

<sup>4</sup>See Center for Human Resource Research, Ohio State University, *The National Longitudinal Surveys NLSY79 User's Guide*, prepared for the Department of Labor, 2002.

were received during unemployment. Our definition of unemployment is not the strict definition used in the BLS's Current Population Survey (CPS). We define unemployment to include both the weeks in which an out-of-work person is looking for work (the standard CPS unemployment definition) and the weeks during which the individual reports being out of the labor force (OLF). We did require that an individual spend at least 1 week actively looking for work after a job loss to reduce the likelihood that the person had permanently left the labor force. Other research has addressed the effect that the UI program plays on the percentage of weeks of nonemployment that a person reports that he or she was looking for work.<sup>5</sup>

For each unemployment period experienced by an individual, we estimate the person's UI eligibility status. Although states determine UI eligibility using a number of criteria, we focus on the following three: (1) the unemployment must be the result of a job loss that was not caused by the individual, (2) the individual must have earned a specified amount of money during the time preceding the unemployment, and (3) the individual must be actively looking for new employment. The NLSY79 provides the information necessary to estimate whether these criteria are met by an unemployed individual. For criterion 1, the NLSY79 provides information about the reason that a job was lost. Only those unemployed individuals who lost a job through no fault of their own were deemed to be UI-eligible.<sup>6</sup> For the monetary eligibility criterion 2, we compiled a detailed set of UI eligibility and benefit criteria for each of the 50 states and the District of Columbia over the period 1978 to 2002.<sup>7</sup> When these criteria

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<sup>5</sup>R. Mark Gritz and Thomas MaCurdy, "Measuring the Influence of Unemployment Insurance on Unemployment Experiences," *Journal of Business and Economic Statistics*, vol. 15, no. 2, (1997), examined the role that UI rules have on an individual's choice to report himself or herself as unemployed (CPS definition) as opposed to out of the labor force. They found that, in addition to having longer nonemployment periods, UI recipients report being unemployed in the CPS sense for a greater proportion of their nonemployment period.

<sup>6</sup>It appeared from the NLSY79 data that a number of respondents did not differentiate between being laid off and being discharged or fired. As a result, we include those who report being either laid off or discharged or fired as satisfying the first UI eligibility rule. The NLSY79 reports a number of other reasons for leaving a job, including having found better work, low pay, pregnancy, illness, change of job by spouse or parents, other family reasons, job's interference with school, the end of a program, bad working conditions, and entrance into the armed forces.

<sup>7</sup>See U.S. Department of Labor. Employment and Training Administration, *Significant Provisions of State Unemployment Insurance Laws* (Washington, D.C., 1979-2002).

were combined with the NLSY79's detailed employment and earnings histories, we were able to determine monetary eligibility for UI with reasonable accuracy, as well as the weekly benefit amount and the number of weeks of benefits a person was eligible to receive.<sup>8</sup> For criterion 3, we considered as UI-eligible only those unemployed individuals who reported actively looking for work during at least 1 week of their unemployment. We erred on the side of overestimating the eligibility based on criterion 3, because individuals who self-report information about nonemployment may not fully realize the impact that "looking for work" versus "being out of the labor force" has on UI eligibility, especially if they did not receive UI benefits. Although this estimation method is not perfect, we believe that it captures some of the most important features of UI eligibility. It is similar to the methods used by other researchers.<sup>9</sup>

In addition to estimating the UI eligibility status of individuals at the time of each of their unemployment periods, we also created the other variables used in our analysis. The empirical model outlined in the following subsection focuses on UI benefit receipt and unemployment duration. UI benefit receipt during unemployment was determined using the monthly measure provided in the NLSY79.<sup>10</sup> The duration of unemployment, as defined above, is measured in weeks from the week after a job was lost to the week a new job was begun. We censor duration to be no longer than 100 weeks.

To isolate the impact that a variable has on the likelihood of UI benefit receipt and unemployment duration, our model controls for a great number of other factors that were observable at the start of, and throughout, the person's unemployment. One set of variables relates to the employment experience of the individual immediately preceding unemployment, including industry and occupation of the lost job (measured at the one-digit Standard Industrial Classification [SIC] and

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<sup>8</sup>Although UI eligibility is based upon the rules in the state where an individual is employed, we used state of residence for our estimates because state of employment was not available in the NLSY79. Thus, people who work in one state but live in another may not be classified correctly. However, we believe that only a small percentage of such data are classified incorrectly and, thereby, our results should be only minimally affected.

<sup>9</sup>See Gritz and MaCurdy, 1997, and McCall 2000 for examples.

<sup>10</sup>We consider only an individual's first period of unemployment with UI receipt during a person's "benefit year." A benefit year is the 52-week period during which UI benefits can be claimed.

Standard Occupational Classification [SOC] level), union status and tenure at the job lost, earnings (base period earnings [BPE] and high quarter earnings [HQE]), whether the job was lost because of a plant closing, and the calendar year and month the unemployment began.<sup>11</sup> We group both earnings measures into brackets to allow for nonlinear effects. All dollar values are adjusted for inflation to 2002 dollars using the BLS's Consumer Price Index for All Urban Consumers (CPI-U). We also control for the state unemployment rate during the month that unemployment began, and, in the duration equation, for the time-varying state monthly unemployment rate over the period of unemployment.

A second set of variables summarizes UI program factors, such as the weekly benefit amount (WBA) a person is eligible to receive, the number of weeks of benefits a person is eligible to receive, whether the state has a waiting period before benefits can be received, and whether permanent or temporary extended benefits are in effect.<sup>12</sup> We also control for the percentage of new UI claims that are denied by a state (in the receipt equation) and the percentage of continuing UI claims that are denied by a state (in the duration equation). In the unemployment duration equation, we also allow the parameter estimates for WBA, remaining weeks of benefits, and extended benefits to vary over the period of unemployment. This is done by interacting these variables with a cubic function of the number of weeks unemployed. Again, all dollar values are adjusted for inflation to 2002 dollars using the BLS's CPI-U.

A third group of variables relates to a person's history of unemployment and UI benefit receipt as measured at the start of an unemployment period. This group of variables includes the number of times the person had been unemployed and the number of times a person had received UI benefits previously (in the receipt equation) and whether or not the person had been unemployed and whether or not the person had received UI benefits previously (in the duration equation). We also interact these variables with industry and occupation dummy variables to investigate whether previous unemployment and UI receipt affect the likelihood of

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<sup>11</sup>The base period is the period of time during which earnings are counted toward UI eligibility. It generally covers a year. We define the base period as the first four of the last five completed calendar quarters. High quarter earnings refers to the quarter of highest earnings during the base period.

<sup>12</sup>Permanent extended benefits are triggered by high unemployment rates in a state, and provide for up to 13 additional weeks of benefits to UI-eligible individuals. Temporary extended benefits are available periodically, as authorized by Congress.

current UI receipt and unemployment durations differently across industries. These interactions with industry and occupation are done in separate specifications of the model.

A fourth group of variables relates to a person's demographic characteristics at the time of unemployment. These include age, race, gender, marital status, number of years of schooling, health limitations, whether a spouse has used UI previously, family size, number of children, number of children between the ages of 0 and 2, whether the person lives with his or her parents, state of residence, and whether the person lives in a Standard Metropolitan Statistical Area (SMSA) as opposed to a rural area.

We limit our analysis to the nonmilitary sample of NLSY79 respondents.<sup>13</sup> In addition, we drop individuals with insufficient information to estimate UI eligibility with reasonable accuracy. Data for an individual were included up to their first missed interview.<sup>14</sup> Individuals without any unemployment, and those without unemployment that was estimated to be UI-eligible, were not used in the analysis. Also, individuals who were missing data required by our econometric model were not used in the analysis. This yielded a sample of 5,631 individuals who had been unemployed and eligible for UI benefits at least once, resulting in a total of 15,506 separate periods of UI-eligible unemployment.

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## Econometric Model

To investigate the key factors associated with UI benefit receipt, including the role of prior UI benefit receipt (repeat UI reciprocity), we used a dynamic econometric model that jointly determines UI benefit receipt and unemployment duration. As mentioned above, the reason for modeling these outcomes jointly is to allow for the likely correlations that exist between them.<sup>15</sup> In addition to modeling UI receipt and unemployment duration jointly, our model allows prior unemployment and prior UI

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<sup>13</sup>The NLSY79 began with 12,686 individuals in 1979, 1,280 of whom were part of the military subsample. The majority of the military subsample of the NLSY79 was eliminated in 1985.

<sup>14</sup>The NLSY79 attempts to reconnect with individuals that missed an interview in the previous year.

<sup>15</sup>For one example of an economic model of how the receipt of UI benefits can affect the expected length of unemployment by affecting a person's reservation wage, see Mortensen.

receipt to influence current UI receipt and unemployment duration to allow for the correlations that possibly exist over time for an individual.

We used a complementary log-log specification to model the probability of UI receipt during an individual's kth unemployment period,  $k=1, \dots, K$ , as:

$$\Pr[UI(k) = 1 | \mathbf{x}^u(k), \xi^u, \mathbf{z}^u(k)] = 1 - \exp(-\xi^u \exp[\mathbf{x}^u(k)' \boldsymbol{\beta}^u + \mathbf{z}^u(k)' \boldsymbol{\gamma}^u]),$$

where  $\mathbf{x}^u(k)$  is a vector of exogenous variables measured at the start of the kth unemployment period, all of which are assumed to be independent of the unobserved random variable  $\xi^u$ , which helps control for unobserved heterogeneity. Variables in  $\mathbf{x}^u(k)$  include demographic characteristics, characteristics about the lost job, and UI program information. The vector  $\mathbf{z}^u(k)$  is a vector of endogenous variables pertaining to past unemployment and past UI benefit receipt, which are measured at the start of an individual's kth unemployment period and may be correlated to  $\xi^u$ .

We modeled unemployment durations using a discrete-time hazard function, which gives the probability of an event occurring during a discrete time period, conditional upon not having experienced the event prior to that time. This can be thought of as the escape rate from unemployment during a specific time period. We assume that the conditional probability that an individual's kth period of unemployment ends in the interval  $(m-1, m]$ , given that it exceeds  $m-1$ , where  $m$  indexes the number of weeks, follows a complementary log-log specification:

$$\Pr[d(k) = m | \mathbf{x}^d(k), \xi^d, \mathbf{z}^d(k)] = 1 - \exp(-\xi^d \exp[\mathbf{x}^d(k)' \boldsymbol{\beta}^d + \mathbf{z}^d(k)' \boldsymbol{\gamma}^d + \alpha_m^d]),$$

for  $m=1, \dots, M$ , and where  $\mathbf{x}^d(k)$  is a vector of exogenous variables measured at the start of the kth unemployment period, all of which are assumed to be independent of the unobserved random variable  $\xi^d$ , which helps control for unobserved heterogeneity. Variables in  $\mathbf{x}^d(k)$  include demographic characteristics, characteristics about the lost job, and UI program information. The vector  $\mathbf{z}^d(k)$  consists of endogenous variables pertaining to current UI benefit receipt, past unemployment, and past UI benefit receipt, which are measured at the start of an individual's kth

unemployment period and may be related to  $\xi^d$ . The parameter vector  $\boldsymbol{\alpha}^d = (\alpha_1^d, \alpha_2^d, \dots, \alpha_M^d)$  is the baseline hazard function.

Letting  $i, i = 1, \dots, I$ , index individuals and  $k$  index an individual's unemployment periods, we define  $q_i(k)$  to be equal to 1 when individual  $i$  has a  $k$ th unemployment period, and 0 otherwise. Also, we define  $c_i(k)$  to be equal to 1 when individual  $i$ 's  $k$ th unemployment period is complete, and 0 otherwise. Using this notation, individual  $i$ 's contribution to the likelihood function can be written:

$$\begin{aligned} L_i(\boldsymbol{\theta}, \xi^u, \xi^d) &= \prod_{k=1}^{K_i} \left\{ \left( \Pr[UI_i(k) = 1 \mid \mathbf{x}_i^u(k), \xi_i^u, \mathbf{z}_i^u(k)] \right)^{UI_i(k)} \right. \\ &\times \left( 1 - \Pr[UI_i(k) = 1 \mid \mathbf{x}_i^u(k), \xi_i^u, \mathbf{z}_i^u(k)] \right)^{1-UI_i(k)} \\ &\times \left( \prod_{m=1}^{d_i(k)-1} \left( 1 - \Pr[d_i(k) = m \mid \mathbf{x}_i^d(k), \xi_i^d, \mathbf{z}_i^d(k)] \right) \right) \\ &\times \left. \left( \Pr[d_i(k) \mid \mathbf{x}_i^d(k), \xi_i^d, \mathbf{z}_i^d(k)] \right)^{c_i(k)} \right\}^{q_i(k)} \end{aligned}$$

where the vector of parameters  $\boldsymbol{\theta}$  is to be estimated and contains  $\boldsymbol{\beta}^j, \boldsymbol{\gamma}^j, \xi^j$ , and  $\boldsymbol{\alpha}^d$ , where  $j = d, u$ . We assume that the distribution of the unobserved random variables  $(\xi^d, \xi^u)$  is such that there are 3 different types of individuals in the population, with the fraction of each type equal

to  $p_h$ , where:  $\sum_{h=1}^3 p_h = 1$ . Combining these possibilities, we write an

individual's likelihood contribution as:  $L_i(\boldsymbol{\theta}, \mathbf{p}) = \sum_{h=1}^3 p_h L_i(\boldsymbol{\theta}, \xi_h^u, \xi_h^d)$ ,

where  $\mathbf{p} = (p_1, p_2, p_3)'$ . Taking logarithms and summing over all individuals yields the full log likelihood function for the sample:

$$\log L(\boldsymbol{\theta}, \mathbf{p}) = \sum_{i=1}^I \log L_i(\boldsymbol{\theta}, \mathbf{p})$$
. This likelihood is computed in FORTRAN and maximized using the BHHH algorithm.<sup>16</sup>

A number of features outlined above are simplifications of a more general version of this model, and were introduced to help reduce the number of parameters to be estimated by the model. First, the baseline hazard function,  $\boldsymbol{\alpha}^d$ , was assumed to be independent of the unemployment period number,  $k$ . Second, the parameters associated with the exogenous ( $\boldsymbol{\beta}^j$ ,  $j = d, u$ ) and endogenous ( $\boldsymbol{\gamma}^j$ ,  $j = d, u$ ) variables were assumed to be independent of the unemployment period number,  $k$ . Third, the unobserved random variables ( $\boldsymbol{\xi}^j$ ,  $j = d, u$ ) were assumed to be independent of the unemployment period number,  $k$ . Although this assumption is not as general as allowing each individual to have different unobserved components over time, it does help control for unobserved differences between individuals that may influence UI receipt and unemployment durations.

Because of the complexity of the empirical model outlined above, interpreting the parameter estimates is difficult.<sup>17</sup> As a result, we use the output from the model to simulate the effect that changes in certain variables have on the likelihood of UI receipt and the duration of unemployment for the average unemployed person in our sample. For example, to understand differences in UI receipt and unemployment durations by industry, we simulate the likelihood of UI benefit receipt and unemployment duration for the average person in our sample for each of the possible industries, and then compare the results. To do this, we use the model's output to calculate every person's likelihood of UI receipt and escape rate from unemployment—conditional upon receiving and not receiving UI—assuming all were in the first industry grouping when they lost their job. Averaging over all individuals yields the average probability

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<sup>16</sup>See E. K. Berndt, B. H. Hall, R. E. Hall, and J. A. Hausman, "Estimation and Inference in Nonlinear Structural Models," *Annals of Economic and Social Measurement*, vol. 3, no. 4 (1974). The BHHH algorithm is a quasi-Newton method for finding maximums.

<sup>17</sup>In addition to being a highly nonlinear model, the data were all normalized to help the convergence of the parameter estimates.

of UI receipt and the averaged (week by week) survivor function.<sup>18</sup> The averaged survivor function can be used to compute the expected median duration of unemployment.<sup>19</sup> We then repeat this process, successively, assuming that all individuals were in another industry grouping when they lost their jobs, until all industry groups have been simulated.

The simulated average likelihood of UI benefit receipt and median unemployment duration can then be compared across industries to estimate the differences by industry. Using all individuals for each simulation, and reporting results for the average unemployed person, helps insure that differences in the simulation results (e.g., industry 1 versus industry 2) reflect only the variables (industry 1, industry 2) being simulated.<sup>20</sup> To describe results that are not related to past experience with unemployment and UI benefit receipt, we present simulations that are specific to first-time unemployment—a simple and clearly defined scenario (the observable trends also hold for unemployed individuals with prior unemployment and UI receipt experience).

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## Results

We report parameter estimates from two specifications of our model. The first specification includes interaction terms between industry and our measures of past UI benefit receipt and past unemployment. These results are presented in tables 8 and 9 for the UI benefit receipt equation and the unemployment duration equation respectively. The second specification includes interaction terms between occupation and our measures of past UI benefit receipt and past unemployment. These results are presented in tables 10 and 11 for the UI benefit receipt equation and the unemployment duration equation respectively. We included the industry and occupation interactions in separate specifications to avoid the issues brought about by

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<sup>18</sup>The survivor function at time  $t$  for an event is the probability of not having experienced that event prior to time  $t$ . The survivor function is mathematically related to the escape rate (hazard rate).

<sup>19</sup>We chose median rather than mean because of the skewed nature of our unemployment duration data.

<sup>20</sup>For our simulations, if we used only those individuals that reported losing a job from a specific industry, as opposed to using all individuals, it is likely that a portion of the differences we would observe in the likelihood of UI benefit receipt and unemployment duration would be due to differences in other observable factors between the individuals from the different industry groups. For example, it may be that professional services workers have higher average earnings than agricultural workers, which would be earnings effect, not an industry-specific effect.

multicollinearity.<sup>21</sup> Because the results for the noninteraction terms are similar between the two specifications, we focus on those from the industry-interaction specification (tables 8 and 9). After discussing these results, we discuss the results for the occupation-interaction specification (tables 10 and 11).

Tables 8, 9, 10, and 11 are structured as follows. The first column in each table lists the variable names; the second column, the parameter estimates; the third column, the estimated standard errors; and the fourth column, the t-statistics. The last column contains asterisks that signify statistical significance. One asterisk (\*) signifies statistical significance at the 90 percent confidence level (t-statistics greater than or equal to 1.65 in absolute value); two asterisks signify statistical significance at the 95 percent confidence level (t-statistics greater than or equal to 1.96 in absolute value) and three asterisks (\*\*\*) signify statistical significance at the 99 percent confidence level. Parameter estimates discussed below are statistically significantly different from zero at the 95 percent confidence level unless stated otherwise.<sup>22</sup> To conserve space, the tables do not present the parameter estimates for the unobserved heterogeneity ( $\xi^d$  and  $\xi^u$ ), state, year, and month effects.

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<sup>21</sup>We also tried running a specification of the model that included these interactions for both industry and occupation. The parameter estimates and simulations were generally similar to those for the two separate specifications, but much of the statistical significance for individual parameters was lost due to the correlation between industry and occupation. However, a likelihood ratio test of the joint hypothesis that the interaction terms for both industry and occupation are all equal to zero is rejected at the 95 percent confidence level, suggesting that there are both industry-specific and occupation-specific differences in the effects of past unemployment and past UI receipt on the likelihood of current UI receipt and current unemployment duration.

<sup>22</sup>A statistically insignificant result indicates that the effect of a characteristic could not be precisely estimated using the sample data, and does not necessarily prove that the characteristic is unimportant.

**Appendix I: Analysis of UI Benefit Receipt  
and Unemployment Duration**

**Table 8: Parameter Estimates for UI Receipt Equation from Industry-Interaction Specification**

	Parameter estimate	Standard error	t-statistic	
<b>Past unemployment and UI receipt</b>				
Number of previous UI receipt spells	0.714	0.086	8.26	***
Number of previous unemployment spells	-0.072	0.017	-4.27	***
<b>Industry</b>				
Agriculture, forestry, and fishing	0.438	0.211	2.07	**
Mining	0.868	0.242	3.59	***
Construction	0.294	0.135	2.17	**
Manufacturing	0.672	0.108	6.20	***
Transportation and public utilities	0.221	0.162	1.36	
Wholesale and retail trade	0.475	0.109	4.36	***
Finance, insurance, and real estate	0.292	0.174	1.68	*
Business services	0.310	0.142	2.19	**
Personal services	-0.077	0.198	-0.39	
Entertainment and recreation services	0.104	0.226	0.46	
Public administration	0.560	0.188	2.98	***
Valid missing	-0.030	0.095	-0.31	
<b>Occupation</b>				
Managers and administrators	0.614	0.100	6.15	***
Sales workers	0.122	0.138	0.88	
Clerical and unskilled workers	0.296	0.088	3.39	***
Craftsmen	0.261	0.092	2.85	***
Machine operators (nontransportation)	0.187	0.090	2.07	**
Transportation equipment operators	0.244	0.115	2.12	**
Laborers (nonfarm)	0.075	0.101	0.75	
Farmers, farm laborers, and foremen	0.134	0.191	0.70	
Service workers (excluding private household)	0.081	0.092	0.88	
<b>Industry * number previous UI receipt spells</b>				
Agriculture, forestry, and fishing	-0.301	0.101	-2.97	***
Mining	-0.115	0.201	-0.57	
Construction	-0.229	0.091	-2.53	**
Manufacturing	-0.160	0.093	-1.72	*
Transportation and public utilities	0.033	0.120	0.27	
Wholesale and retail trade	0.010	0.109	0.10	
Finance, insurance, and real estate	0.565	0.344	1.64	
Business services	-0.005	0.122	-0.04	

**Appendix I: Analysis of UI Benefit Receipt  
and Unemployment Duration**

	<b>Parameter estimate</b>	<b>Standard error</b>	<b>t-statistic</b>	
Personal services	-0.011	0.161	-0.07	
Entertainment and recreation services	0.160	0.227	0.70	
Public administration	0.487	0.239	2.04	**
Valid missing	0.158	0.098	1.61	
<b>Industry * number of previous unemployment spells</b>				
Agriculture, forestry, and fishing	-0.043	0.035	-1.23	
Mining	-0.129	0.056	-2.29	**
Construction	-0.040	0.022	-1.83	*
Manufacturing	-0.057	0.019	-2.97	***
Transportation and public utilities	-0.001	0.028	-0.02	
Wholesale and retail trade	-0.047	0.020	-2.30	**
Finance, insurance, and real estate	-0.013	0.032	-0.41	
Business services	-0.012	0.025	-0.48	
Personal services	0.023	0.035	0.65	
Entertainment and recreation services	-0.052	0.045	-1.15	
Public administration	-0.061	0.040	-1.54	
Valid missing	-0.061	0.021	-2.90	***
<b>UI program variables</b>				
Weekly benefit amount (WBA)	0.064	0.058	1.09	
Potential UI benefit duration	-0.623	0.592	-1.05	
Waiting week for UI benefits	0.053	0.124	0.43	
Denial rate for new UI claims	-1.448	0.836	-1.73	*
Extended UI benefits in effect	0.133	0.097	1.36	
<b>Personal characteristics</b>				
Years of education	0.569	0.128	4.44	***
Armed Forces Qualifying Test score	-0.295	0.097	-3.06	***
African-American	0.005	0.059	0.08	
Hispanic	-0.084	0.086	-0.98	
Hispanic * male	0.225	0.098	2.30	**
Married	0.167	0.050	3.35	***
Age	20.541	4.510	4.55	***
Age-squared	-41.787	8.035	-5.20	***
Male	-0.357	0.051	-7.01	***
Lives in SMSA (urban)	-0.111	0.050	-2.24	**
Health limitations	0.041	0.110	0.38	
Spouse used UI in past	0.270	0.100	2.70	***

**Appendix I: Analysis of UI Benefit Receipt  
and Unemployment Duration**

	<b>Parameter estimate</b>	<b>Standard error</b>	<b>t-statistic</b>	
Spouse used UI in past * male	-0.688	0.173	-3.97	***
Live with parents	-0.160	0.097	-1.65	*
Family size	-0.478	0.177	-2.71	***
Live with parents * family size	0.572	0.231	2.47	**
Children under age 2	0.091	0.060	1.51	
Number of children	-0.017	0.025	-0.68	
<b>Recent employment experience</b>				
Union member	-0.003	0.048	-0.05	
Tenure	0.140	0.029	4.85	***
Tenure-squared	-0.015	0.004	-4.20	***
Lost job due to plant closing	-0.263	0.085	-3.08	***
State unemployment rate	0.314	0.150	2.09	**
<b>Base period earnings brackets</b>				
Under \$2,000	-1.450	0.278	-5.21	***
\$2,000-\$3,999	-1.383	0.196	-7.05	***
\$4,000-\$5,999	-1.177	0.168	-7.02	***
\$6,000-\$7,999	-0.799	0.152	-5.25	***
\$8,000-\$9,999	-0.780	0.140	-5.56	***
\$10,000-\$11,999	-0.528	0.127	-4.16	***
\$12,000-\$13,999	-0.565	0.126	-4.50	***
\$14,000-\$15,999	-0.381	0.116	-3.28	***
\$16,000-\$17,999	-0.279	0.109	-2.56	**
\$18,000-\$19,999	-0.282	0.108	-2.62	***
\$20,000-\$24,999	-0.143	0.089	-1.61	
\$25,000-\$29,999	0.015	0.086	0.17	
<b>High quarter earnings</b>				
\$0-\$999	-0.180	0.260	-0.69	
\$1,000-\$1,999	0.076	0.196	0.39	
\$2,000-\$2,999	0.333	0.153	2.18	**
\$3,000-\$3,999	0.443	0.129	3.44	***
\$4,000-\$4,999	0.410	0.113	3.65	***
\$5,000-\$5,999	0.270	0.103	2.63	***
\$6,000-\$6,999	0.096	0.092	1.05	
\$7,000-\$7,999	0.170	0.090	1.89	*
\$8,000-\$8,999	0.030	0.092	0.33	

**Appendix I: Analysis of UI Benefit Receipt  
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	Parameter estimate	Standard error	t-statistic
Year effects	Included		
Month effects	Included		
State effects	Included		
Unobserved heterogeneity effects	Included		

Source: GAO analysis of NLSY79 data.

Note: In the final column an asterisk signifies statistical significance at the 90 percent confidence level, two asterisks signify statistical significance at the 95 percent confidence level, and three asterisks signify statistical significance at the 99 percent confidence level. The notation X \* Y signifies an interaction between the variables X and Y. The omitted category for industry is professional and related services and for occupation is professional and technical workers. The omitted category for BPE is \$30,000 and above and for HQE it is \$9,000 and above. Sample includes 5,631 individuals with a total of 15,506 unemployment spells. The maximized log likelihood value is -63,438.514.

**Table 9: Parameter Estimates for Duration Equation from Industry-Interaction Specification**

	Parameter estimate	Standard error	t-statistic	
<b>Past unemployment and UI receipt</b>				
Previous UI receipt	0.155	0.090	1.73	*
Previous unemployment	0.101	0.093	1.09	
<b>Industry</b>				
Agriculture, forestry, and fishing	-0.088	0.198	-0.45	
Mining	0.301	0.273	1.10	
Construction	0.314	0.156	2.01	**
Manufacturing	0.213	0.107	1.99	**
Transportation and public utilities	-0.135	0.233	-0.58	
Wholesale and retail trade	0.069	0.104	0.67	
Finance, insurance, and real estate	0.121	0.202	0.60	
Business services	0.268	0.153	1.76	*
Personal services	-0.031	0.191	-0.16	
Entertainment and recreation services	-0.024	0.299	-0.08	
Public administration	0.029	0.236	0.12	
Valid missing	0.005	0.084	0.06	
<b>Occupation</b>				
Managers and administrators	-0.046	0.062	-0.74	
Sales workers	-0.024	0.070	-0.33	
Clerical and unskilled workers	-0.106	0.044	-2.43	**
Craftsmen	0.030	0.050	0.61	
Machine operators (nontransportation)	-0.025	0.048	-0.51	
Transportation equipment operators	0.005	0.061	0.08	

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	Parameter estimate	Standard error	t-statistic	
Laborers (nonfarm)	-0.030	0.052	-0.59	
Farmers, farm laborers, and foremen	-0.055	0.105	-0.52	
Service workers (excluding private household)	-0.112	0.044	-2.57	**
<b>Industry * previous UI receipt</b>				
Agriculture, forestry, and fishing	-0.004	0.162	-0.02	
Mining	0.006	0.287	0.02	
Construction	-0.123	0.111	-1.10	
Manufacturing	-0.136	0.099	-1.37	
Transportation and public utilities	-0.007	0.144	-0.05	
Wholesale and retail trade	-0.128	0.110	-1.16	
Finance, insurance, and real estate	-0.165	0.213	-0.78	
Business services	-0.104	0.138	-0.75	
Personal services	0.101	0.188	0.54	
Entertainment and recreation services	0.088	0.221	0.40	
Public administration	0.303	0.221	1.37	
Valid missing	-0.080	0.098	-0.82	
<b>Industry * previous unemployment</b>				
Agriculture, forestry, and fishing	0.053	0.196	0.27	
Mining	-0.455	0.295	-1.54	
Construction	-0.253	0.159	-1.60	
Manufacturing	-0.187	0.111	-1.69	*
Transportation and public utilities	0.139	0.239	0.58	
Wholesale and retail trade	-0.126	0.109	-1.16	
Finance, insurance, and real estate	-0.175	0.214	-0.82	
Business services	-0.276	0.163	-1.69	*
Personal services	-0.199	0.199	-1.00	
Entertainment and recreation services	0.012	0.305	0.04	
Public administration	-0.239	0.247	-0.97	
Valid missing	0.224	0.090	2.48	**
<b>UI program variables</b>				
Receiving UI	-1.256	0.195	-6.45	***
Weekly benefit amount (WBA)	0.031	0.035	0.90	
WBA * receiving UI	0.067	0.059	1.14	
Remaining UI benefit duration	-0.014	0.009	-1.64	
Waiting week for UI benefits	0.030	0.064	0.47	
Denial rate for continuing UI claims	0.488	0.215	2.27	**
Extended UI benefits in effect	0.042	0.054	0.78	

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	Parameter estimate	Standard error	t-statistic	
<b>Personal characteristics</b>				
Years of education	0.235	0.069	3.40	***
Armed Forces Qualifying Test score	0.251	0.056	4.49	***
African-American	-0.254	0.033	-7.74	***
Hispanic	-0.078	0.037	-2.13	**
Male	-1.022	0.397	-2.57	**
Married	-0.137	0.037	-3.73	***
Married * male	0.294	0.049	6.05	***
Age	-5.371	2.796	-1.92	*
Age-squared	9.472	5.010	1.89	*
Age * male	7.759	2.905	2.67	***
Age-squared * male	-13.614	5.150	-2.64	***
Lives in SMSA (urban)	-0.040	0.027	-1.48	
Health limitations	-0.095	0.055	-1.73	*
Spouse used UI in past	0.136	0.051	2.68	***
Live with parents	-0.045	0.051	-0.87	
Family size	-0.118	0.089	-1.33	
Live with parents * family size	0.114	0.136	0.84	
Live with parents * family size * male	0.024	0.094	0.26	
Children under age 2	-0.098	0.033	-2.93	***
Number of children	-0.004	0.014	-0.30	
<b>Recent employment experience</b>				
Union member	0.084	0.029	2.86	***
Tenure	0.050	0.018	2.75	***
Tenure-squared	-0.008	0.002	-3.07	***
Lost job due to plant closing	-0.179	0.046	-3.87	***
State unemployment rate (time varying)	-0.030	0.007	-4.04	***
<b>Base period earnings brackets</b>				
Under \$2,000	-0.389	0.103	-3.77	***
\$2,000-\$3,999	-0.367	0.088	-4.18	***
\$4,000-\$5,999	-0.360	0.080	-4.49	***
\$6,000-\$7,999	-0.286	0.079	-3.64	***
\$8,000-\$9,999	-0.239	0.074	-3.22	***
\$10,000-\$11,999	-0.165	0.072	-2.29	**
\$12,000-\$13,999	-0.186	0.069	-2.71	***
\$14,000-\$15,999	-0.137	0.066	-2.07	**
\$16,000-\$17,999	-0.125	0.064	-1.95	*

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	Parameter estimate	Standard error	t-statistic	
\$18,000-\$19,999	-0.101	0.066	-1.53	
\$20,000-\$24,999	-0.039	0.056	-0.71	
\$25,000-\$29,999	-0.135	0.053	-2.54	**
<b>High quarter earnings</b>				
Under \$1,000	-0.051	0.115	-0.44	
\$1,000-\$1,999	0.103	0.096	1.07	
\$2,000-\$2,999	0.060	0.083	0.72	
\$3,000-\$3,999	0.088	0.074	1.20	
\$4,000-\$4,999	0.031	0.066	0.46	
\$5,000-\$5,999	0.021	0.062	0.33	
\$6,000-\$6,999	0.009	0.057	0.17	
\$7,000-\$7,999	-0.034	0.057	-0.60	
\$8,000-\$8,999	-0.029	0.056	-0.51	
<b>Time interactions (t = number of weeks unemployed)</b>				
UI receipt * Extended Benefits * (t-1)	-1.536	0.740	-2.08	**
UI receipt * Extended Benefits * (t-1)-squared	3.351	2.822	1.19	
UI receipt * Extended Benefits * (t-1)-cubed	-0.179	0.246	-0.73	
Remaining UI benefit duration * (t-1)	0.569	0.201	2.83	***
Remaining UI benefit duration * (t-1)-squared	-3.172	2.624	-1.21	
Remaining UI benefit duration * (t-1)-cubed	-0.256	0.956	-0.27	
UI receipt * (t-1)	10.713	1.987	5.39	***
UI receipt * (t-1)-squared	-24.169	5.707	-4.24	***
UI receipt * (t-1)-cubed	1.564	0.441	3.55	***
UI receipt * WBA * (t-1)	-1.052	0.683	-1.54	
UI receipt * WBA * (t-1)-squared	2.425	2.065	1.17	
UI receipt * WBA * (t-1)-cubed	-0.141	0.163	-0.87	
Year effects	Included			
Month effects	Included			
State effects	Included			
Unobserved heterogeneity effects	Included			

Source: GAO analysis of NLSY79 data.

Note: In the final column an asterisk signifies statistical significance at the 90 percent confidence level, two asterisks signify statistical significance at the 95 percent confidence level, and three asterisks signify statistical significance at the 99 percent confidence level. The notation X \* Y signifies an interaction between the variables X and Y. The omitted category for industry is professional and related services and for occupation is professional and technical workers. The omitted category for BPE is \$30,000 and above and for HQE it is \$9,000 and above. Sample includes 5,631 individuals with a total of 15,506 unemployment spells. The maximized log likelihood value is -63,438.514.

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**Table 10: Parameter Estimates for UI Receipt Equation from Occupation-Interaction Specification**

	Parameter estimate	Standard error	t-statistic	
<b>Past unemployment and UI receipt</b>				
Number of previous UI receipt spells	0.678	0.059	11.58	***
Number of previous unemployment spells	-0.094	0.016	-5.84	***
<b>Industry</b>				
Agriculture, forestry, and fishing	-0.044	0.143	-0.30	
Mining	0.302	0.171	1.77	*
Construction	0.004	0.095	0.04	
Manufacturing	0.346	0.079	4.38	***
Transportation and public utilities	0.256	0.106	2.41	**
Wholesale and retail trade	0.285	0.077	3.73	***
Finance, insurance, and real estate	0.307	0.121	2.54	**
Business services	0.253	0.092	2.75	***
Personal services	0.045	0.127	0.36	
Entertainment and recreation services	-0.090	0.157	-0.57	
Public administration	0.426	0.122	3.48	***
Valid missing	-0.174	0.070	-2.48	**
<b>Occupation</b>				
Managers and administrators	0.573	0.154	3.72	***
Sales workers	0.101	0.202	0.50	
Clerical and unskilled workers	0.351	0.122	2.88	***
Craftsmen	0.437	0.126	3.46	***
Machine operators (nontransportation)	0.534	0.121	4.42	***
Transportation equipment operators	0.353	0.167	2.12	**
Laborers (nonfarm)	0.364	0.135	2.70	***
Farmers, farm laborers, and foremen	0.549	0.239	2.29	**
Service workers (excluding private household)	0.108	0.128	0.85	
<b>Occupation * number previous UI receipt spells</b>				
Managers and administrators	-0.155	0.082	-1.89	*
Sales workers	0.830	0.292	2.84	***
Clerical and unskilled workers	0.141	0.097	1.45	
Craftsmen	-0.204	0.071	-2.89	***
Machine operators (nontransportation)	-0.100	0.069	-1.45	
Transportation equipment operators	-0.276	0.073	-3.79	***
Laborers (nonfarm)	-0.108	0.082	-1.31	
Farmers, farm laborers, and foremen	0.035	0.182	0.19	

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	Parameter estimate	Standard error	t-statistic	
Service workers (excluding private household)	0.283	0.091	3.13	***
<b>Occupation * number of previous unemployment spells</b>				
Managers and administrators	0.025	0.025	0.98	
Sales workers	-0.013	0.036	-0.35	
Clerical and unskilled workers	-0.009	0.021	-0.44	
Craftsmen	-0.007	0.020	-0.36	
Machine operators (nontransportation)	-0.060	0.021	-2.91	***
Transportation equipment operators	0.020	0.027	0.73	
Laborers (nonfarm)	-0.049	0.024	-2.03	**
Farmers, farm laborers, and foremen	-0.073	0.052	-1.39	
Service workers (excluding private household)	-0.023	0.022	-1.02	
<b>UI Program variables</b>				
Weekly benefit amount (WBA)	0.068	0.058	1.16	
Potential UI benefit duration	-0.529	0.589	-0.90	
Waiting week for UI benefits	0.050	0.121	0.41	
Denial rate for new UI claims	-1.482	0.828	-1.79	*
Extended UI benefits in effect	0.126	0.095	1.33	
<b>Personal characteristics</b>				
Years of education	0.537	0.128	4.19	***
Armed Forces Qualifying Test score	-0.265	0.096	-2.75	***
African-American	0.008	0.058	0.14	
Hispanic	-0.084	0.086	-0.98	
Hispanic * male	0.239	0.097	2.46	**
Married	0.164	0.050	3.30	***
Age	18.880	4.432	4.26	***
Age-squared	-38.467	7.863	-4.89	***
Male	-0.362	0.051	-7.13	***
Lives in SMSA (urban)	-0.131	0.050	-2.64	***
Health limitations	0.071	0.110	0.64	
Spouse used UI in past	0.271	0.100	2.71	***
Spouse used UI in past * male	-0.696	0.170	-4.10	***
Live with parents	-0.170	0.097	-1.76	*
Family size	-0.485	0.177	-2.74	***
Live with parents * family size	0.577	0.232	2.49	**
Children under age 2	0.109	0.060	1.84	*
Number of children	-0.028	0.024	-1.17	

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	Parameter estimate	Standard error	t-statistic	
<b>Recent employment experience</b>				
Union member	0.000	0.048	0.01	
Tenure	0.130	0.029	4.50	***
Tenure-squared	-0.014	0.004	-3.71	***
Lost job due to plant closing	-0.250	0.085	-2.94	***
State unemployment rate	0.354	0.148	2.40	**
<b>Base period earnings brackets</b>				
Under \$2,000	-1.423	0.278	-5.11	***
\$2,000-\$3,999	-1.344	0.196	-6.85	***
\$4,000-\$5,999	-1.135	0.168	-6.77	***
\$6,000-\$7,999	-0.808	0.152	-5.32	***
\$8,000-\$9,999	-0.778	0.140	-5.55	***
\$10,000-\$11,999	-0.492	0.127	-3.87	***
\$12,000-\$13,999	-0.564	0.126	-4.48	***
\$14,000-\$15,999	-0.365	0.117	-3.12	***
\$16,000-\$17,999	-0.292	0.109	-2.68	***
\$18,000-\$19,999	-0.272	0.108	-2.51	**
\$20,000-\$24,999	-0.136	0.090	-1.50	
\$25,000-\$29,999	0.019	0.086	0.22	
<b>High quarter earnings</b>				
\$0-\$999	-0.209	0.257	-0.81	
\$1,000-\$1,999	0.080	0.195	0.41	
\$2,000-\$2,999	0.339	0.152	2.23	**
\$3,000-\$3,999	0.441	0.129	3.43	***
\$4,000-\$4,999	0.416	0.113	3.69	***
\$5,000-\$5,999	0.275	0.104	2.65	***
\$6,000-\$6,999	0.115	0.093	1.24	
\$7,000-\$7,999	0.169	0.090	1.88	*
\$8,000-\$8,999	0.054	0.091	0.59	
Year effects	Included			
Month effects	Included			
State effects	Included			
Unobserved heterogeneity effects	Included			

Source: GAO analysis of NLSY79 data.

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Note: In the final column an asterisk signifies statistical significance at the 90 percent confidence level, two asterisks signify statistical significance at the 95 percent confidence level, and three asterisks signify statistical significance at the 99 percent confidence level. The notation X \* Y signifies an interaction between the variables X and Y. The omitted category for industry is professional and related services and for occupation is professional and technical workers. The omitted category for BPE is \$30,000 and above and for HQE it is \$9,000 and above. Sample includes 5,631 individuals with a total of 15,506 unemployment spells. The maximized log likelihood value is -63,453.973.

**Table 11: Parameter Estimates for Duration Equation from Occupation-Interaction Specification**

	Parameter estimate	Standard error	t-statistic	
<b>Past unemployment and UI receipt</b>				
Previous UI receipt	0.111	0.076	1.47	
Previous unemployment	0.270	0.095	2.83	***
<b>Industry</b>				
Agriculture, forestry, and fishing	-0.031	0.081	-0.38	
Mining	-0.105	0.111	-0.95	
Construction	0.052	0.051	1.03	
Manufacturing	0.013	0.042	0.32	
Transportation and public utilities	-0.003	0.062	-0.05	
Wholesale and retail trade	-0.069	0.039	-1.75	*
Finance, insurance, and real estate	-0.062	0.068	-0.92	
Business services	-0.007	0.050	-0.14	
Personal services	-0.205	0.058	-3.51	***
Entertainment and recreation services	-0.005	0.076	-0.07	
Public administration	-0.153	0.072	-2.14	**
Valid missing	0.190	0.033	5.71	***
<b>Occupation</b>				
Managers and administrators	0.117	0.251	0.47	
Sales workers	0.340	0.188	1.81	*
Clerical and unskilled workers	0.087	0.123	0.71	
Craftsmen	0.444	0.146	3.03	***
Machine operators (nontransportation)	0.287	0.118	2.42	**
Transportation equipment operators	0.240	0.206	1.16	
Laborers (nonfarm)	0.231	0.136	1.70	*
Farmers, farm laborers, and foremen	-0.002	0.234	-0.01	
Service workers (excluding private household)	0.123	0.122	1.01	
<b>Occupation * previous UI receipt</b>				
Managers and administrators	0.056	0.147	0.38	
Sales workers	-0.074	0.241	-0.31	

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	Parameter estimate	Standard error	t-statistic	
Clerical and unskilled workers	-0.063	0.101	-0.63	
Craftsmen	-0.117	0.099	-1.18	
Machine operators (nontransportation)	-0.053	0.092	-0.58	
Transportation equipment operators	-0.141	0.118	-1.20	
Laborers (nonfarm)	0.079	0.108	0.73	
Farmers, farm laborers, and foremen	0.017	0.202	0.09	
Service workers (excluding private household)	-0.065	0.110	-0.59	
<b>Occupation * previous unemployment</b>				
Managers and administrators	-0.199	0.258	-0.77	
Sales workers	-0.387	0.197	-1.96	**
Clerical and unskilled workers	-0.202	0.125	-1.62	
Craftsmen	-0.422	0.149	-2.84	***
Machine operators (nontransportation)	-0.338	0.120	-2.80	***
Transportation equipment operators	-0.222	0.213	-1.04	
Laborers (nonfarm)	-0.308	0.138	-2.24	**
Farmers, farm laborers, and foremen	-0.085	0.238	-0.36	
Service workers (excluding private household)	-0.249	0.125	-2.00	**
<b>UI program variables</b>				
Receiving UI	-1.247	0.195	-6.41	***
Weekly benefit amount (WBA)	0.028	0.035	0.79	
WBA * receiving UI	0.066	0.059	1.12	
Remaining UI benefit duration	-0.014	0.008	-1.68	*
Waiting week for UI benefits	0.030	0.064	0.47	
Denial rate for continuing UI claims	0.474	0.214	2.21	**
Extended UI benefits in effect	0.042	0.054	0.77	
<b>Personal characteristics</b>				
Years of education	0.240	0.070	3.43	***
Armed Forces Qualifying Test score	0.242	0.056	4.31	***
African-American	-0.255	0.033	-7.74	***
Hispanic	-0.080	0.037	-2.16	**
Male	-0.994	0.399	-2.49	**
Married	-0.133	0.037	-3.59	***
Married * male	0.289	0.049	5.91	***
Age	-5.011	2.825	-1.77	*
Age-squared	8.897	5.061	1.76	*
Age * male	7.571	2.917	2.60	*
Age-squared * male	-13.275	5.164	-2.57	**

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	Parameter estimate	Standard error	t-statistic	
Lives in SMSA (urban)	-0.041	0.027	-1.51	
Health limitations	-0.096	0.055	-1.75	*
Spouse used UI in past	0.133	0.051	2.62	***
Live with parents	-0.042	0.051	-0.83	
Family size	-0.120	0.089	-1.35	
Live with parents * family size	0.112	0.135	0.83	
Live with parents * family size * Male	0.023	0.094	0.24	
Children under age 2	-0.095	0.033	-2.83	***
Number of children	-0.004	0.014	-0.30	
<b>Recent employment experience</b>				
Union member	0.087	0.029	2.94	***
Tenure	0.050	0.018	2.75	***
Tenure-squared	-0.007	0.002	-3.03	***
Lost job due to plant closing	-0.175	0.046	-3.80	***
State unemployment rate (time varying)	-0.029	0.007	-4.02	***
<b>Base period earnings brackets</b>				
Under \$2,000	-0.387	0.103	-3.76	***
\$2,000-\$3,999	-0.365	0.088	-4.16	***
\$4,000-\$5,999	-0.359	0.080	-4.49	***
\$6,000-\$7,999	-0.285	0.078	-3.65	***
\$8,000-\$9,999	-0.236	0.074	-3.18	***
\$10,000-\$11,999	-0.161	0.072	-2.24	**
\$12,000-\$13,999	-0.187	0.068	-2.73	***
\$14,000-\$15,999	-0.133	0.066	-2.02	**
\$16,000-\$17,999	-0.134	0.064	-2.10	**
\$18,000-\$19,999	-0.097	0.066	-1.48	
\$20,000-\$24,999	-0.048	0.055	-0.86	
\$25,000-\$29,999	-0.134	0.053	-2.52	**
<b>High quarter earnings brackets</b>				
\$0-\$999	-0.063	0.115	-0.55	
\$1,000-\$1,999	0.096	0.096	0.99	
\$2,000-\$2,999	0.053	0.083	0.63	
\$3,000-\$3,999	0.084	0.074	1.14	
\$4,000-\$4,999	0.027	0.066	0.41	
\$5,000-\$5,999	0.022	0.062	0.36	
\$6,000-\$6,999	0.011	0.057	0.19	
\$7,000-\$7,999	-0.033	0.057	-0.58	

**Appendix I: Analysis of UI Benefit Receipt  
and Unemployment Duration**

	Parameter estimate	Standard error	t-statistic	
\$8,000-\$8,999	-0.032	0.056	-0.57	
<b>Time interactions (t = number of weeks unemployed)</b>				
UI Receipt * Extended Benefits * (t-1)	-1.582	0.734	-2.16	**
UI Receipt * Extended Benefits * (t-1)-squared	3.496	2.805	1.25	
UI Receipt * Extended Benefits * (t-1)-cubed	-0.191	0.244	-0.78	
Remaining UI benefit duration * (t-1)	0.572	0.201	2.85	***
Remaining UI benefit duration * (t-1)-squared	-3.185	2.626	-1.21	
Remaining UI benefit duration * (t-1)-cubed	-0.257	0.955	-0.27	
UI receipt * (t-1)	10.722	1.976	5.43	***
UI receipt * (t-1)-squared	-24.286	5.667	-4.29	***
UI receipt * (t-1)-cubed	1.577	0.438	3.60	***
UI receipt * WBA * (t-1)	-1.049	0.680	-1.54	
UI receipt * WBA * (t-1)-squared	2.455	2.051	1.20	
UI receipt * WBA * (t-1)-cubed	-0.145	0.161	-0.90	
Year effects	Included			
Month effects	Included			
State effects	Included			
Unobserved heterogeneity effects	Included			

Source: GAO analysis of NLSY79 data.

Note: In the final column an asterisk signifies statistical significance at the 90 percent confidence level, two asterisks signify statistical significance at the 95 percent confidence level, and three asterisks signify statistical significance at the 99 percent confidence level. The notation X \* Y signifies an interaction between the variables X and Y. The omitted category for industry is professional and related services and for occupation is professional and technical workers. The omitted category for BPE is \$30,000 and above and for HQE it is \$9,000 and above. Sample includes 5,631 individuals with a total of 15,506 unemployment spells. The maximized log likelihood value is -63,453.973.

## Industry-Interaction Specification

### UI Receipt Equation

Table 8 summarizes the parameter estimates for the UI receipt equation of the industry-interaction specification. A positive parameter estimate for a variable implies that an increase in the variable increases the likelihood of UI benefit receipt. A negative parameter estimate implies that an increase in the variable decreases the likelihood of UI benefit receipt. For example, the parameter estimate for years of education is 0.569, meaning that unemployed individuals with more years of education have a higher likelihood of receiving UI benefits than otherwise similar individuals with

fewer years of education. The single asterisk signifies that the parameter estimate for years of education is statistically significant at the 95 percent confidence level.

The results in table 8 show that the number of prior unemployment periods and the number of prior UI benefit receipt periods are strong predictors of an unemployed individual's likelihood of receiving UI benefits. The parameter estimate for the number of prior unemployment periods is -0.072, which indicates that each additional prior unemployment period experienced by an individual reduces the likelihood of UI benefit receipt during current unemployment. Alternatively, the parameter estimate for the number of prior UI receipt periods is 0.714, which indicates that each additional prior UI receipt period experienced by an individual increases the likelihood of UI benefit receipt during current unemployment.

The fact that the parameter estimate for the number of previous UI receipt periods is larger in absolute value suggests that this is the stronger of the two effects. To illustrate the magnitude of the effects, table 12 presents simulations of the likelihood of UI receipt by past unemployment and past UI receipt experience. According to the table, the average simulated likelihood of UI receipt for unemployed individuals with one previous unemployment period is 48 percent if UI was received in the previous unemployment period, but only 30 percent if UI was not received in the previous unemployment period.<sup>23</sup> Thus, for individuals with one previous unemployment period, the average likelihood of UI receipt is 60 percent higher (18 percentage points) for those who received UI benefits in their previous unemployment period. The remainder of the table shows that UI receipt exhibits significant occurrence dependence. Specifically, an individual who does not receive UI benefits during unemployment becomes less likely to receive them during future unemployment, while an individual who does receive UI benefits during unemployment becomes more likely to receive them during future unemployment.<sup>24</sup> Our model and data do not allow us to determine the underlying reasons for these associations. There are several possible reasons for the strong relationship

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<sup>23</sup>Note that the average simulated likelihood of UI receipt for first-time unemployed workers is 33 percent.

<sup>24</sup>See Brian P. McCall, "Repeat Use of Unemployment Insurance," in Laurie J. Bassi and Stephen A. Woodbury, editors, *Long-Term Unemployment and Reemployment Policies* (Stamford, Connecticut: JAI Press, Inc., 2000).

between past UI receipt and current UI receipt, however. If unemployed people do not know they are eligible for benefits, or think that UI benefits are not worth the effort to apply, or are overoptimistic about finding employment, then there may be a “learning effect” that results from having received UI benefits which increases the likelihood of future use. Alternatively, if people do not apply for benefits because of a misperception of UI as a welfare program, then having received benefits once may soften such an outlook and increase the likelihood of future use.

**Table 12: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers during Successive Periods of Unemployment, by Past UI Receipt Status**

Unemployment period	Simulated likelihood of receiving UI benefits (percent)	
	Always received UI benefits previously	Never received UI benefits previously
First	—	33
Second	48	30
Third	64	28
Fourth	78	25
Fifth	88	23
Sixth	94	21

Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI by unemployment period for two extreme cases: (1) individuals always received UI benefits during previous unemployment, and (2) individuals never received UI during previous unemployment. N/A denotes that there is no applicable value. See accompanying text for details.

The results in table 8 also show that the likelihood of UI benefit receipt varies by the industry of the job lost by unemployed individuals. The industry variable is categorical in nature, so the parameter estimate for a particular category is an estimate of the effect of being in that category relative to an omitted category. The omitted category for industry is professional and related services. Table 8 shows that unemployed individuals from the mining, manufacturing, public administration, wholesale and retail trade, agriculture, forestry and fishing, business services, and construction industries are more likely to receive UI benefits than similar individuals from the professional services industry, because their parameter estimates are positive and statistically significant. To illustrate the magnitudes of these differences, table 13 presents the average simulated likelihood of UI receipt by industry under the specific assumption of first-time unemployment. The average simulated likelihood of UI receipt during first-time unemployment is 45.6 percent for unemployed miners, but only 24.3 percent for unemployed professional

service workers. Table 13 clearly demonstrates that there are significant differences across industries in unemployed individuals' likelihoods of UI benefit receipt during first-time unemployment.

**Table 13: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers from Different Industries**

Industry	Simulated likelihood of receiving UI benefits (percent)
Mining	46
Manufacturing	40
Public administration	37
Wholesale and retail trade	35
Agriculture, forestry, and fishing	34
Business services	31
Construction	31
Finance, insurance, and real estate	31
Transportation and public utilities	29
Entertainment and recreation services	26
Professional and related services	24
Personal services	23
<b>All industries</b>	<b>33</b>

Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during first-time unemployment. The parameter estimates for the mining, manufacturing, public administration, wholesale and retail trade, agriculture, forestry, and fishing, business services, and construction industries are statistically significant relative to the professional and related services industry at the 95 percent confidence level. See accompanying text for details.

To test whether or not the effects of previous experience with unemployment and UI receipt differ by industry, we also included the industry categories interacted with both the number of previous unemployment periods and the number of previous UI receipt periods. As was the case above, the parameter estimates are calculated relative to the omitted professional and related services industry. The parameter estimates for the industry interactions with the number of prior unemployment periods indicate that unemployed individuals from the mining, manufacturing, and wholesale and retail trade industries exhibit stronger occurrence dependence than unemployed individuals from the

professional services industry.<sup>25</sup> That is, each additional previous unemployment period has a stronger negative effect on the likelihood of receiving UI benefits for unemployed individuals from these three industries relative to similar individuals from the professional services industry.<sup>26</sup>

The parameter estimates for the industry interactions with the number of previous UI receipt periods show that unemployed individuals from the agriculture and construction industries exhibit weaker occurrence dependence than individuals from the professional and related services industry.<sup>27</sup> That is, each additional previous UI receipt period has a weaker positive effect on the likelihood of receiving UI benefits for unemployed individuals from these three industries relative to similar individuals from the professional services industry. Unemployed individuals from the manufacturing industry also have weaker occurrence dependence, but the result is only statistically significant at the 90 percent confidence level. Unemployed individuals from the public administration industry exhibit stronger occurrence dependence than individuals from the professional services industry. A similar result occurs for unemployed workers from the finance, insurance, and real estate industry, but the result is only statistically significant at the 90 percent confidence level. The other industries showed no statistically significant effects compared to those from the professional services industry.<sup>28</sup>

To illustrate the magnitudes of these differences, table 14 presents the average simulated likelihood of UI receipt by industry and by the number of previous unemployment and UI receipt periods. Column 1 presents the simulations for first-time unemployment (see table 13). Column 2 presents

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<sup>25</sup>As stated above, the occurrence dependence in this case relates to the fact that an individual who does not receive UI benefits during unemployment becomes less likely to receive them during future unemployment.

<sup>26</sup>Although the results for some industries were not individually statistically significant, a likelihood ratio test of the joint hypothesis that all of the interaction terms between industry and past unemployment experience are equal to zero is rejected at the 95 percent confidence level.

<sup>27</sup>As stated earlier, occurrence dependence relating to previous UI receipt means that an individual who receives UI benefits during unemployment becomes more likely to receive them during future unemployment.

<sup>28</sup>However, a likelihood ratio test of the joint hypothesis that all of the interaction terms between industry and past UI receipt experience are equal to zero is rejected at the 95 percent confidence level.

the simulations assuming one prior unemployment period with UI receipt. Column 3 presents the simulations assuming two prior unemployment periods, both with UI receipt. Table 14 shows that, although unemployed individuals from the mining and manufacturing industries have the highest average simulated likelihoods of UI receipt for first-time unemployment, this is not the case if individuals have received UI benefits previously. For unemployed individuals with two prior UI receipt periods, those from the public administration, wholesale and retail trade, entertainment services, transportation, and business services industries are about as likely or are more likely to receive UI benefits again than similar individuals from the mining and manufacturing industries. Administrative unemployment insurance data have shown that repeat UI recipients tend to be from industries that are more seasonal, such as manufacturing and construction. Our results, however, suggest that this is not because workers from these industries who have received UI before are more likely to receive UI benefits when they become unemployed than similar workers from other industries. Rather, it may be that workers from such seasonal industries are unemployed more often on average than workers from other industries, or that a larger fraction of unemployed workers from such industries have collected UI previously.

**Table 14: Simulated Likelihood of Receiving UI Benefits during Different Periods of UI-Eligible Unemployment for Workers with Past UI Receipt, by Industry**

Industry	Simulated likelihood of receiving UI benefits during a current UI-eligible unemployment period, given past UI receipt (percent)		
	First unemployment period <sup>a</sup>	Second unemployment period	Third unemployment period
Mining	46	57	69
Manufacturing	40	52	65
Public administration	37	68	91
Wholesale and retail trade	35	52	70
Agriculture, forestry, and fishing	34	42	50
Business services	31	48	66
Construction	31	40	51
Finance, insurance, and real estate	31	64	91
Transportation and public utilities	29	46	66
Entertainment and recreation services	26	45	67
Professional and related services	24	39	58
Personal services	23	38	56
<b>All industries</b>	<b>33</b>	<b>48</b>	<b>64</b>

Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during a first unemployment period, a second unemployment period with UI receipt during the prior unemployment period, and a third unemployment period with UI receipt during both prior unemployment periods. The positive effect that each prior UI receipt period has on the likelihood of current UI receipt is statistically significantly larger for the public administration industry relative to the professional and related services industry at the 95 percent confidence level, and smaller for the agriculture and construction industries. The simulations also incorporate the industry effects and the industry interactions with the number of prior periods of unemployment. See accompanying text for details.

<sup>a</sup>Workers experiencing their first period of unemployment did not have past UI receipt.

Our model also controls for UI program factors, but the results in table 8 show that after controlling for other observable characteristics, these factors had no statistically significant impact on an unemployed individual's likelihood of UI receipt. These program factors include the estimated amount of weekly benefits an unemployed individual was eligible to receive, the estimated duration of those benefits, and the state-specific denial rate for new UI claims.<sup>29</sup> Weekly benefits and the potential duration of benefits are functions of earnings, which we controlled for (and are discussed below).

The parameter estimates in table 8 also show that a number of personal characteristics are associated with an unemployed individual's likelihood of UI benefit receipt, including education, age, and gender. For instance, the parameter estimate on years of education is 0.569, which indicates that each year of education increases an unemployed individual's likelihood of receiving UI benefits. The direction of the age effect on the likelihood of UI benefit receipt is difficult to interpret from the parameter estimates in table 8, because it is included as a polynomial to allow for nonlinear effects. Figure 10 presents a graph of the average simulated likelihood of UI receipt by age for the specific case of first-time unemployment. The graph shows that the likelihood of UI receipt increases until about the age of 25 and then decreases thereafter. For example, the average simulated likelihood of UI receipt during first-time unemployment for 25-year-olds is 10 percentage points (39 percent) higher than for 35-year-olds. While other research has found that older individuals are more likely to receive UI benefits, other researchers generally do not control for individuals' past unemployment and UI receipt experience as completely as we did.<sup>30</sup> Because age and experience with both unemployment and UI receipt are

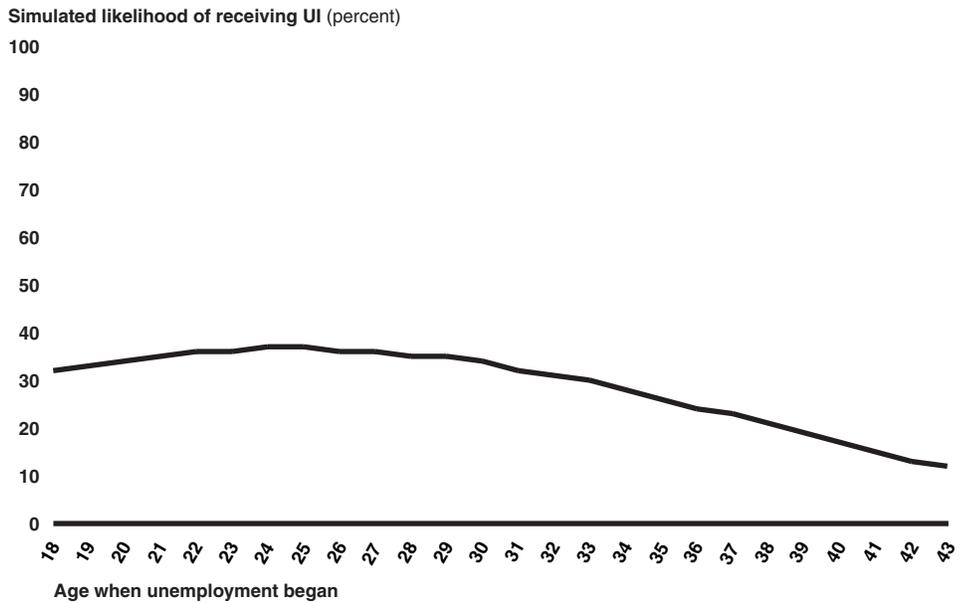
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<sup>29</sup>Other researchers have found that the weekly benefit amount does not affect UI receipt. See Gritz and MaCurdy.

<sup>30</sup>See McCall.

correlated, age may act as a proxy for these experience measures when they are not controlled for.

**Figure 10: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers, by Age**



Source: Simulations based on GAO analysis of NLSY79 data.

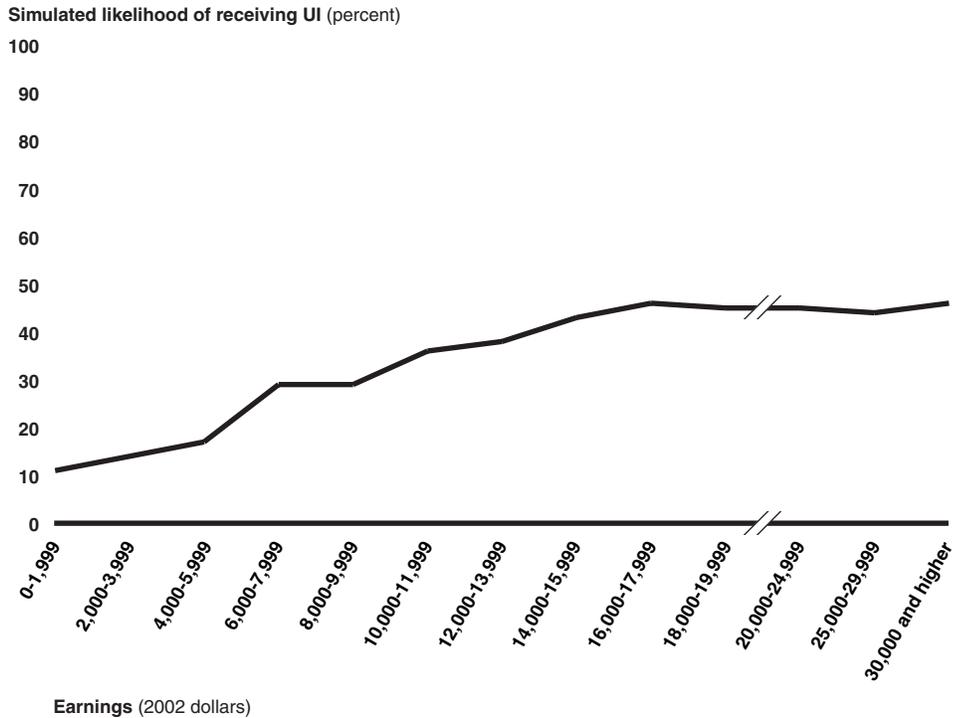
Note: Simulations are the average likelihood of receiving UI during first-time unemployment at different ages. The overall average likelihood of receiving UI during first-time unemployment is 33 percent. See accompanying text for details.

Table 8 also shows that several measures relating to the recent employment experience of unemployed individuals (excluding industry and occupation, which are discussed elsewhere) affect an unemployed individual’s likelihood of UI benefit receipt. For instance, table 8 shows that an unemployed individual’s likelihood of receiving UI benefits increases with earnings. We include two earnings measures: base period earnings and high quarter earnings. Each measure is grouped in earnings brackets and entered into the equation as a categorical variable to reflect nonlinear effects. As was the case with industry, each estimated effect is relative to an omitted category. For BPE the omitted earnings bracket is \$30,000 and above and for HQE the omitted bracket is \$9,000 and above. The pattern of parameter estimates for BPE shows that an unemployed individual is more likely to receive UI benefits, the higher his BPE (at least up to \$20,000). The pattern of parameter estimates for HQE shows that an unemployed individual is more likely to receive UI benefits if his HQE are

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between \$2,000 and \$6,000. Figure 11 presents a graph of the average simulated likelihood of receiving UI benefits by base period earnings for the specific case of first-time unemployment. The level of HQE is varied to maintain a ratio of HQE to BPE of about 25 percent to approximate steady employment during the base period. The figure shows that unemployed individuals who earned more than \$14,000 in their base period had a likelihood of UI receipt of over 40 percent, while individuals who earned less than \$6,000 had a likelihood of UI receipt of less than 20 percent.

**Figure 11: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers, by Prior-Year Earnings**



Source: Simulations based on GAO analysis of NLSY79 data.

Note: Simulations are for the average likelihood of receiving UI during first-time unemployment at different levels of earnings. The overall average likelihood of receiving UI during first-time unemployment is 33 percent. See accompanying text for details.

Table 8 shows that employment experience measures other than earnings also affect the likelihood of UI receipt. For instance, an individual’s likelihood of UI receipt increases with tenure up to 9 years, after which it decreases. Also, an individual’s likelihood of UI receipt increases as the state unemployment rate increases. Interestingly, the parameter estimate on the plant closing variable is a statistically significant -0.263, indicating that unemployed individuals are less likely to receive UI benefits if they lost their jobs because of a plant closing. Union status does not have a statistically significant effect on an unemployed individual’s likelihood of UI receipt.

Unemployment Duration Equation

Table 9 summarizes the parameter estimates for the unemployment duration equation of the industry interaction specification. A positive parameter estimate implies that an increase in a variable increases the escape rate from unemployment, thereby decreasing the duration of

unemployment. A negative parameter estimate implies that an increase in a variable decreases the escape rate from unemployment, thereby increasing the duration of unemployment. For example, the parameter estimate for years of education is a statistically significant 0.235, which implies that unemployed individuals with more years of education have higher escape rates from unemployment than otherwise similar individuals with fewer years of education. As a result, unemployed individuals with more years of education will tend to have shorter unemployment durations than those with fewer years of education.

We found that after controlling for other observable characteristics, the single most important predictor of unemployment duration is whether or not an individual receives UI benefits during the current unemployment period. The parameter estimate on the dummy variable for UI receipt status is -1.256, which implies that receiving UI benefits while unemployed reduces an individual's escape rate from unemployment, thereby increasing unemployment duration. Simulations show that the median duration of unemployment is 8 weeks for individuals who do not receive UI benefits, but 21 weeks when they do receive UI benefits. We also allowed the effect of UI receipt to vary with the number of weeks of unemployment. These results indicate that a UI recipient's escape rate from unemployment increases until about the 33rd week of unemployment. After 33 weeks, the escape rate decreases again until about the 72nd week, and then increases until 100 weeks.<sup>31</sup>

The parameter estimates in table 9 show that having experienced prior unemployment or prior UI receipt has no statistically significant effect on unemployment duration. This result, however, is conditional upon whether or not an individual currently receives UI benefits. The unconditional effect of having previously received UI benefits is to increase unemployment duration. As stated earlier, we found that unemployed individuals who have previously received UI benefits are significantly more likely to receive UI benefits during current unemployment. Because those individuals who receive UI benefits during unemployment have longer unemployment duration, the unconditional effect of having previously received UI benefits is to increase unemployment duration.

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<sup>31</sup>Changes in the escape rate over an unemployment period are also affected by the other time-interaction effects included in the specification. However, these other effects do not affect the general shape of this overall trend.

Table 9 also shows that there is an association between the industry from which an individual lost a job and the duration of unemployment. As in the UI receipt equation, the omitted category for industry is professional and related services. Table 9 shows that unemployed individuals from the construction and manufacturing industries have higher escape rates from unemployment than otherwise similar individuals from the professional services industry, because their parameter estimates are positive and statistically significant. The parameter estimate for business services is also positive, but is only statistically significant at the 90 percent confidence level. The effects for the other industries are not statistically significant relative to the professional services industry. To illustrate the magnitudes of these differences, table 15 presents the median simulated duration of unemployment by industry for the specific case of first-time unemployment. The median duration is about 17 and 19 weeks, respectively, for unemployed individuals from the construction and manufacturing industries who receive UI benefits, but is about 24 weeks for those from the professional services industry.

**Table 15: Simulated Unemployment Duration for UI-Eligible Workers, by Industry and UI Receipt Status**

Industry	Simulated unemployment duration (median weeks)	
	Receiving UI benefits	Not receiving UI benefits
Construction	17	6
Mining	17	6
Business services	18	7
Manufacturing	19	7
Finance, insurance, and real estate	21	8
Wholesale and retail trade	22	9
Public administration	23	9
Professional and related services	24	10
Entertainment and related services	24	10
Personal services	24	10
Agriculture, forestry, and fishing	26	11
Transportation and public utilities	27	12
<b>Overall average duration</b>	<b>21</b>	<b>8</b>

Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment. The parameter estimates for the construction and manufacturing industries are statistically significant relative to the professional and related services industry at the 95 percent confidence level. See accompanying text for details.

To test whether or not the effects of previous experience with unemployment and UI receipt on the duration of unemployment differ by industry, we also included the industry categories interacted with the indicators for both previous unemployment and previous UI receipt. As stated above, the effects are relative to the omitted category of professional and related services. The parameter estimates in table 9 indicate that there are no statistically significant differences across

industry types by previous experience with unemployment or previous UI receipt, conditional upon current UI receipt status.<sup>32</sup>

Table 9 also shows that only one UI program factor (other than current UI receipt) has a statistically significant impact on an individual's unemployment duration. Specifically, individuals who are unemployed in states with higher denial rates for continuing UI claims have higher escape rates from unemployment. That is, these individuals tend to become reemployed more quickly than those in states with lower denial rates.

The parameter estimates in table 9 show that a number of personal characteristics affect an individual's unemployment duration, including education, race, gender, and marital status. For example, the parameter estimate on years of education is 0.235, which indicates that each year of education increases an individual's escape rate from unemployment. The simulations reported in table 16 show that unemployed individuals with 16 years of education (roughly a college education) have median unemployment duration that is about 1.9 weeks shorter than unemployed individuals with 12 years of education when UI benefits are received, and 1.1 weeks when UI benefits are not received. The parameter estimates for race show that African-Americans have significantly lower escape rate from unemployment than Hispanics, who in turn have slightly lower escape rates than whites. Table 17 displays simulations of median unemployment duration by race for the specific case of first-time unemployment. Simulations showed that the age effect, although statistically significant, did not have much of an impact on the median duration of unemployment. In table 9, the parameter estimates for gender are difficult to interpret because gender is interacted with other variables in our specification, including age. Simulations show that unemployed men have median unemployment durations that are about 2 weeks shorter than for unemployed women when UI benefits are received; and about 1 week shorter when UI benefits are not received. The parameter estimates for marital status show that married women tend to have longer unemployment durations than do unmarried women and married men tend

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<sup>32</sup>However, a likelihood ratio test of the joint hypotheses that all of the interaction terms between industry and past unemployment experience are equal to zero is rejected at the 95 percent confidence level. A similar test of the joint hypothesis that all of the interaction terms between industry and past UI receipt experience are equal to zero could not be rejected at the 95 percent confidence level.

to have shorter unemployment durations than do unmarried men.<sup>33</sup> Although the age effects in table 9 are statistically significant, simulations showed that age had minimal effect on the median duration of unemployment.

**Table 16: Simulated Unemployment Duration for UI-Eligible Workers, by Education Level and UI Receipt Status**

Years of education when unemployment began	Simulated unemployment duration (median weeks)	
	Receiving UI benefits	Not receiving UI benefits
9	22	9
10	22	9
11	21	9
12	21	8
13	20	8
14	20	8
15	19	8
16	19	7
17	18	7
18	18	7
19	18	6
20 and higher	17	6

Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment. Overall average duration is 21 weeks for UI-eligible workers receiving UI benefits and 8 weeks for UI-eligible workers not receiving UI benefits. See accompanying text for details.

<sup>33</sup>In alternative specifications we explored whether an individual’s likelihood of UI benefit receipt and unemployment duration were affected by spousal income in the previous year. We found that spousal income had no statistically significant effect on an individual’s likelihood of UI benefit receipt, but did slightly increased the duration of unemployment.

**Table 17: Simulated Unemployment Duration for UI-Eligible Workers, by Race/Ethnicity and UI Receipt Status**

Race or ethnicity	Simulated unemployment duration (median weeks)	
	Receiving UI benefits	Not receiving UI benefits
White	19	8
Hispanic	21	8
African-American	25	11

Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment. Overall average duration is 21 weeks for UI-eligible workers receiving UI benefits and 8 weeks for UI-eligible workers not receiving UI benefits. See accompanying text for details.

The last set of parameter estimates in table 9 relates to the recent employment experience of unemployed individuals (excluding industry and occupation, which are discussed elsewhere). Most of the parameter estimates in this grouping are statistically significant at the 95 percent level. Specifically, unemployed individuals who belonged to a union at the job that was lost had a higher escape rate from unemployment than otherwise similar individuals who were not union members. The simulations in table 18 show that union members had median unemployment durations that were 2 weeks shorter than nonunion members when UI benefits were received and 1 week shorter when UI benefits were not received. Simulations also show that an individual's unemployment duration decreases modestly with job tenure until 7 years, after which it increases slightly.

**Table 18: Simulated Unemployment Duration for UI-Eligible Workers, by Union Status and UI Receipt Status**

Union memberships status when unemployment began	Simulated unemployment duration (median weeks)	
	Receiving UI benefits	Not receiving UI benefits
Union member	19	8
Not a union member	21	9

Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment. Overall average duration is 21 weeks for UI-eligible workers receiving UI benefits and 8 weeks for UI-eligible workers not receiving UI benefits. See accompanying text for details.

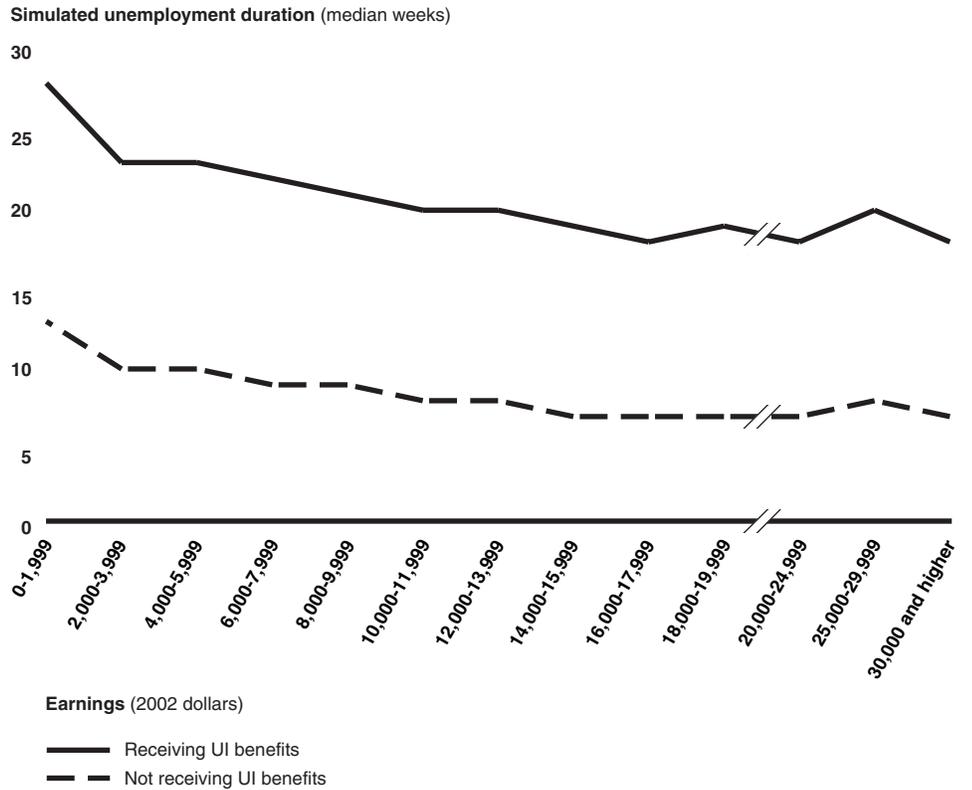
Of our two measures of an individual's earnings, only the base period earnings proved to have a statistically significant effect on the duration of unemployment.<sup>34</sup> The pattern of parameter estimates for BPE shows that unemployed individuals with low BPE have lower escape rates from unemployment than otherwise similar individuals with higher BPE. That is, lower-earning individuals tend to have longer unemployment periods. Figure 12 graphs simulations of median unemployment duration by BPE for the specific case of first-time unemployment.<sup>35</sup> Individuals with BPE below \$6,000 tend to have longer unemployment duration than unemployed individuals with higher BPE.

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<sup>34</sup>Recall that each measure was broken into earnings brackets and entered into the equation as a categorical variable. See tables 8,9,10, or 11 for the brackets used. The omitted category for BPE is \$30,000 and above and the omitted category for high quarter earnings is \$9,000 and above.

<sup>35</sup>For comparability, the simulations in figure 12 hold the ratio of HQE to BPE as closely as possible to 25 percent.

**Figure 12: Simulated Unemployment Duration for UI-Eligible Workers, by Prior-Year Earnings and UI Receipt Status**



Source: Simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment. Overall average duration is 21 weeks for UI-eligible workers receiving UI benefits and 8 weeks for UI-eligible workers not receiving UI benefits. See accompanying text for details.

## Occupation-Interaction Specification

We also estimated a specification of our model with interaction effects between the occupation categories (as opposed to industry) and our measures of past unemployment and past UI receipt experience. These results are presented in tables 10 and 11. A comparison of these results with those from tables 8 and 9 shows that the overall results of the two specifications are very similar. Therefore, only the occupation estimates will be discussed here.

Because occupation is included as a categorical variable, the parameter estimates are relative to an omitted group, which is professional and technical workers. The estimates in table 10 show that unemployed managers, machine operators, craftsmen, laborers, transportation

workers, and clerical workers are more likely to receive UI benefits than similar professional and technical workers. Table 19 presents the average simulated likelihood of receiving UI benefits by occupation for the specific case of first-time unemployment. Although the range is not as wide as for industry (see table 13), the table shows that there are differences in the likelihood of UI receipt by occupation.

**Table 19: Simulated Likelihood of Receiving UI Benefits for UI-Eligible Workers from Different Occupations**

<b>Occupation</b>	<b>Simulated likelihood of receiving UI benefits (percent)</b>
Managers and administrators	39
Farmers, farm laborers and foremen	38
Machine operators (nontransportation)	38
Craftsmen	35
Laborers (nonfarm)	34
Transportation equipment operators	33
Clerical and unskilled workers	33
Service workers (excluding private household)	28
Sales workers	28
Professional and technical workers	25
<b>Overall average</b>	<b>33</b>

Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during first-time unemployment for workers from different occupations. The parameter estimates for managers and administrators, farmers, farm laborers, and foremen, machine operators, craftsmen, laborers, transportation equipment operators, and clerical and unskilled workers are statistically significant relative to professional and technical workers at the 95 percent confidence level. See accompanying text for details.

The interactions between occupation and the number of previous unemployment periods in table 10 indicate that unemployed machine operators and laborers exhibit stronger occurrence dependence than otherwise similar professional and technical workers.<sup>36</sup> That is, each additional previous unemployment period has a stronger negative effect on the likelihood of receiving UI benefits for unemployed individuals from

<sup>36</sup>As stated above, the occurrence dependence in this case relates to the fact that an individual who does not receive UI benefits during unemployment becomes less likely to receive them during future unemployment.

these two occupations relative to similar professional and technical workers.<sup>37</sup>

The parameter estimates for occupation interacted with the number of previous UI receipt periods show that unemployed transportation operators and craftsmen exhibit weaker occurrence dependence than otherwise similar professional and technical workers.<sup>38</sup> That is, each additional previous UI receipt period has a weaker positive effect on the likelihood of receiving UI benefits for unemployed individuals from these two occupations relative to otherwise similar individuals from professional and technical occupations. Managers also showed weaker occurrence dependence, but this estimate is only statistically significant at the 90 percent confidence level. Unemployed sales workers and service workers exhibit stronger occurrence dependence than otherwise similar professional and technical workers. The other occupations showed no statistically significant effects compared with professional and technical workers.<sup>39</sup>

To illustrate the magnitudes of these differences, table 20 presents the average simulated likelihood of UI receipt by occupation and by the number of previous UI receipt periods. Column 1 presents the simulations for first-time unemployment (as in table 19). Column 2 presents the simulations assuming one prior unemployment period with UI receipt. Column 3 presents the simulations assuming two prior unemployment periods, both with UI receipt. Table 20 shows that although unemployed managers and machine operators have among the highest average simulated likelihoods of UI receipt for first-time unemployment, this is not the case if individuals have received UI benefits previously. In the case of unemployed individuals with two prior UI receipt periods, sales workers, service workers, clerical workers, and farmers are about as likely, or are

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<sup>37</sup> Although the results for some occupations were not individually statistically significant, a likelihood ratio test of the joint hypothesis that all of the interaction terms between occupation and past unemployment experience are equal to zero is rejected at the 95 percent confidence level.

<sup>38</sup> As stated earlier, occurrence dependence relating to previous UI receipt means that an individual who receives UI benefits during unemployment becomes more likely to receive them during future unemployment.

<sup>39</sup> However, a likelihood ratio test of the joint hypothesis that all of the interaction terms between occupation and past UI receipt experience are equal to zero is rejected at the 95 percent confidence level.

**Appendix I: Analysis of UI Benefit Receipt and Unemployment Duration**

more likely, to receive UI benefits than otherwise similar managers and machine operators.

**Table 20: Simulated Likelihood of Receiving UI Benefits during Different Periods of UI-Eligible Unemployment for Workers with Past UI Receipt, by Occupation**

Occupation	Simulated likelihood of receiving UI benefits during a current UI-eligible unemployment period, given past UI receipt (percent)		
	First unemployment period <sup>a</sup>	Second unemployment period	Third unemployment period
Managers and administrators	39	52	65
Farmers, farm laborers, and foremen	38	54	70
Machine operators (nontransportation)	38	50	62
Craftsmen	35	46	56
Laborers (nonfarm)	34	45	58
Transportation equipment operators	33	42	51
Clerical and unskilled workers	33	53	73
Service workers (excluding private household)	28	50	74
Sales workers	28	66	94
Professional and technical workers	25	39	56
<b>Overall average</b>	<b>33</b>	<b>48</b>	<b>64</b>

Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the average likelihood of receiving UI during a first unemployment period, a second unemployment period with UI receipt during the prior unemployment period, and a third unemployment period with UI receipt during both prior unemployment periods. The positive effect that each prior UI receipt period has on the likelihood of current UI receipt is statistically significantly larger for sales workers and service workers relative to professional and technical workers at the 95 percent confidence level, and smaller for transportation equipment operators and craftsmen. The simulations also incorporate the occupation effects and the occupation interactions with the number of prior periods of unemployment. See accompanying text for details.

<sup>a</sup>Workers experiencing their first period of unemployment did not have past UI receipt.

Table 11 shows that there is also an association between the occupation from which an individual lost a job and the duration of unemployment. Specifically, unemployed craftsmen and machine operators have higher escape rates from unemployment than similar professional and technical

workers, because the estimates are positive and statistically significant. The effects for the other occupations were not statistically significant relative to professional and technical workers. To illustrate the magnitudes of these differences, table 21 presents the median simulated duration of unemployment by occupation for the specific case of first-time unemployment. The median duration is under 20 weeks for unemployed craftsmen and machine operators who receive UI, but is almost 26 weeks for professional and technical workers.

**Table 21: Simulated Unemployment Duration for UI-Eligible Workers, by Occupation and UI Receipt Status**

Occupation	Simulated unemployment duration (median weeks)	
	Receiving UI benefits	Not receiving UI benefits
Craftsmen	16	6
Sales workers	18	7
Machine operators (nontransportation)	19	7
Transportation equipment operators	20	8
Laborers (nonfarm)	20	8
Service workers (excluding private household)	23	9
Managers and administrators	23	9
Clerical and unskilled workers	23	10
Farmers, farm laborers, and foremen	26	11
Professional and technical workers	26	11
<b>Overall average duration</b>	<b>21</b>	<b>8</b>

Source: GAO simulations based on GAO analysis of NLSY79 data.

Note: Simulations are the median duration of unemployment during first-time unemployment for workers from different occupations. The parameter estimates for craftsmen and machine operators are statistically significant relative to professional and technical workers at the 95 percent confidence level. See accompanying text for details.

To test whether or not the effects of previous experience with unemployment and UI receipt on the duration of unemployment differ by occupation, we also included the occupation categories interacted with the indicators for both previous unemployment and previous UI receipt. As stated earlier, the effects are relative to the omitted category of professional and technical workers. The parameter estimates in table 11

indicate that the interactions for prior unemployment are negative and statistically significant for craftsmen, sales workers, machine operators, laborers, and service workers. This suggests that unemployed workers from these occupations have lower escape rates from unemployment relative to professional and technical workers as the number of past unemployment periods increases.<sup>40</sup> The parameter estimates for the interactions between occupation and past UI receipt showed no individual statistical significance.<sup>41</sup>

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## Limitations of the Analysis

Although our analysis was performed using the most appropriate dataset and methodology available, there are a number of limitations to the analysis that could not be avoided and should be highlighted. Although the NLSY79 is the best available dataset for our purposes, it lacks some information that could have improved our analysis. It does not provide information about whether an unemployed individual attempted to collect UI benefits or not, only whether the individual did collect benefits. It also does not provide information about whether an individual was aware of his or her eligibility for benefits. As a result, we had to estimate each unemployed individual's UI-eligibility status. An unemployed worker's awareness of the UI program and knowledge of its basic rules could have a large impact on his or her decision to apply for benefits. This awareness may also be correlated with other observable characteristics (education and earnings, for example). Not controlling for awareness may affect the estimates of such variables.

The NLSY79 also lacks information about an unemployed worker's former employer that could help estimate UI receipt and unemployment duration. Although our results control for industry, firms within an industry have different labor turnover patterns that result in different UI tax rates through experience rating.<sup>42</sup> The lack of perfect experience rating may even encourage firms to use temporary layoffs and recalls as a way of

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<sup>40</sup>However, a likelihood ratio test of the joint hypothesis that all of the interaction terms between occupation and past unemployment experience are equal to zero could not be rejected at the 95 percent confidence level.

<sup>41</sup>In addition, a likelihood ratio test of the joint hypotheses that all of the interaction terms between occupation and past UI receipt experience are equal to zero could not be rejected at the 95 percent confidence level.

<sup>42</sup>Experience rating describes the practice of making a firm's UI tax rate a function of the amount of UI benefits paid to its former employees.

managing its labor force during demand fluctuations.<sup>43</sup> An individual who works for a firm with high labor turnover or with a high UI tax rate may be more aware of the UI program and, thus, more likely to receive benefits.

Another limitation of the NLSY79 is that it includes only information about the specific group of individuals who were between the ages of 14 and 22 in 1979. Thus, any findings based on the NLSY79 are specific to this group and do not represent the experiences of workers of all ages during the 1979-2002 period.

A methodological limitation is that we assume that the time between unemployment spells is fixed. One might expect individuals who have been unemployed and received UI benefits to change their subsequent work behavior, either to increase or decrease their chances of using the program in the future. For example, a person who received UI benefits while unemployed may search for more stable employment in order to reduce the likelihood of experiencing a layoff in the future. We do not incorporate such possibilities into our model because this would require a third equation to model employment duration, which would be a more complex and time-consuming analysis.

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<sup>43</sup>See Martin Feldstein, "Temporary Layoffs in the Theory of Unemployment," *The Journal of Political Economy*, vol. 84, no. 5 (1976).

# Appendix II: Comments from the Department of Labor

U.S. Department of Labor

Assistant Secretary for  
Employment and Training  
Washington, D.C. 20210



MAR - 2 2006

Mr. Sigurd R. Nilsen  
Director  
Education, Workforce and Income Security Issues  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Mr. Nilsen:

Thank you for the opportunity to comment on your report. We applaud the Government Accountability Office's (GAO) efforts to determine the extent to which an individual worker's characteristics are associated with the likelihood of Unemployment Insurance (UI) benefit receipt and with unemployment duration. It is an interesting study which adds to our knowledge of the UI program, especially on the impact that past UI benefit receipt has on current UI benefit receipt.

Although the report makes no recommendations, we believe it is important to note that a number of issues related to data and methodology prevent the report's findings from being definitive and limit their utility for policymaking. In addition, a number of findings differ from those of past research and should be explained more fully. The report describes several of the data limitations in footnotes and in Appendix I. However, given their significance, we believe that they should be more comprehensively and prominently addressed in the body of the report in order for the reader to understand more easily the validity of the research and draw appropriate conclusions from it. Our specific technical observations on the reported results, data limitations, and methodologies used in the analysis are attached.

Thank you for the opportunity to comment on this interesting report. If you have any questions, please do not hesitate to call me at 693-2700.

Sincerely,

A handwritten signature in cursive script that reads "Emily Stover DeRocco".

Emily Stover DeRocco

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# Appendix III: GAO Contact and Staff Acknowledgment

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## GAO Contact

Sigurd R. Nilsen, Director, (202) 512-7215

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## Staff Acknowledgments

In addition to the contact named above, Brett Fallavollita, Assistant Director, Regina Santucci, James Pearce, Bill Bates, Gale Harris, Gene Kuehneman, Jonathan McMurray, Edward Nannenhorn, Dan Schwimer, Shana Wallace, and Daniel G. Williams made major contributions to this report.

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