

Gaining the Skills for Employment: The Literacy of Female Public Assistance Recipients

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Introduction

The 2007 report *Literacy in Everyday Life*, based on the results of the 2003 National Assessment of Adult Literacy (NAAL), described respondents' employment status and their self-assessments of how their literacy skills may limit job opportunities. According to the report, at least half the individuals with *Below Basic* prose, document, and quantitative literacy levels were not in the labor force. When women in particular do not have the literacy and job skills that are needed for today's workforce, many must turn to public assistance (Wedgeworth 2004). The 2003 NAAL data revealed that, in general, more literate women who received assistance reported that their need for it was shorter than women with lower levels of literacy (Kutner, Greenberg, Jin, Boyle, Hsu, and Dunleavy 2007). Therefore, in order for women receiving public assistance to enter or re-enter the workforce or to make the transition to jobs that will support their families, they must have the literacy skills necessary to locate and perform sustainable jobs.

Using data collected from the 2003 NAAL, this report highlights findings that compare the literacy of women who reported receiving public assistance with the literacy of women who reported never receiving public assistance. Receipt of public assistance was measured using the item from the NAAL background questionnaire that asked respondents to report whether they received "Temporary Assistance to Needy Families (TANF), public assistance, or public welfare payments from the state or local welfare office" within the past 12 months. Women who responded that they had received assistance in the past 12 months are considered those who were current recipients for the purposes of these analyses. Analyses are restricted to women, because only women are eligible to receive TANF payments. Many of the background variables examined in this report are based on self-reported data, and because many of the variables are related to one another, complex interactions and relationships among them cannot be explored. Therefore, readers are cautioned not to draw causal inferences based solely on the results presented here.

The 2003 NAAL assessed the English literacy of adults (ages 16 and older) in the United States for the first time since the 1992 National Adult Literacy Survey. The NAAL provided information on the literacy proficiency of approximately 18,000 adults living in households and 1,200 prison inmates. In the household sample, 331 women reported that they had received public assistance in the past 12 months and formed the analysis sample for the current recipients of public assistance in this report. In addition to assessing the literacy skills of respondents, the NAAL gathered extensive background information on their demographic and socioeconomic characteristics (e.g., age, country of birth, schooling, labor force status), as well as on their literacy practices.

The NAAL measured respondents' proficiency on three literacy scales: *prose*, *document*, and *quantitative*. For each, proficiency was measured on a scale that ranged from 0 to 500. Scores on each of the three literacy scales were characterized in terms of four literacy proficiency levels: *Below Basic*, *Basic*, *Intermediate*, and *Proficient*.¹ These analyses focused on the prose and quantitative literacy scales; in some sections, the analyses focused on the prose literacy scale only. A detailed description of background variables and methodology used in this report is provided in Appendix A: Methodology and Technical Notes.

¹ For an interpretation of the literacy scales and performance levels on the NAAL assessment, see Kutner, M., Greenberg, E., Jin, Y., Boyle, B., Hsu, Y., and Dunleavy, E. (2007). *Literacy in Everyday Life: Results From the 2003 National Assessment of Adult Literacy* (NCES 2007-48). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Profile of Women Who Were Recipients of Public Assistance

Background Characteristics

Demographic Characteristics

The results of the 2003 NAAL shown in Table 1 indicate that the majority of women who were receiving public assistance were relatively young, White, U.S. natives. Nearly half (48%) of the women who were current recipients were ages 25-39. A higher percentage of current recipients were ages 19-39 than those who had never received public assistance. The race/ethnicity of the recipients was distributed among Whites (39%), Blacks (34%), and Hispanics (22%). Significantly more current recipients were Black or Hispanic than those who had never received public assistance in each of these racial/ethnic groups. As shown in Table 2, current recipients of public assistance who were White were underrepresented compared with the general household population, and Black and Hispanic current recipients were overrepresented.

Among women who were current recipients of public assistance, 85 percent were native to the United States. Approximately the same percentages of women who were current recipients and those who had never received public assistance reported that their first language was English (only or with another language).

Table 1. Percentage distribution of women who were currently receiving public assistance and women who had never received public assistance, by selected characteristics: 2003

Characteristic	Current public assistance recipients	Never received public assistance
Age		
16-18	—	6
19-24	20	10*
25-39	48	25*
40-64	22	41*
65 or older	—	17
Race/ethnicity		
White	39	73*
Black	34	10*
Hispanic	22	12*
Other	—	5
Country of birth		
U.S.	85	87
Other	15	13
Language spoken before starting school		
English only or with other	84	87
Other only	16	13

See notes at end of table.

Table 1. Percentage distribution of women who were currently receiving public assistance and women who had never received public assistance, by selected characteristics: 2003—Continued

Characteristic	Current public assistance recipients	Never received public assistance
Highest educational attainment		
Still in H.S.	—	4
Less than/some H.S.	40	13*
H.S. grad/GED or equivalency diploma	34	31
Postsecondary	24	53*
Have you used a computer?		
Yes	65	78*
No	35	23*
Computer with Internet access		
Yes	37	69*
No	63	31*
Computer literacy		
Computer literate	52	71*
Not computer literate	48	29*
Employment status		
Employed full- or part-time	35	58*
Unemployed	21	5*
Out of labor force	44	37*
Participation in job training		
Yes	37	39
No	63	61
Number of children		
No children	23	63*
1 child	29	16*
2 children	24	14*
3 children or more	25	8*
School involvement		
2 activities or fewer	34	33
3 activities	30	28
4 activities	37	39
Voting		
Did not vote	59	32*
Voted	41	68*

*Significantly different from those who were currently receiving public assistance at the significance level of .05.

— Sample size is insufficient to permit a reliable estimate.

NOTES: Percentages may not sum to 100 because of rounding. The "Other" category includes Asians, Pacific Islanders, Native Hawaiians, American Indians, Alaska Natives, and Multiracial adults.

Highest Educational Attainment and Computer Literacy

Among women who were current recipients of public assistance, 40 percent had attained less than/some high school education. This represents a higher percentage of women with less than a high school diploma (or equivalency) than among

women who had never received assistance. As shown in Table 2, women who were current recipients of welfare and had less than/some high school were overrepresented compared with the general household population. A higher percentage of women who had never received public assistance reported attaining postsecondary education, such as earning an Associate’s degree, graduating college, or earning a graduate degree, than women who were current recipients.

A smaller percentage (65%) of women who were current recipients of public assistance reported having used a computer than those who had never received assistance (78%). Similarly, a smaller percentage (37%) of women who were current recipients of public assistance reported having a computer with Internet access than those women who had never received assistance (69%). Nearly half (48%) of the women who were current recipients of public assistance were not computer literate. In contrast, 71 percent of those who had never received assistance had at least some computer literacy.

Table 2. Percentage distribution of women who were currently receiving public assistance, women who had never received public assistance, and the household population, by race/ethnicity and highest educational attainment: 2003

Characteristic	Current public assistance recipients	Never received public assistance	Household adults
Race/ethnicity			
White	39*	73	71
Black	34*	10	11
Hispanic	22*	12	12
Other	—	5	6
Highest educational attainment			
Still in H.S.	—	4	3
Less than/some H.S.	40*	13*	15
H.S. grad/GED or equivalency diploma	34	31	31
Postsecondary	24*	53*	51

*Significantly different from the household population distribution at the significance level of .05.

— Sample size is insufficient to permit a reliable estimate.

NOTES: Percentages may not sum to 100 because of rounding. The "Other" category includes Asians, Pacific Islanders, Native Hawaiians, American Indians, Alaska Natives, and Multiracial adults.

Employment and Job Training

The NAAL background questionnaire also collected information on respondents’ labor force and employment activities at the time of the assessment and during the previous 12 months. Compared with those who had never received public assistance, a lower percentage of women who were current recipients were employed full- or part-time. Similarly, a higher percentage of current recipients reported that they

were unemployed or out of the labor force² than those who had never received assistance. Among the out-of-the-labor-force respondents, the majority reported that they were “keeping house.” There were no significant differences between women who were current recipients of public assistance and women who had never received assistance in terms of their participation in job training or education, including courses, workshops, formal on-the-job training, or apprenticeships that helped them perform their job better, obtain a job, or earn a promotion.

Children, School Involvement, and Voting

Among women who were current recipients of public assistance, higher percentages had one or more children than those women who had never received assistance. Parents with school-aged children were asked whether they had been involved in their children’s school(s) during the previous year in any of the following ways:

- Volunteered to help out at the school, including in the classroom, on a field trip, or at a school event such as a party or school fair
- Gone to a parent-teacher or other type of meeting at the school
- Spoken individually with a teacher to see how their children were doing in school
- Sent food or other items to share in the classroom

Approximately one-third of both current recipients and those who had never received assistance participated in two or fewer activities. More than one third of the women in each group reported involvement with four activities during the past year.

Among citizens of the United States, significantly more women who were current recipients of public assistance (59%) reported that they did not vote in the 2000 presidential election than those who had never received assistance (32%).

Public Assistance Participation

As shown in Table 3, in regard to the length of time for which women reported receiving assistance, the largest percentage of women (39%) who were current recipients reported receiving assistance for more than three years during their lifetime.

Although the NAAL does not provide information regarding the specific courses taken, the majority (62%) of recipients had not taken any classes sponsored by a program to help them get off of public assistance.

² For more information about the “out of labor force” category, please refer to the Labor Force Participation variable description in Appendix A.

Table 3. Percentage distribution of women who were currently receiving public assistance, by selected public assistance participation characteristics: 2003

Public assistance participation	Current public assistance recipients
Length of time on public assistance	
1 year or less	27
More than 1 year but less than 2 years	20
2 to 3 years	14
More than 3 years	39
Taken classes to help get off public assistance	
Yes	38
No	62

NOTE: Percentages may not sum to 100 because of rounding.

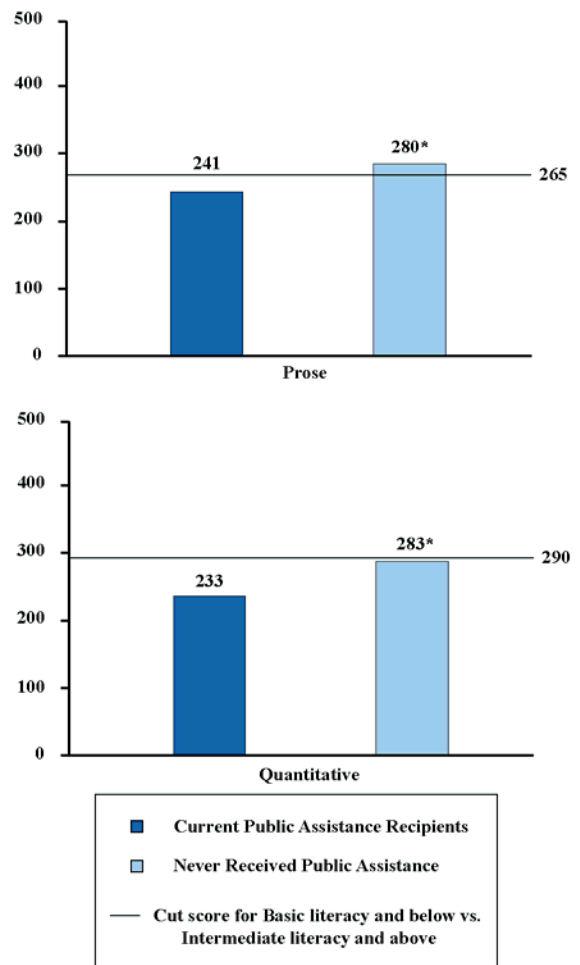
Prose and Quantitative Literacy

Estimates of the mean prose and quantitative literacy scores of current recipients of public assistance and those who had never received assistance are displayed in Figure 1. Women who were current recipients of public assistance had significantly lower prose and quantitative literacy scores than those who had never received assistance.

The literacy scores can also be used to assign individuals to one of the four levels of literacy performance. The percentage distributions across proficiency levels on the prose and quantitative scales are displayed in Figure 2. Higher percentages of women who were current recipients of public assistance had *Below Basic* or *Basic* prose literacy than women who had never received public assistance. A higher percentage of current recipients had *Below Basic* quantitative literacy than women who had never received public assistance.

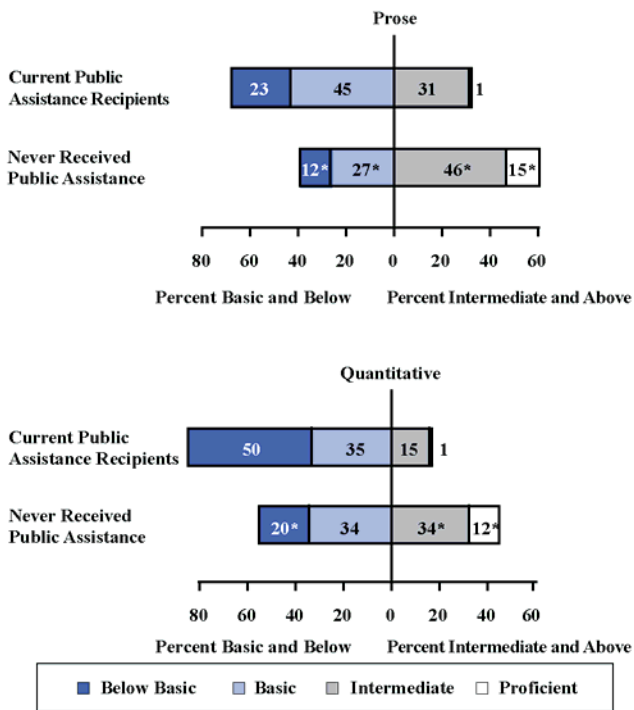
Studies have shown that the majority of public assistance recipients were not employed and that a substantial percentage of them had characteristics that made gaining and retaining employment difficult, such as low educational attainment, limited work experience, limited English proficiency, and low basic skills (Fagnoni 2001). A multivariate examination of TANF recipients' background characteristics and level of literacy proficiency described in the sections above showed similar results. For example, women with children under the age of 18 (especially unmarried mothers), women who lacked a high school diploma, and unemployed women were more likely to receive public assistance.

Figure 1. Average prose and quantitative literacy scores of women who were currently receiving public assistance and women who had never received public assistance: 2003



*Significantly different from those who were currently receiving public assistance at the significance level of .05.

Figure 2. Percentage of women who were currently receiving public assistance and women who had never received public assistance in each prose and quantitative literacy level: 2003



*Significantly different from those who were currently receiving public assistance at the significance level of .05.

Profile of Women with Lower Prose Literacy

This section examines selected characteristics of women receiving public assistance with the two lowest prose proficiency levels (i.e., *Below Basic* and *Basic*). In this report, these women are referred to as the lower literacy or less literate group. Special focus was paid to the lower literacy women who were recipients of public assistance because they were considered to be in greatest need of literacy interventions to improve their skills and employability.

Background Characteristics

Demographic Characteristics

As shown in Table 4, nearly half (46%) of the less literate women who were current recipients were ages 25-39. The race/ethnicities of less literate women who were current recipients were represented by similar percentages of Blacks (37%) and Whites (34%). Nearly one-quarter of the women in this group were Hispanic. By contrast, a higher percentage (55%) of the less literate women who had never received assistance was White. Similarly, the percentage of lower literacy current recipients who were Black (37%) was larger than those who had never received assistance (16%).

Table 4. Percentage distribution of women who were currently receiving public assistance with low prose literacy and women who had never received public assistance with low prose literacy, by selected characteristics: 2003

Characteristic	Current public assistance recipients with low prose literacy	Never received public assistance with low prose literacy
Age		
16-18	—	6
19-24	17	10
25-39	46	21*
40-64	27	36*
65 or older	—	26
Race/ethnicity		
White	34	55*
Black	37	16*
Hispanic	24	23
Other	—	6
Country of birth		
U.S.	79	74
Other	21	26
Language spoken before starting school		
English only or with other	78	75
Other only	22	25
Highest educational attainment		
Still in H.S.	—	4
Less than/some H.S.	50	28*
H.S. grad/GED or equivalency diploma	33	38
Postsecondary	18	31*
Have you used a computer?		
Yes	54	58
No	46	42
Computer with Internet access		
Yes	31	51*
No	69	49*
Computer literacy		
Computer literate	38	49
Not computer literate	62	51
Employment status		
Employed full- or part-time	28	45*
Unemployed	25	6*
Out of labor force	47	49

See notes at end of table.

Table 4. Percentage distribution of women who were currently receiving public assistance with low prose literacy and women who had never received public assistance with low prose literacy, by selected characteristics: 2003—Continued

Characteristic	Current public assistance recipients with low prose literacy	Never received public assistance with low prose literacy
Number of children		
No children	27	64*
1 child	27	16
2 children	19	12
3 children or more	27	8*
School involvement		
2 activities or fewer	36	39
3 activities	31	28
4 activities	33	32
Voting		
Did not vote	61	42*
Voted	39	58*

*Significantly different from low literacy women who were currently receiving public assistance at the significance level of .05.

—Sample size is insufficient to permit a reliable estimate.

NOTES: Percentages may not sum to 100 because of rounding. The "Other" category includes Asians, Pacific Islanders, Native Hawaiians, American Indians, Alaska Natives, and Multiracial adults.

Highest Educational Attainment and Computer Literacy

Half of the less literate women who were current recipients of public assistance had less than/some high school as their highest educational attainment. This is significantly higher than for those in this group who had never received public assistance. Conversely, and as expected, a smaller percentage of the lower literacy women who were current recipients (18%) had attained a postsecondary education than lower literacy women who had never received assistance (32%).

Nearly half (46%) of the lower literacy women who were current recipients of public assistance had not used a computer, and more than two-thirds of women in this group (69%) did not have a computer with access to the Internet. Among both women who were current recipients and women who had never received assistance, more than half of the respondents (62%) were not computer literate.

Employment

Significantly fewer lower literacy women who were current recipients of public assistance were employed full- or part-time (28%) than those women who had never received public assistance (45%).

Children and Voting

Although the number of children varied among low literacy current recipients of public assistance, the majority of less

literate women who had never received assistance had no children. A higher percentage of low literacy current recipients (27%) had three or more children than did women with low literacy who had never received assistance (8%). Among citizens of the United States, a higher percentage of lower literacy current recipients (61%) reported that they did not vote in the 2000 presidential election than did less literate women who had not received assistance (42%).

Public Assistance Participation

For these analyses, we examined lower literacy women who were current recipients of public assistance in comparison to their higher literacy counterparts. The length of time respondents received public assistance was similarly distributed across categories of time (see Table 5) for both lower and higher literacy recipients. Among both literacy-level groups, the highest percentages of recipients—44 percent of lower literacy recipients and 29 percent of higher literacy recipients—had received public assistance for more than three years.

Table 5. Percentage distribution of women who were currently receiving public assistance with low prose literacy and women who were currently receiving public assistance with high prose literacy, by selected public assistance participation characteristics: 2003

Public assistance participation	Current public assistance recipients with low prose literacy	Current public assistance recipients with high prose literacy
Length of time on public assistance		
1 year or less	28	25
More than 1 year but less than 2 years	18	26
2 to 3 years	11	21
More than 3 years	44	29
Taken classes to help get off public assistance		
Yes	38	39
No	63	61

NOTE: Percentages may not sum to 100 because of rounding.

Characteristics Most Associated with Low Prose Literacy Among Women Who Were Recipients of Public Assistance

To identify the characteristics most associated with the low prose literacy of women who were current recipients of public assistance, we conducted multivariate analyses (see Appendix A for details on the methodology). Such analyses allowed us to disentangle differences in the characteristics among women who were current recipients with *Below Basic*, *Basic*, and *Above Basic* (i.e., *Intermediate* and *Proficient*) prose literacy.

In general, among the factors investigated, educational attainment, race/ethnicity, computer literacy, and participation

in job training were found to be associated with the literacy level of women receiving public assistance.

For example, women who were current recipients lacking a high school diploma or a GED certificate were, not surprisingly, considerably more likely than those who had received postsecondary education to have *Below Basic* literacy relative to *Basic* or *Above Basic* literacy. Women who were current recipients whose highest level of education was high school or high school equivalency were six times more likely than those having received postsecondary education to have *Below Basic* literacy relative to *Above Basic* literacy.

Among women who were current recipients of public assistance, Black women were nearly four times more likely than White women to have *Below Basic* literacy relative to *Basic* literacy. In contrast, women who were current recipients with at least some computer literacy were only 0.17 times as likely as those who were not computer literate to have *Below Basic* literacy relative to *Above Basic* literacy.

Women who were current recipients of assistance who had participated in job training were more than three times more likely than those who had never participated in job training to have *Below Basic* literacy relative to *Basic* literacy.

Summary

This report, based on the 2003 NAAL assessment data, examines the characteristics of women who were current recipients of public assistance as well as the relationship between various characteristics and the English literacy proficiency of this population group. The key findings in this report are as follows:

- With regard to women who were current recipients of public assistance, whereas White women were underrepresented in comparison with the household population, Black and Hispanic women were overrepresented.
- A higher percentage (42%) of women who were current recipients of public assistance had less than/some high school education than did women who had never received public assistance (17%).
- The majority (44%) of women who were current recipients of public assistance reported that they were out of the labor force (e.g., keeping house). The majority (58%) of women who had never received assistance reported that they were employed full- or part-time.
- A higher percentage of women who were current recipients of public assistance reported having children (78%) than those who had never received assistance (37%).
- More than one third (39%) of women who were current recipients of public assistance reported receiving such for more than three years during their lifetime. The majority (62%) of these recipients had

not taken classes sponsored by a program to help them get off of public assistance.

- Women who were current recipients of public assistance had significantly lower prose and quantitative literacy scores than those who had never received assistance.
- Compared with lower literacy women who had never received assistance (49%), a higher percentage (62%) of women who were current recipients with lower literacy reported they did not have a computer with Internet access. Among both current recipients and those who had never received assistance, more than half of the less literate women were not computer literate.
- Among current recipients of public assistance, there were no differences in the length of time receiving public assistance for women with higher versus lower prose literacy.
- Relative to more literate women who were receiving public assistance, women who were Black, were not computer literate, lacked participation in job training, and earned lower oral passage reading scores were more likely to have lower literacy.

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Appendix A: Methodology and Technical Notes

This section describes the background variables and statistical procedures used in this report. It also provides a brief explanation of the direct estimation method and the plausible values method used to estimate the NAAL proficiency scores. For information on survey methodology (e.g., sampling, data collection, weighting and variance estimation, scaling) for the NAAL, see *Literacy in Everyday Life: Results from the 2003 National Assessment of Adult Literacy* (Kutner, Greenberg, Jin, Boyle, Hsu, and Dunleavy 2007).

Descriptions of Background Variables

Age

All respondents were asked to report their birthdates, and this information was used to calculate their age. Age groups reported are 16 to 18, 19 to 24, 25 to 39, 40 to 49, 50 to 64, and 65 and older. Age groups were selected to correspond to key life stages of many adults:

- 16–18: Completion of secondary education
- 19–24: College or job training
- 25–39: Early career
- 40–49: Mid career
- 50–64: Late career
- 65 and older: Retirement

Race and Ethnicity

In 2003, all respondents were asked two questions about their race and ethnicity. The first question asked them to indicate whether they were Hispanic or Latino. Then, all respondents, including those who indicated they were Hispanic or Latino, were asked to choose one or more of the following groups to describe themselves:

- White
- Black or African American
- Asian
- American Indian or Alaska Native
- Native Hawaiian or other Pacific Islander

Individuals who responded “yes” to the first question were coded as Hispanic, regardless of their answer to the second question. Individuals who identified more than one group on the second question were coded as Multiracial. Respondents of Native Hawaiian or Pacific Islander origin were grouped with those of Asian origin.

Language Spoken Before Starting School

All respondents were asked what language or languages they learned to speak before starting school. Their responses were then used to divide respondents into five groups: English only, English and Spanish, English and other language, Spanish only, or Other language(s). The English and Spanish category includes adults who spoke languages in addition to both English and Spanish.

Highest Educational Attainment

All respondents were asked to indicate the highest level of education they had completed. The following options were provided:

- Still in high school
- Less than high school
- Some high school
- GED or high school equivalency
- High school graduate
- Vocational, trade, or business school after high school
- College: less than 2 years
- College: Associate’s degree (A.A.)
- College: 2 or more years, no degree
- College graduate (B.A. or B.S.)
- Postgraduate, no degree
- Postgraduate degree (M.S., M.A., Ph.D., M.D., etc.)

Respondents who reported less than high school or some high school were asked how many years of education they had completed. For certain analyses, some of these groups were collapsed.

Computer Literacy

The NAAL background questionnaire collected data from respondents on performing various activities using a computer. Specifically, respondents were asked how often (every day, a few times a week, once a week, less than once a week, never) they:

- Send or receive an email message
- Write using a word processing program
- Use a spreadsheet program or use a financial program
- Look up information on a CD-ROM
- Find information on the Internet

On the basis of these questionnaire items, a computer literacy scale was created such that respondents who had never performed any of these five computer activities were considered to have no computer literacy, whereas those who had at least some experience with at least one of the five items were considered to have at least some computer literacy.

Labor Force Participation

The NAAL background questionnaire also collected information on respondents’ labor force and employment activities at the time of the assessment and during the previous 12 months. Responses to the questions on current employment status at the time of the assessment were used to assign each respondent to one of the following labor force statuses: employed full-time; employed part-time; employed, not-at-work; unemployed, looking for work; unemployed, not looking for work; and out-of-the-labor-force. The out-of-the-labor-force group included individuals who were classified as neither employed nor unemployed: students not looking for work, retirees, persons keeping house, persons who were disabled, and those who did not wish to work at the present time for other reasons.

Participation in Job Training

Respondents were asked in separate questions whether during the past year they had participated in any training or education, including courses, workshops, formal on-the-job training, or apprenticeships, intended to help improve job performance, earn a promotion, or obtain a job.

School Involvement

Respondents were asked four questions to indicate the number of different types of activities they were involved in at their child's or grandchild's school. They were asked whether during the past year they had done the following:

- Volunteered to help out at their child's (one of their children's/grandchild's/grandchildren's') school(s), including in the classroom, on a field trip, or at a school event such as a party or school fair?
- Gone to a PTA or other type of parent meeting at their child's (one of their children's/grandchild's/grandchildren's') school(s)?
- Spoken individually with their child's (one of their children's/grandchild's/grandchildren's') teacher(s) to see how he or she was doing in school?
- Sent food, or other items to share in their child's (one of their children's/grandchild's/ grandchildren's') classroom(s)?

Respondents were grouped according to the number of questions to which they answered "yes" as none, one, two, three, or four.

Voting

All respondents who either were born in the United States or indicated in their response to a separate question (that was asked only of people not born in the United States) that they were citizens of the United States were asked whether they remembered whether or not they voted in the 2000 presidential election. If they said they remembered whether or not they voted in the election, they were asked whether they voted. Respondents who did not remember whether they voted were treated as missing data for this question.

Participation in Public Assistance

Respondents were asked whether they or anyone in their household had received TANF, public assistance, or public welfare payments from the state or local welfare office during the previous 12 months or whether they had ever received public assistance in the past. Respondents were identified as never, past, or current participants in public assistance.

Time Receiving Public Assistance

Respondents were asked about how long, in total, they had received public assistance payments in their lifetime: less than 6 months, 6 months to 1 year, more than 1 year but less than 2 years, 2 to 3 years, more than 3 years.

Statistical Procedures

Tests of Statistical Significance

All comparisons discussed in this report have been tested for statistical significance using the *t* statistic. Statistical significance was determined by calculating a *t* value for the difference between a pair of means, or proportions, and comparing this value with published tables of values at a certain level of significance, called the alpha level. The alpha level is an a priori statement of the probability of inferring that a difference exists when, in fact, it does not. The alpha level used in this report is .05, based on a two-tailed test. Differences in the means and proportions between subgroups were calculated using the following *t* statistic:

$$t = \frac{(p_1 - p_2)}{\sqrt{(se_1^2 + se_2^2)}}$$

where p_1 and p_2 are the estimates to be compared and se_1 and se_2 are their corresponding standard errors. When a subgroup was compared to a total group, a modification of the standard error of difference was made to adjust for group dependence. The formula for the adjusted standard error of difference was as follows:

$$SE_{\text{Total-Subgroup}} = \sqrt{SE_{\text{Total}}^2 + SE_{\text{Subgroup}}^2 - 2pSE_{\text{Subgroup}}^2}$$

where p is the proportion of the total group contained in the subgroup.

Minimum Sample Sizes for Reporting Subgroup Results

In the NAAL reports, the sample sizes were not always large enough to permit accurate estimates of proficiency and/or background results for one or more categories of variables. For results to be reported for any subgroup, a minimum sample size of 45 was required. This number was arrived at by determining the sample size needed to detect an effect size of 0.5 with a probability of 0.8 or greater, using a design effect of 1.5. This design effect implies a sample design-based variance 1.5 times that of a simple random sample. The effect size of 0.5 pertains to the true difference in a given mean estimate (e.g., mean proficiency) between the subgroup in question and the total population, divided by the standard deviation of that estimate in the total population. An effect size of 0.5 was chosen following Cohen (1988), who classifies effect size of this magnitude as "medium" as well as to be consistent with what was done in the 1992 National Adult Literacy Survey (NALS).³

Multinomial Logistic Regression Analyses

Proficiency on the NAAL literacy scales (i.e., prose, document, and quantitative) is measured on a scale that ranges from 0 to 500. The performance of adults on the assessment

³ Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (second edition). Hillsdale, NJ: Lawrence Erlbaum Associates.

can be reported as either mean scores on the scale or on the basis of the distribution of adults across the NAAL performance levels (*Below Basic*, *Basic*, *Intermediate*, and *Proficient*). Each performance level describes the abilities associated with score ranges on the NAAL scale.

In investigating the effects of multiple factors on low literacy for women who were current recipients of public assistance, we conducted multinomial logistic regression analyses. Such analyses allowed us to disentangle differences between the characteristics of women who were current recipients of public assistance with *Below Basic* literacy and those with *Basic* literacy, while holding constant a series of other explanatory variables. Similarly, it also allowed us to examine differences between the characteristics of adults with *Basic* literacy and those of adults with literacy levels in the next highest categories (*Intermediate* and *Proficient*).

Multinomial logistic regression is a form of regression used when the dependent variable is categorical with more than two classes and the independent variables are of any type.⁴ It allows the simultaneous comparison of more than one contrast (e.g., the probability of *Below Basic* vs. *Basic* literacy, *Basic* vs. *Above Basic* literacy, *Below Basic* vs. *Above Basic* literacy) and usually expresses the impact of predictor variables on dependent variables in terms of odds ratios.

The odds ratio for a given independent variable represents the factor by which the odds change in the dependent variable for a one-unit change in the independent variable. For example, if the odds ratio for success in a given performance test for females versus male is 3.5, and if this odds ratio is statistically significant, we would say that the odds of success for females are 3.5 times as large as for males.

The statistical significance of the odds ratio estimates are indicated by the confidence interval for the odds ratio. If the confidence interval around the odds ratio contains the value of 1.0, then the change in the value of the independent variable is not associated with change in the odds of the dependent variable. Thus, that independent variable is not considered a useful predictor in the logistic model.

In our multinomial logistic regression analyses, the outcome measure was the NAAL literacy performance level: *Below Basic*, *Basic*, and *Above Basic* (i.e., *Intermediate* and *Proficient* combined). Using the literacy levels rather than the NAAL scale scores as the dependent variables in the model made the analyses more easily interpretable. If the continuous NAAL scale scores had been used, the results would need to be discussed in terms of unit changes on the NAAL scale per unit change in an independent variable. The impact of specific variables would be more difficult to grasp in this approach, given the abstract nature of the NAAL scale. The predictor variables in the model were age, race/ethnicity, country of birth, educational attainment, length of time receiving public

assistance, participation in courses to get off public assistance, computer literacy, employment status, participation in job training, and oral passage reading scores as measured in Fluency Addition to NAAL.⁵

Table A-1 reports the odds ratio estimates from the multinomial regression of the prose literacy performance level on the set of predictor variables described above.

Estimation of Literacy Proficiency

The NAAL used a complex assessment design that allowed maximum coverage of the broad domain of literacy while minimizing the time burden on any one respondent. Under this design, the NAAL administered only a fraction of the assessment items on each literacy scale to each respondent. Although individual respondents were required to take only a small portion of the entire pool of assessment questions, the aggregate results across the entire assessment allowed broad reporting of literacy for the targeted population. However, because respondents did not receive enough literacy tasks to provide reliable information about individual performance, traditional test scores for individual respondents would have resulted in biased estimates of population characteristics and therefore were not appropriate to use for estimates of population statistics.

To obtain unbiased estimates of population statistics (e.g., subgroup means or percentages in each proficiency level), the NAAL used methods derived from Marginal Maximum Likelihood (MML) estimation. Such MML estimation procedures were available with AM software.⁶ Estimates for average literacy scores and percentages in each literacy proficiency level in this report were all obtained using the direct estimation method with AM. The multinomial logistic regression analyses could not be conducted using MML direct estimation because the procedure is not available in AM. Instead, an alternative estimation procedure called plausible values methodology was used for the multinomial logistic regression analyses. Plausible values were initially developed for the National Assessment of Educational Progress (NAEP; Mislevy 1984, 1985, 1991; Thomas, 1993) to allow secondary users to estimate statistics derived from individual data. Plausible values are multiple imputations randomly drawn from a distribution derived from the MML parameter estimates for an extensive conditioning model (Allen, Carlson, and Zelenak 1999).

⁵ As part of the NAAL assessment, adults were asked to read a series of short passages aloud. Their responses were recorded and later scored for accuracy and speed.

⁶ For more information on direct estimation methodology followed for NAAL and the use of AM, see Baldi, S. (Ed.) et al. (Forthcoming). *Technical Report and Data File User's Manual for the 2003 National Assessment of Adult Literacy*. U.S. Department of Education. Washington, DC: National Center for Education Statistics.

⁴ For more information on multinomial logistic regression, see Hosmer, D., and Lemeshow, S. (2004). *Applied Logistic Regression*. New York: John Wiley & Sons.

Table A-1. Odds ratio estimates from multinomial regression analyses for women who were current recipients of public assistance

Effect	Below Basic vs. Basic			Basic vs. Above Basic			Below Basic vs. Above Basic		
	Point Estimate	95% Wald Confidence Limits		Point Estimate	95% Wald Confidence Limits		Point Estimate	95% Wald Confidence Limits	
Race/ethnicity: Black vs. White	3.83	1.28	12.13	--	--	--	4.18	1.55	11.49
Education: Less than/some high school vs. Postsecondary	9.42	3.96	23.87	2.71	1.04	7.15	14.18	4.35	49.89
Education: High school/GED vs. Postsecondary	5.36	1.78	16.80	--	--	--	6.45	1.78	23.86
Computer literacy: Some vs. None	0.25	0.10	0.63	--	--	--	0.17	0.06	0.48
Job training participation: Yes vs. No	3.27	1.15	9.65	--	--	--	--	--	--
Oral passage reading score	--	--	--	0.98	0.97	0.99	0.98	0.96	0.99

-- Estimates not significant and not shown.

Note: Results were only shown for predictors with significant odds ratio estimates.

It is important to recognize that plausible values are not test scores for individuals, and they should not be treated as such. Plausible values are randomly drawn from the distribution of scores that could be reasonably assigned to each individual. As such, the plausible values contain random error variance components and are not optimal as scores for individuals.

In our multivariate analyses, five plausible values for each adult were obtained as estimates of scores on the prose literacy scale. These plausible values were then used to assign each individual to one of the NAAL performance levels. Five sets of multinomial regression analysis were conducted, using each of the five plausible values. The reported odds ratio estimates are the average of the five odds ratio estimates using each of the five plausible values. It should be noted, however, that the standard errors used in the significance tests for the reported odds ratio estimates were not adjusted for variation among the five sets of results given the complexity of the computations and the unavailability of an estimation procedure in the statistical software. Therefore, the confidence limits around the odds ratio estimates might be narrower than they would be, had the standard errors been corrected.