

Preparing Youth for the Future: The Literacy of America's Young Adults

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Introduction

Young adults are among the most recent entrants into the labor force. Many out-of-school young adults, especially those with no postsecondary schooling, have encountered severe difficulties in obtaining access to career jobs (Sum, Fogg, and Mangum 2000). Improving the literacy of young adults is among the proven strategies for enhancing their labor market prospects. Knowing the literacy proficiencies of America's young adults has become increasingly important for providing guidance to public policymakers about effective literacy instruction among this population group.

Using data collected from the 2003 National Assessment of Adult Literacy (NAAL), this report examines the characteristics and literacy proficiency of America's young adults ages 16-18 and 19-24, with particular attention to high school drop-outs within these age cohorts. This report also compares the literacy of young adults with that of older age cohorts and identifies characteristics that are most associated with the low literacy of America's young adults. 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 proficiencies of approximately 18,000 adults living in households and 1,200 prison inmates. In the household sample, 2,960 adults were between ages 16 and 24 and formed the young adult analysis sample 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., their age, gender, nativity status, schooling, labor force status, household income), as well as on their literacy practices.

The NAAL measured respondents' proficiencies 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 Given the scope of this report, the 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 the Appendix A: Methodology and Technical Notes.

Profile of Young Adults Ages 16-18 and 19-24

Background Characteristics

Demographic Characteristics, Educational Attainment, and Computer Literacy

Table 1 presents the percentage distribution of young adults ages 16-18 and 19-24 by selected characteristics. Based on self-reported data on highest level of educational attainment, although nearly half of young adults ages 16-18 were still in high school and 23 percent had completed high school or high school equivalency, nearly one quarter still lacked a high school diploma or a General Educational Development (GED) certificate. Among young adults ages 19-24, some 16 percent lacked a high school diploma or a GED certificate.

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.

Table 1. Percentage distribution of young adults ages 16-18 and 19-24, by selected characteristics: 2003

Characteristic	Young adults 16-18	Young adults 19-24
Gender		
Male	52	52
Female	48	48
Race/ethnicity		
White	62	58
Black	12	15
Hispanic	17	20
Other	9	8
Highest educational attainment		
Still in H.S.	48	—
Less than/some high school	24	16
H.S. grad/GED/equivalency	23	33
Postsecondary but less than 4-year college	5	40
College grad/graduate studies/degree	—	10
Language spoken before starting school		
English only	81	77
English and other	8	8
Other only	11	16
Age learned English if not spoken before starting school		
1-10	63	39
11-15	—	22
16 or older	—	16
Does not speak English	—	24
Computer literacy		
At least some computer literacy	92	81
No computer literacy	8	20
Employment status		
Employed full time	11	47
Employed part time	28	22
Employed not at work	—	3
Unemployed	13	12
Out of labor force	44	16

See notes at end of table.

Table 1. Percentage distribution of young adults ages 16-18 and 19-24, by selected characteristics: 2003—Continued

Characteristic	Young adults 16-18	Young adults 19-24
Occupation		
Management/Business/Financial	—	4
Professional and related	—	13
Service	47	28
Sales and related	20	16
Office/Administrative support	9	15
Farming/Fishing/Forestry	—	—
Construction/Extraction	—	9
Installation/Maintenance/Repair	—	3
Production	—	6
Transportation/Material moving	7	6
Weekly wage		
Less than \$300	49	21
\$300 - \$499	—	41
\$500 - \$649	—	16
\$650 - \$849	—	13
\$850 or more	—	10
Participation in job training		
Yes	31	48
No	70	52
Number of children		
No children	96	77
1 child	4	15
2 or more children	—	9
School involvement		
2 activities or fewer	—	37
3 activities	—	41
4 activities	—	22
Public assistance participation		
Never participated	96	94
Had participated	—	6
Voting		
Did not vote	—	74
Voted	—	26

— Sample size is insufficient to permit a reliable estimate.

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

Although the majority of young adults in these age cohorts reported speaking English before starting school, 11 percent of the 16-18 year olds and 16 percent of the 19-24 year olds reported speaking a non-English language before starting school. Among the latter, 16 percent first learned to speak English after the age of 16, and nearly one quarter did not speak English at all.

The vast majority (92%) of young adults ages 16-18 had at least some computer literacy (see Appendix A for information on how the computer literacy scale was constructed). A higher percentage of young adults ages 19-24 (20%) lacked computer literacy compared with the younger age group.

Employment, Earnings, and Job Training

As presented in Table 1, 72 percent of young adults ages 19-24 were employed full or part time at the time of the assessment compared with 12 percent who were unemployed and 16 percent who were out of the labor force. Forty-four percent of young adults ages 16-18 were out of the labor force. The out-of-the-labor-force group included individuals who were classified as neither employed nor unemployed. They included students, persons keeping house, persons who were disabled, and those who did not wish to work at the time of the assessment for other reasons.

Of all employed young adults ages 16-18, nearly half held jobs in *Service* occupations and another 20 percent in *Sales and related* occupations. Similarly, the occupations of the employed 19-24 year olds were concentrated in *Service, Sales and related*, and *Office/Administrative support*.

Data on weekly earnings at the time of the assessment were also available for young adults who were employed full time. Of young adults ages 16-18, nearly half earned less than \$300 weekly. Of the 19-24 age group, 21 percent earned less than \$300 weekly, and 41 percent earned between \$300 and \$499. In general, young adults ages 19-24 earned more weekly than the younger age group.

The NAAL respondents were asked whether, during the previous year, they had participated in any training or education to help improve their job performance, get a promotion, or get a job. Thirty-one percent of the young adults ages 16-18 and nearly half of those ages 19-24 had participated in some type of job training.

School Involvement, Public Assistance Participation, and Voting

Among adults ages 19-24, less than a quarter had one or more children. Parents of school-age children were asked whether they had been involved in their children’s schools 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

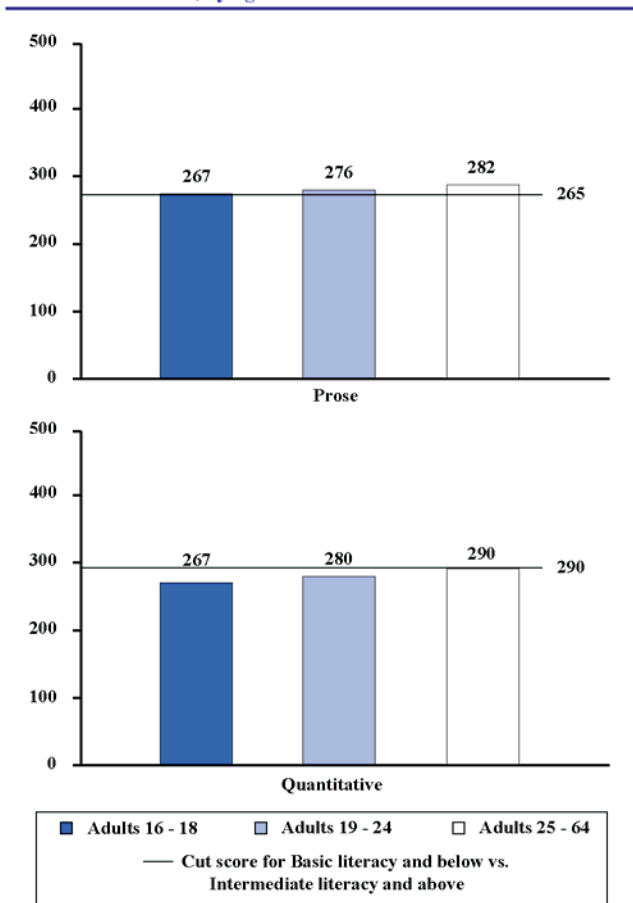
- Spoken individually with a teacher to see how their children were doing in school
- Sent food or other items to share in the classroom

Among the 19-24 year olds who had school-age children, 63 percent reported doing three or four activities during the past year.

The majority of young adults in both age groups had never participated in public assistance programs such as Temporary Assistance to Needy Families (TANF). Among America’s young adult citizens of voting age, 74 percent reported they voted in the 2000 presidential election.

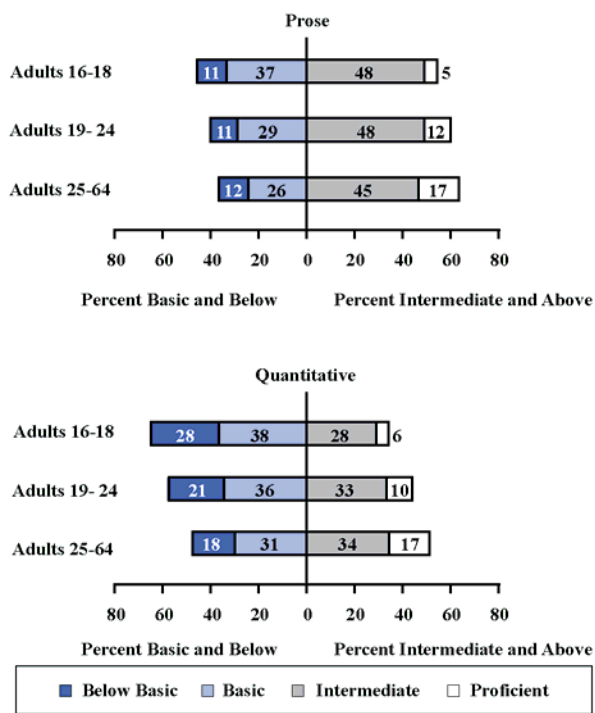
Prose and Quantitative Literacy

Figure 1. Average prose and quantitative literacy scores of adults, by age: 2003



Estimates of the mean prose and quantitative literacy scores of adults by age cohorts are displayed in Figure 1. On both the prose and the quantitative literacy scales, adults ages 16-18 had lower average scores than adults in the two older age cohorts (i.e., 19-24 and 25-64). For adults ages 19-24 and adults ages 25-64, although their average prose literacy scores were similar, their average quantitative literacy scores were different, with the older age group having higher scores than the younger age group.

Figure 2. Percentage of adults in each prose and quantitative literacy level, by age: 2003



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 prose and quantitative scales are displayed in Figure 2 for adults in different age cohorts. On the prose literacy scale, nearly half of young adults ages 16-18 had *Below Basic* or *Basic* literacy, indicating that their literacy proficiency was quite limited. The percentages of adults having *Below Basic* or *Basic* prose literacy were lower in the two older age cohorts. On the quantitative scale, about two-thirds of young adults ages 16-18 and 57 percent of those ages 19-24 had *Below Basic* or *Basic* literacy. Both percentages were higher than those of adults ages 25-64.

Characteristics of Young Adults Who Dropped Out of High School

Nineteen percent of all young adults ages 16-24 had not completed high school or high school equivalency. This section examines the characteristics and literacy proficiency of America's youths who dropped out of high school.

Background Characteristics

Table 2: Percentage distribution of young adults ages 16-18 and 19-24 who dropped out of high school, by selected characteristics: 2003

Characteristic	Dropped-out young adults 16-18	Dropped-out young adults 19-24
Gender		
Male	58	56
Female	43	44
Race/ethnicity		
White	48	38
Black	17	15
Hispanic	23	43
Other	—	—
Number of years of education		
0-8 years	—	25
9-12 years	90	75
Computer literacy		
At least some computer literacy	85	50
No computer literacy	16	50
Number of children		
No children	92	61
1 child	—	23
2 or more children	—	15
Public Assistance		
Never	95	89
Had participated	—	11
Voting		
Did not vote	—	93
Voted	—	—

— 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.

Demographic Characteristics, Years of Schooling, and Computer Literacy

As indicated in Table 2, in both age groups of 16-18 and 19-24, more male than female young adults dropped out of high school. One-quarter of the out-of-school youths ages 19-24 had less than 9 years of schooling.

Compared with 12 percent of Hispanics in the NAAL household population, higher percentages of the high school drop-outs were Hispanics in both age groups (23% and 43%, respectively), indicating an over-representation of this ethnic

group. Blacks were also over-represented among high school drop-outs ages 16-18 (17%) compared with the general NAAL household population (11%).

Employment and Earnings

As shown in Table 3, high school drop-outs more frequently held jobs in the construction industry compared to graduates. With the exception of this difference, there was no other significant difference among high school completers and drop-outs in types of jobs held. Both groups held jobs most frequently in *Service* and *Sales and related* industries.

Table 3: Percentage distribution of young adults ages 16-24 by occupation, weekly wage and completion of high school: 2003

Characteristic	Dropped-out young adults	High school graduated young adults
Occupation		
Management/Business/Financial	—	—
Professional and related	—	—
Service	39	38
Sales and related	15	17
Office/Administrative support	—	13
Farming/Fishing/Forestry	—	—
Construction/Extraction	16	10 *
Installation/Maintenance/Repair	—	—
Production	—	6
Transportation/Material moving	8	6
Weekly wage		
Less than \$300	30	27
\$300 - \$499	49	44
\$500 or more	—	29

*Significantly different from dropped-out young adults at the significance level of .05.

— Sample size is insufficient to permit a reliable estimate.

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

Thirty percent of the young drop-outs ages 16-24 who were employed full time earned less than \$300 weekly at the time of the assessment. No significant differences in weekly wage were found between high school drop-outs and high school completers.

Public Assistance Participation and Voting

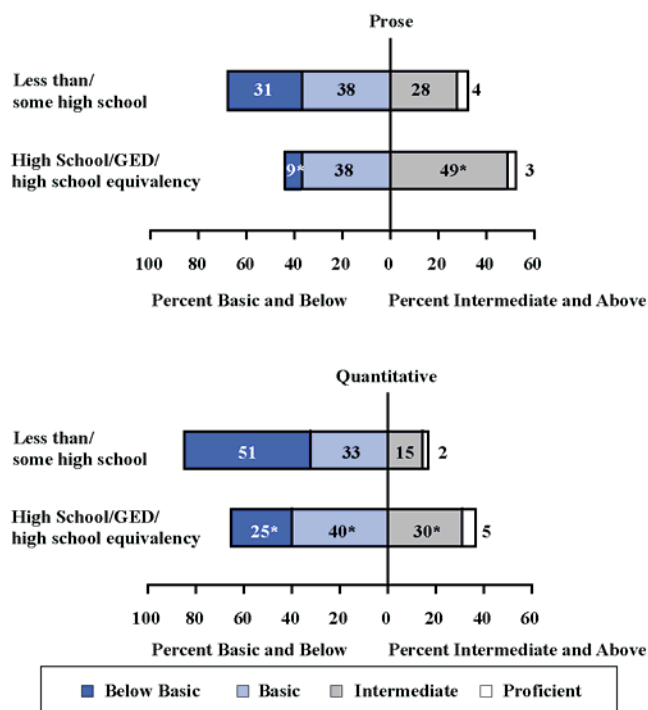
Compared with the general young adult population ages 19-24, a higher percentage of drop-outs of the same age had children (38% vs. 24%) and had received public assistance (11% vs. 6%).

While 74 percent of young adult citizens of voting age reported they did not vote in the 2000 presidential election, an even higher percentage of those who had dropped out of high school (93%) reported not voting.

Prose and Quantitative Literacy

Figure 3 shows how the literacy performance distributions varied between young adults who lacked a high school diploma or a GED certificate and those who completed high school or high school equivalency.

Figure 3. Percentage of adults ages 16-24 in each prose and quantitative literacy level, by high school completion: 2003



*Significantly different from young adults with less than/some high school education at the significance level of .05.

Of young adults who dropped out of high school, more than 30 percent had *Below Basic* prose literacy compared with 9 percent of their peers who completed high school or high school equivalency. In total, more than two-thirds of high school drop-outs had *Below Basic* or *Basic* prose literacy, whereas less than half of those with a high school diploma or a GED certificate fell into these two lowest literacy levels.

On the quantitative literacy scale, half of the young adults who dropped out of high school had *Below Basic* literacy, which was also higher than the percentage of those having a high school diploma or a GED certificate.

Similar to the findings in the previous section, among dropped-out young adults having *Below Basic* and *Basic* prose literacy, Hispanics and Blacks were over-represented

compared with the general adult population (Table 4). For example, over half of drop-outs ages 19-24 who had *Below Basic* and *Basic* prose literacy were Hispanics, compared with 12 percent of Hispanics in the total adult population.

Table 4: Percentage distribution of young adults ages 16-18 and 19-24 who dropped out of high school and had low prose literacy, by selected characteristics: 2003

Characteristic	Dropped-out young adults 16-18 with low prose literacy	Dropped-out young adults 19-24 with low prose literacy
Gender		
Male	56	57
Female	44	44
Race/ethnicity		
White	40	28
Black	22	18
Hispanic	29	52
Other	—	—
Number of years of education		
0-8 years	—	32
9-12 years	88	68
Computer literacy		
At least some computer literacy	80	39
No computer literacy	21	61

— 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.

Nearly one-third of the drop-outs ages 19-24 who had *Below Basic* and *Basic* prose literacy had less than 9 years of schooling, and 61 percent demonstrated a lack of computer literacy.

Characteristics Most Associated With Low Prose Literacy of Young Adults

To identify characteristics most associated with the low prose literacy of America's young adults, we conducted multivariate analyses (see Appendix A for details on the methodology). Such analyses allowed us to disentangle differences in the characteristics among young adults with *Below Basic*, *Basic*, and *Above Basic* (i.e., *Intermediate* and *Proficient*) prose literacy.

In general, among the factors investigated, lacking a high school diploma or a GED certificate, lacking computer literacy, and not speaking English before starting school were

found to increase the likelihood that young adults had low prose literacy.

For example, young adults lacking a high school diploma or a GED certificate were four times more likely than those having received postsecondary education to have *Below Basic* relative to *Above Basic* prose literacy.

Young adults having at least some computer literacy were only half as likely as those who were not computer literate to have *Below Basic* literacy relative to *Above Basic* literacy.

Young adults who spoke a non-Spanish foreign language before starting school were over three times more likely than their native English-speaking counterparts to have *Below Basic* literacy relative to *Above Basic* literacy.

Results also showed that Black young adults were nearly twice as likely as White young adults to have *Below Basic* literacy relative to *Above Basic* literacy.

Summary

This report, based on the 2003 NAAL assessment data, examines the characteristics and literacy proficiency of America's young adults ages 16-18 and 19-24, with particular attention to high school drop-outs within these age cohorts. This report also compares the literacy proficiency of young adults with that of older age cohorts and discusses characteristics that are most associated with the low literacy of America's young adults.

The key findings in this report are as follows:

- More male than female young adults dropped out of high school.
- Hispanic and Black young adults were over-represented in the high-school drop-out population, especially among the drop-outs having low prose literacy.
- The most frequently held jobs among young adults were in *Service* and *Sales and related* industries.
- The vast majority (92%) of young adults ages 16-18 had at least some computer literacy. The percentage among adults ages 19-24 was lower (80%).
- Compared with the general young adult population ages 19-24, a higher percentage of the 19-24-year-old drop-outs had children and had received public assistance, but a lower percentage reported voting in the 2000 presidential election.
- Young adults who did not have a high school diploma or a GED certificate, lacked computer literacy, and did not speak English before starting school were more likely to have low prose literacy.
- Black young adults were nearly twice as likely as White young adults to have *Below Basic* literacy over *Above Basic* 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) followed for 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

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 three groups: English only, English and other language, or Other language(s).

Age Learned English

Respondents who spoke a language other than English before starting school were asked their age when they learned to speak English. They were classified into one of the following categories: 10 or younger, 11 to 15, 16 or older.

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.

Participation in Basic Skills Class

The NAAL respondents were asked whether they had participated in a program other than in regular school to improve their *basic skills*, that is, basic reading, writing, and arithmetic skills.

Information Technology (IT) Certification

All respondents were asked whether they had received any type of information technology skill certification sponsored by a hardware or software manufacturer or an industry or professional association and whether they had passed a test to get the certification. Those who answered yes to both questions were counted as receiving IT certification.

Computer Literacy

The NAAL background questionnaire collected data from respondents on using a computer to perform various activities. Specifically, respondents were asked *How often (every day, a few times a week, once a week, less than once a week, never) do you:*

- Send or receive an email message
- Write using a word processing program
- Use a spreadsheet program or use a financial program
- Look up info on a CD-ROM
- Find info 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, 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.

Occupation

Respondents who had held a job within the past 3 years were asked to provide the title of their occupation and its most important activities and duties. This information was used to assign each occupation a 2000 Census Bureau code. The occupations were then collapsed into eight major occupational groups:

- Management, business, and financial
- Professional and related
- Service
- Sales and related
- Office and administrative support
- Construction and extraction
- Installation, maintenance, and repair
- Production

Weekly wage

Respondents who were employed were asked to report their gross weekly wage or salary (before deductions) during the previous week. Some respondents were unable to report their weekly wage or salary before deductions. In these cases, the interviewers asked them to report their take-home pay and noted that fact. Some respondents reported their pay per hour, day, 2-week period, month, or year, rather than per week as requested. This was also noted by the interviewers, who asked a follow-up question to clarify the time frame the respondents were using.

All reported pay was adjusted to approximate gross weekly wages or salaries. For respondents who reported their earnings in units other than weekly (e.g., per hour or per day), information on the number of hours worked per week (collected in a separate question) was used to compute weekly earnings. For respondents who reported take-home pay rather than gross pay, adjustments were made to the wage or salary they reported by adding a FICA adjustment at a flat rate of 7.65 percent and an additional adjustment based on IRS withholding tables for single taxpayers in 2003. An additional 10 percent was added as a proxy for state taxes and miscellaneous deductions.

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/grandchildren) school(s), including in the classroom, on a field trip, or at 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/grandchildren) school(s)?
- Spoken individually with their child's (one of their children's/grandchild/grandchildren) 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/grandchildren) classroom(s)?

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

Participation in Public Assistance

Respondents were asked whether they or anyone in their household had received Temporary Assistance for Needy Families (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 welfare.

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.

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).²

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 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 young adults, we conducted multinomial logistic regression analyses. Such analyses allowed us to disentangle differences between the characteristics of adults with *Below Basic* literacy and those of adults 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.³ 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 sex, race/ethnicity, country of birth, language spoken before starting school, educational attainment, IT certification, computer literacy, employment status, participation in job training, participation in basic skills training, and oral passage reading scores as measured in the Fluency Addition to NAAL.⁴

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

² Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (second edition). Hillsdale, NJ: Lawrence Erlbaum Associates.

³ For more information on multinomial logistic regression, see Hosmer, D., and Lemeshow, S. (2004). *Applied Logistic Regression*. New York: John Wiley & Sons.

⁴ 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.

therefore were not appropriate to use for estimates of population statistics.

Table A-1. Odds ratio estimates from multinomial regression analyses for young adults

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	--	--	--	1.90	1.43	2.54	1.92	1.16	3.20
Language spoken before starting school: English with other language vs. English only	--	--	--	2.42	1.01	5.92	--	--	--
Language spoken before starting school: Other vs. English only	--	--	--	2.39	1.15	5.01	3.30	1.38	7.92
Education: Still in high school vs. Postsecondary	--	--	--	1.66	1.17	2.36	2.35	1.27	4.36
Education: Less than high school vs. Postsecondary	1.99	1.15	3.44	2.08	1.37	3.15	4.10	2.43	6.95
Education: High school/GED vs. Postsecondary	--	--	--	1.64	1.15	2.34	2.12	1.27	3.57
Computer literacy: Some vs. None	0.69	0.48	1.00	0.68	0.46	0.99	0.46	0.30	0.72
Oral passage reading score	0.99	0.98	0.99	0.99	0.98	0.99	0.97	0.97	0.98

-- Estimates not significant and not shown.

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

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.⁵ 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).

It is important to recognize that plausible values are not test scores for individual, 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.

⁵ 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.