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ABSTRACT

The methodology of five national surveys designed to estimate the scale and scope of training was analyzed to identify the reasons underlying the variability and unreliability of estimates of education and training. The five surveys were as follows: May Triennial Adult Education Supplement to the Current Population Survey, National Longitudinal Survey of Youth, Survey of Income and Program Participation, National Longitudinal Survey of High School Class of 1972, and High School and Beyond. The analysis focused on the following: fundamental purpose of each survey, population sampled, goodness of fit, and survey structure/design. The analysis established that the five surveys do not measure fully what they purport to measure. It was concluded, however, that when taken collectively, they provided an invaluable insight into the nature of work-related education and training in the United States. The following are recommendations for improving the surveys' reliability and capacity for measuring the scale and scope of education and training: (1) "bundle" questions focusing on incidence of work-related education and training with questions dealing explicitly with work and the skills needed for it; (2) include matched samples of employment establishments and employees; and (3) develop more explicit questions focusing on training credentials and certificates. (Contains 16 figures/tables and 19 references.) (MN)

EQW WORKING PAPERS

On Measuring a Mirage: Why U. S. Training Numbers Don't Add Up

by

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Contents

I. Introduction

Estimating the scale and scope of training has become something of a growth industry. As part of the national debate over the requirements for economic revitalization, there has been a marked increase in the importance accorded to job training, youth apprenticeships, and schools that prepare their students for the labor market. In order to better understand the nation's current investments in work-related education and training, this interest has been accompanied by a substantial increase in the number of surveys that have asked workers, both present and future, how often and from whom have they received work-related training.

In one respect, however, training's new importance has proved to be too much of a good thing. As the effort to measure training and its effects has gathered momentum, an increasingly sophisticated array of national surveys yielded results that were not just widely, but wildly, different in their estimates of who received training and why. The more diligently the research community worked to establish a baseline for training rates, the less certain what qualified as work-related education and training became—much less the measurement, even the approximation, of its incidence. How, for example, was one to make sense of the fact that two well-constructed surveys with almost identical sampling frames and administered less than a year apart reported that the proportion of the working population who had received training was either two-thirds or one-quarter—take your pick? What was the nation being told when more than 70 percent of the respondents to a survey designed by the Bureau of Labor Statistics reported that they needed no training—including on-the-job training—to perform their current jobs?

Our purpose in this essay is to attempt to explain why these estimates of training have proved so variable and, in that sense, unreliable. We have proceeded in this effort, much as the historian or archeologist might, by treating national surveys and the responses they elicited as artifacts generated by a process in which we believe training appeared to be as much a mirage as a reality. What we sought is an understanding of how these data came to be—what processes and transac-

tions gave shape to the responses at hand. From this vantage point we could then ask, "What do these conflicting training estimates tell us about the perception and meaning of training in the American context?" To answer our question, we needed a better understanding of what the respondents thought they were being asked and why, in the end, they responded so uncertainly.

The surveys we examined—the archeological "tells" of our excavations—included major national surveys sponsored by the federal government since 1973. Each survey was based on a national probability sample in which either individuals or individual households were asked, among other questions, to report their income, age, gender, ethnicity, education, and whether they had received work-related education or training. Many of the surveys were part of the regular Current Population Survey (CPS) series—in this case, the May Triennial Adult Education Supplement that asked whether members of the household had participated in a broadly defined range of adult education programs that included work-related education or training, as well as two special CPS surveys that included supplements dealing with work-related training. Three of the surveys were longitudinal analyses that followed specific youth cohorts—two were developed by the Department of Education and the other by the Bureau of Labor Statistics. Some of the surveys had a special focus, either training itself or participation in a range of federal programs that included training as well as social security and public welfare. In the latter case, the survey sought to measure the incidence of training whether or not it was part of a federal program.

In the course of our research we became the first to develop a systematic "crosswalk" designed to compare the specific ways each survey asked its training questions.[1] To facilitate this aspect of our analysis we borrowed technology from an unusual source, children's "flipbooks," which allow the young to assemble different animals or stories by changing the order in which the different parts are revealed. The resulting ability to, quite literally, lay out the different surveys side by side in any combination highlighted how often the surveys differed linguistically—as well as how often they seemingly asked the same question and still elicited substantially different responses.

We also developed a new way to present graphically the statistical differences between surveys. Using basic logistic procedures for estimating the odds that a specific group of respondents would report having received training, we developed what we came to call "odds trees" that showed us at a glance both the general estimate of reported training and its distribution among groups defined by levels of education, income, age, and gender.

Finally, we used this analytic architecture—both the linguistic crosswalks and the odds trees—to explore three hypotheses that might explain the contradictory estimates of work-related training generated by more than a decade of national surveys.

1. The first, and most stark, hypothesis was simply that the surveys were so flawed that they did not warrant further analysis. Whether the discrepancies were caused by linguistic problems inherent in the questions, by the order of the questions and context in which they were asked, or by the differences in the people queried, we speculated about the possibility that due to their actual construction the instruments themselves were the principal cause of the reported variances in training rates.

2. Second, we asked whether there was something inherently "slippery" about the nature, and hence the meaning and definition, of training that makes consistent measurement unlikely. While train-

ing's proponents find it easy, and almost trivial, to define what they mean by a structured or formal training program, is it possible that the beneficiaries of those efforts have a less clear picture of how participation in a specific program contributed to what they needed to know to work better and smarter?

3. Third, we returned to that old intuition that Americans believe in education while downplaying, even demeaning, the importance of training. In the American context education is associated principally with credentials. Americans have a better sense of what they have earned in terms of degrees and certificates than what they have learned in terms of either knowledge or skills. One of the principal characteristics of work-related training in the United States is its remarkable detachment from credentials. While educated citizens, quite literally, have their degrees to display, trained workers have little to show others—or themselves—to document their proficiency. We came to ask: Is it possible that both the result and process of training is so ephemeral when compared with the result and process of earning a high school or college degree that it renders the former event unremarkable and thus not remembered? Was it possible that training has so little intrinsic meaning in the American context that the respondents to the national surveys relied on the context of the training question—rather than their own sense of having been trained or not—to form their answers?

A Catalog of Artifacts

We begin our story with a description of the surveys themselves, 25 separate administrations from 1973 to 1991. We first looked at the **May Triennial Adult Education Supplement to the Current Population Survey (CPS),** which asked questions about the educational courses, including formal job training courses, taken by adults in CPS's national probability sample of approximately 56,000 households. The sample for this instrument is drawn to maximize the reliability of the survey's estimates of labor force characteristics. While comparable data for the May Triennial Adult Education Supplement survey were collected as far back as 1969, we only examined the years 1981 and 1984, since only these administrations included relevant income data.[2]

Periodically, the CPS has been used to mount special surveys on a particular topic. In January 1983 and again in January 1991 the CPS included a specialized survey on work-related training. While the 1983 CPS Training Supplement increasingly has been utilized to analyze the scale and scope of work-related training, the public use file containing the January 1991 data only recently has become available. Our research represents one of the first efforts to match the 1991 results to those of 1983 to understand the changing demand for work-related training.[3]

The National Longitudinal Survey of Youth (NLS-Y) is one of five longitudinal studies administered by the Bureau of Labor Statistics and managed by

the Center for Human Resource Research at The Ohio State University.[4] These studies are collectively known as the National Longitudinal Surveys of Labor Market Experience.[5] The NLS-Y is a national probability sample of 12,686 men and women who were 14 to 21 in 1979 when they were first interviewed. The most recent year for which we analyzed data for this project is 1988. Among the core set of questions asked are items covering labor force status, job information, and training.

The Survey of Income and Program Participation (SIPP) is a nationwide survey designed to provide comprehensive information on the economic situation of households and persons in the United States. The first SIPP survey of 20,000 households was conducted in October 1983 and is referred to as the 1984 panel.[6] Respondents were interviewed once every four months for approximately two-and-one-half years. A new sample panel of approximately 12,000 households is introduced every year. SIPP collects information on income, participation in government transfer programs, labor force status, and other topics on a regular basis. Various modules addressing topics of special interest are administered throughout the two-and-one-half-year period. One of these topical modules asks about the education and training histories of the respondents.

The National Longitudinal Survey of High School Class of 1972 (NLS-72) is the first major study of the National Education Longitudinal Studies program of the National Center for Educational Statistics (NCES).[7] The original sample consisted of 22,652 high school seniors in the spring of 1972. In 1986 a questionnaire was mailed to a subsample of 14,489 members of the original sample. This subset provides the most recent data available on this cohort. Training-relevant questions were asked during every administration of the NLS-72 from the first follow-up and on.

High School and Beyond (HS&B) was the second major longitudinal study undertaken by NCES.[8] The base-year survey of HS&B included a 1980 cohort of high school seniors who were comparable to the 1972 cohort. At the same time, a sophomore cohort was included to provide data on the educational choices made between the sophomore and senior years. Over 30,000 sophomores and 28,000 seniors provided base-year questionnaire data. The third follow-up of HS&B took place in 1986 and remains the most recent data available. This questionnaire contains data on 13,425 respondents from the sophomore cohort and 10,536 respondents from the senior cohort. Questions about training were asked of the senior cohort on all follow-up surveys; for the sophomore cohort, training-relevant questions were asked on the second and third follow-up surveys.

The Fundamental Problem

In attempting to draw consistent estimates of training from this wealth of national survey data, researchers have had to confront a host of problems stemming largely from the nature and purposes of the instruments themselves. Most of the surveys derive from attempts to measure something other than training—and in that sense the questions on work-related training are peripheral to the core items motivating the administration of the survey. Not surprisingly, the specific syntax of the training items, as well as the context in which the training questions are asked, varies across surveys. Because the surveys have not been constructed to allow the straightforward development of a training measure, their use for purposes of estimating the incidence of training inevitably requires the researcher to invest substantial time and effort in culling information from a particular data source. As a result, most researchers become familiar with a single data set of choice, implicitly recognizing that the task of mastering the disparate sources that do exist is simply too expensive.[9]

The result is the confusion of estimates that confront policy makers, who try to approximate the United States' current investment in work-related training in order to gauge how much more (or less) the nation ought to be investing in the educational quality of its workforce. Estimates of the cost of training, for example, range from 2 billion dollars annually to 200 or more billion dollars per year (Zemsky and Meyerson 1981; Eurich 1990) The number of people who reported receiving work-related education or training has been estimated variously at 20 percent, 55 percent, and 70 percent of the working population—depending on the data source used and its particular definition of training. Interestingly, although there is little agreement on the incidence of work-related training, most research finds that the most likely recipients tend to be male, white, well-educated, and between the ages of 25 and 44.

For our analysis, the staff of the National Center on the Educational Quality of the Workforce (EQW) derived new estimates of work-related training from each of the surveys described above. The results of the basic tabulation—along with the text of the training questions themselves—are presented below in Table 1.

The task set for the EQW work-team was the development of a crosswalk between and among these national surveys to facilitate a better understanding of the causes of the variations in training rates. We note at the outset that the greatest similarity among these surveys is their form. Each instrument focuses on the experiences of individuals—rather than the experiences of either firms or the suppliers of work-related training—as reported by the individuals themselves or by a member of their household. Since the federally-sponsored individual and household surveys included in the EQW crosswalk are national probability samples of

Table 1

Data Set	Population	Training Question	Percent Responding Affirmatively
NLS-72 as of the 1986 Follow-up	All workers with reported income in 1986 who were high school seniors in 1972	Between the time you left high school (*or the last interview*) and October 1973 (*or the current year*), have you participated in any program such as on-the-job-training, registered apprenticeships, manpower training, personal enrichment, or correspondence courses? Do not include Armed Forces training programs, or regular school and college programs. **or** Not including on-the-job training, did you receive formal instruction to do this kind of work? (*asked for the 2nd through 4th follow-up surveys.*) **or** Considering the most recent full-time job you have held, did you receive or participate in any type of employer provided training benefits or training programs? (*Asked for the 5th follow-up only.*)	86%

Table 1 (continued)

Data Set	Population	Training Question	Percent Responding Affirmatively
High School & Beyond - as of the 1986 Follow-Up	All workers with reported income in 1986 who were high school seniors or sophomores in 1980	Between the time you left high school (*or the previous interview*) and the end of February 1982 (*or the February of the current year*) have you participated in any program such as registered apprenticeships or manpower training programs? Do not include regular school or college programs or armed forces training programs. or Considering the most recent full-time job you have held, which type(s) of employer-provided training benefit(s) or training program(s) did you receive or participate in? or Not including on-the-job training or employer provided training, have you received formal training to do your current (or most recent) job?	75%
January 1991 CPS	All workers aged 22 to 65 with reported income	Did you need specific skills or training to obtain your current (last) job? or Since you obtained your present job did you take any training to improve your skills?	70%[10]
January 1983 CPS	All workers aged 22 to 65 with reported income	Did you need specific skills or training to obtain your current (last) job? or Since you obtained your present job did you take any training to improve your skills?	66%

[10]The rate excludes non-respondents. The public use file for the January 1991 CPS had about 1 in 5 nonrespondents for training questions.

Table 1 (continued)

Data Set	Population	Training Question	Percent Responding Affirmatively
NLS Youth Cohort as of 1988	All workers 23-30 as of January 1, 1988 with reported income	Since *a year ago*, have you received skills training from a government sponsored program such as CETA, the Job Corps, or any of these other government-sponsored programs where young people who are not attending regular school are provided with skills training? or Since (last interview), have you received training from any (other) source, such as the kinds of places listed on this card? For example, training in a business college, nurse's program, an apprenticeship program, voc-tech institute, or any of these other kinds of sources? *Versions of these questions were asked at each interview from 1979 through 1988*	59%
SIPP 1987 Wave 2	All workers aged 22 to 65 with reported earnings	Has_____ ever received training designed to help find a job, improve job skills, or learn a new job?	29%
SIPP 1986 Wave 2	All workers aged 22 to 65 with reported earnings	Has _____ ever received training designed to help find a job, improve job skills, or learn a new job?	29%
SIPP 1984 Wave 3	All workers aged 22 to 65 with reported earnings	Has _____ ever received training designed to help find a job, improve job skills, or learn a new job?	24%
May 1984 CPS	All workers aged 22 to 65 with reported income	(Excluding full-time attendance in school), have you taken part in any organized adult education courses or activities?	19%
May 1981 CPS	All workers aged 22 to 65 with reported income	(Excluding full-time attendance in school), have you taken part in any organized adult education courses or activities?	17%

individuals in the workforce, they have the further advantage of combining within a single instrument questions about work-related training supplied by employers, about both formal and informal on-the-job training, and about training gained through regular schooling and as an adult learner. Finally, household and individual surveys allow a full representation of workers employed by small businesses, which are often underrepresented in national surveys of firms. What none of these national surveys supplies, however, are adequate data on the employing firms themselves—an oversight that should to be corrected in future administrations.

The Text-Based Crosswalk

Our first step toward understanding the differences between and among these national household and individual surveys was to develop a strategy for identifying the extent to which language alone might account for the training estimates derived for any pair of surveys. Our answer was the invention of a survey catalog—what we would eventually call the *Crosswalk of National Data Sets Focusing on Worker Training*, which lists the specific questions asked and, where appropriate, the basic categories of allowed responses to questions about types of training and sources of payment. We also included within our catalog the available population characteristics, the structure of the survey in terms of skip patterns and question contexts, and the sampling frame that the survey employed.

The *Crosswalk* is designed to allow researchers to compare questions and options both among all the surveys and within the same survey across different years of administration. The *Crosswalk* is a double-sided book which, when opened, resembles two identical books placed side-by-side with mirror-image pages. Figure 1 provides a schematic representation of the *Crosswalk*, while Figure 2 gives a sample entry for one survey—in this case the 1984 SIPP. Each of the tables appears in both halves of the crosswalk, allowing for the comparison of any two training questions. The layout covers the four broad areas necessary to understand why various estimates of worker training might differ:

1. Questions and options pertaining to work-related training.
2. Skip patterns that determine the specific population that is asked to respond to each question about training.
3. Population characteristics available for grouping respondents.
4. Organizational characteristics including the sponsoring agency and the survey's length and frequency of administration.

Central to the utility of the crosswalk is the "Listing of Training Options" (see Figure 2). Because surveys can vary substantially in the types of options offered to a respondent, we "crosswalked" these options by reordering them to facilitate a comparison, so that similar or identical options are found on the same line. (For example, the options "Military Service" or "Armed Forces Training Programs" are always listed in the same row.)

Beyond Logical Differences

No one should expect the surveys included in the *Crosswalk* to yield identical results, largely due to the structure of the surveys themselves. The NCES data sets, for example, are the result of the separate sampling of specific high school students over time. As such, they logically will report a different incidence of training than a sample of the population as a whole. Similarly, the focus of the 1981 and 1984 May Triennial Adult Education Supplements to the CPS will involve a different definition of work-related education and training than the one employed in the special 1983 and 1991 January Training Supplements, which were designed specifically to measure the level of work-related training in the United States. Even nearly identical surveys, such as the January 1983 and January 1991 CPS special training supplements, can yield different results, either because of sampling variations or, more likely, the passage of time. These variations in sample, language, and purpose among the surveys are readily identified using EQW's *Crosswalk* (see pages 12-15). Other differences, however, are not as easily reconciled. Take, for example, a comparison between the January 1983 administration of the CPS Training Supplement and the first administration of the Survey of Income and Program Participants.

This January Training Supplement attempted to capture—in a deceptively simple pair of questions—the full range of activities that workers might identify as training. One question read:

> **Did you need special skills or training to obtain your current job?**

Among employed persons aged 22 to 65 years, 56 percent answered affirmatively to this question focusing on qualifying training. Another asked:

> **Since you obtained your present job did you take any training to improve your skills?**

Among employed persons aged 22 to 65 years, 38 percent answered "yes" to this question focusing on skills improvement. In all, 66 percent answered "yes" to at least one of the two questions. Still, we were struck by the fact that 34 percent said they needed

neither skills nor training to obtain or keep their present jobs. It made us wonder.

This second survey—or rather, set of surveys—began less than a year later. The Survey of Income and Program Participation (SIPP) was commissioned to provide policy makers with information to study government tax and transfer programs, estimate future program costs and coverage, and assess the effects of proposed policy changes.

Designed and conducted by the same organizations responsible for the 1983 CPS January Training Supplement, the SIPP questioned people about training in virtually the same way:

> **Has _____ ever received training designed to help find a job, improve job skills, or learn a new job?**

Surprisingly, just 24 percent of employed persons aged 22-65 years answered "yes."

Curious about the linguistic tilt of the surveys, we began asking members of the staff, visitors to the Center, and even the audience of a Washington Public Policy Seminar to guess which of the two sets of questions would be more likely to elicit a larger positive response. Almost uniformly, the SIPP question was viewed as broader, more inclusive, and more likely to engender positive answers.

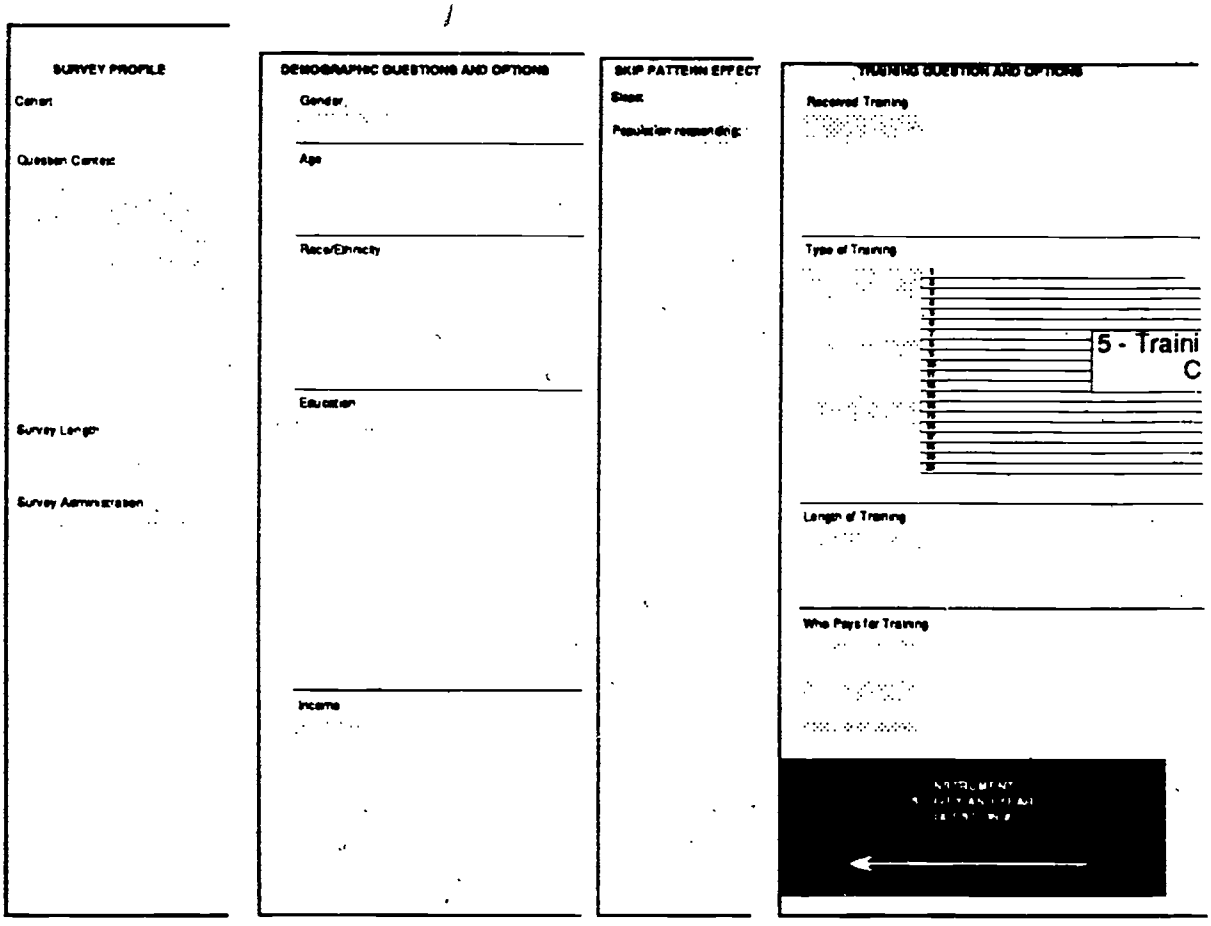
To resolve the differences between these two well-constructed national surveys with well-administered protocols, extensively field-tested survey questions, and practically the same sampling frame, we set about constructing a statistical companion to complement the linguistic comparison presented in our crosswalk. Adopting the historian's guise, we approached the two surveys as sets of transactions. What were we being told about the sample population? About the survey questions? About the context for interpreting education and training?

Comparison of CPS 1983 & SIPP 1984

CPS 1983:	**SIPP 1984:**
58, 000 households	20, 000 households
10-12 minutes per person	25-30 minutes per person

Figure 1

Design for *A Crosswalk of National Data Sets Focusing on Worker Training*

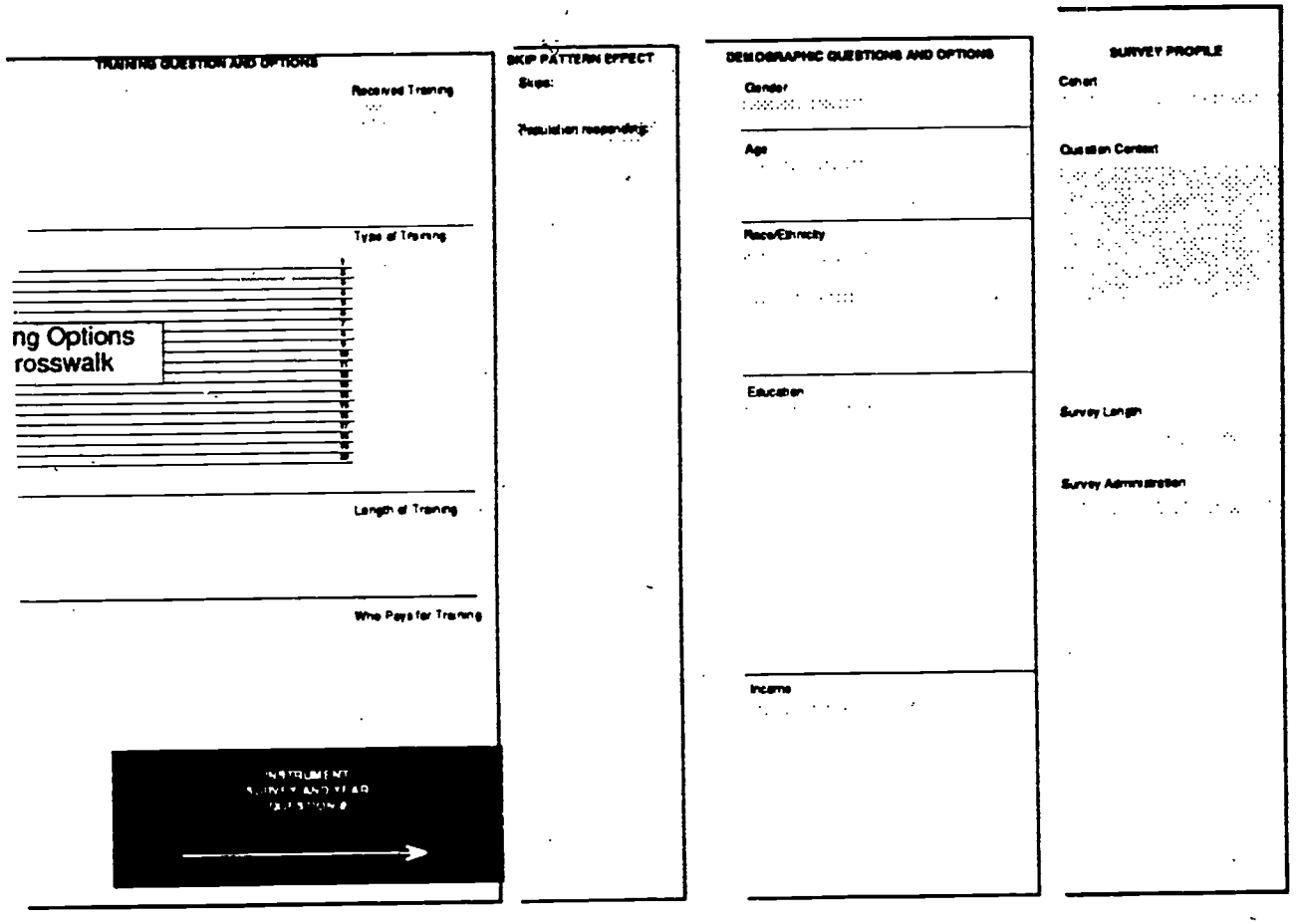


4 - Survey Profile

2 - Demographic Question and Options

3 - Skip Pattern Effect

4 - Training Question and Options



4 - Training Question and Options

3 - Skip Pattern Effect

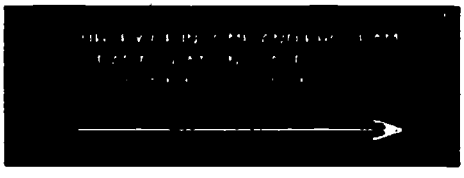
2 - Demographic Question and Options

1 - Survey Profile

Figure 2

***Crosswalk* Right-Hand Side Entry for SIPP 1984**

TRAINING QUESTION AND OPTIONS				SKIP PATTERN EFFECT
		Received Training	-	Skips: 2
yes (then to 3b) no (skip to Check Item T9)		Has ___ ever received training designed to help find a job, improve job skills, or learn a new job?	sect 5 Part A 3a	Check Item T1: is ___ over 15 years of age? Eliminates all who respond NO. Check Item T5: is ___ over 65 years of age? Eliminates all who respond YES. **Population responding:** All who are older than 15 and younger than 65 years of age.
		Type of Training		
(3c) training program at work	1	Where did ___ receive this training?	3c	
	2			
(3c) on-the-job training	3			
(3c) apprenticeship program	4			
(3c) trng or experience on prev job: (3k) work experience	5			
(3h) JTPA, CETA, WIN, Job Corps Program, TAAA	6	Since Jan 1, 1982, has ___ received training that was sponsored by any of the following programs?	3h	
	7			
(3c) military service (not basic training)	8			
(3c) sheltered workshop: (3c) vocat rehab center	9			
(3c & 3k) other	10			
	11			
(3c) high sch voc pgm: (3c) bus., commercial, or voc sch	12			
(3c) junior or community college	13	What type of training program is (was) this?	3a	Question 3h is asked only of those who responded affirmatively to question 3h
(3c) 4 yr college or graduate school	14			
(3c) 4 yr college or graduate school	15			
(3c) correspondence course	16			
	17			
(3a) classroom training: job skills	18			
(3a) classroom training: basic education	19			
(3a) job search assistance	20			
		Length of Training		
___ weeks less than 1 week		For how many weeks did ___ attend this (most recent) training program?	3f	
		Who Pays for Training		
self or family federal, state, or local govt someone else		Who paid for 3a (most recent) program?	3g	
employer				



DEMOGRAPHIC QUESTIONS AND OPTIONS

	Gender	
Control card Q26	Sex: (ask if not apparent)	male female
	Age	
Control card Q24	What is __'s date of birth?	month, day, year
	Race/Ethnicity	
Control card Q 29	What is the race of each person in this household?	black, white, Am Ind/Eskimo/Aleut, Asn/Pacific Islander, other (specify)
Control card Q 30	What is the origin or descent of each person in this household?	23 opsons, see SIPP Note 1
	Education	
Sect 5 T2	Was __'s highest grade attended at least 4 years of high school?	yes no
Sect 5 Pt A Q 1a	Has __ received a high sch diploma?	yes no
Sect 5 T3	Was __'s highest grade attended at least 1 year of college?	yes no
Sect 5 Pt A Q 2b	What is the highest degree beyond a high school diploma that __ has earned?	PhD or equiv, prof degr (dent, med, law, theol), Masters, Bachelor's, associate degr, voc certif or dipl, has not earned degree
	Income	
Sect 3	"Amounts" section, detailed assessment of earned and unearned income. For full list of income sources coded, see SIPP Note 2	
Sect 2 Pt A1, Q 8	What was the total amount of pay that __ received BEFORE deductions on this job (in each mo past 4 mos)? Be sure to include any tips, bonuses, overtime pay, or commissions. (Total income summed over all jobs, including self-employment)	spaces provided

SURVEY PROFILE

Cohort

US Population

Question Content

A. Core questionnaire (questions asked in every wave)
1. Labor force activity
2. Earnings and employment identification
3. Amounts (assets, unearned income, investments)
4. Program participation

B. Topical modules (in 1984 asked in Wave 3)
1. Education and work history (Q3: training received)
2. Health and disability

Survey Length

147 questions (50 pages), organized into 6 sections (4 in core questionnaire, 2 topical modules)
Average length of interview: 25-30 min./person

Survey Administration

Personal interviews administered by trained Census Bureau interviewers

Table 44 SIPP 1984 Training Question #3a

The Sampled Population

Our first task was to develop a sufficiently broad scheme for describing the population samples responding to each survey in the crosswalk. What we sought was a set of definitions that would allow the ready comparison of subsets based on gender, education, income, and age—even though the surveys used slightly different questions to chart the population characteristics of their samples. Most, but not all, of these discrepancies involved how the different surveys asked respondents to report their income.

For both practical and theoretical reasons, we elected to characterize the sampled populations using a series of categorical variables, which provided a simplification that made data comparisons across surveys possible. As it turned out, however, there were also important substantive reasons for looking at the data in this way, largely because we did not want to assume *a priori* the nature of the relationship between training and our four population characteristics: gender, education, income, and age.

The analytic scheme we adopted placed each working respondent from each sampled population into one of 128 "buckets" based on four categories describing the respondents' education, four age cohorts, four income bands, and two genders. The 128 (4 x 4 x 4 x 2 = 128) mutually exclusive and exhaustive categories thus defined our analytic structure.

Education

Although researchers frequently use years of schooling to explain differences in income, we believed that in a nation in which degrees, rather than years of schooling, are the better predictor of labor market experience, it made sense to focus on educational credentials. Accordingly we placed each respondent into one of four categories of educational attainment:

- No High School Degree
- High School Degree Only
- Some College but not a Bachelor's Degree
- A Bachelor's Degree or Better

Age

Ordinarily age is treated as a continuous variable. Here too, we wanted to allow for the possibility that age introduced discontinuities into the distribution of work-related training. We separated respondents into one of four eleven-year age-bands, classifying them by their age in the year in which the survey was administered. While there is a degree of arbitrariness to our definition of age-band categories for defining cohorts, we found the following classifications to be useful in interpreting the data:

- Respondents aged 22-32
- Respondents aged 33-43
- Respondents aged 44-54
- Respondents aged 55-65

During our initial examination of the data, it became clear to us that the reported income for younger and

older cohorts were biased downward—attributable, we believed, to the part-time work status of many students and semi-retired adults. Accordingly we limited our analysis to those respondents between the ages of 22 and 65 at the time of the survey.

Income

Given the different ways in which the surveys reported the income of respondents, it proved impossible to make comparisons treating income as a continuous variable. Moreover, in the absence of any prior knowledge concerning a specific relationship between income and training, we were hesitant to assume that income acted in a linear fashion. Our solution was to categorize respondents based on the income quartiles into which they fell.[10]

An Architecture for Analyzing the Structure of Responses

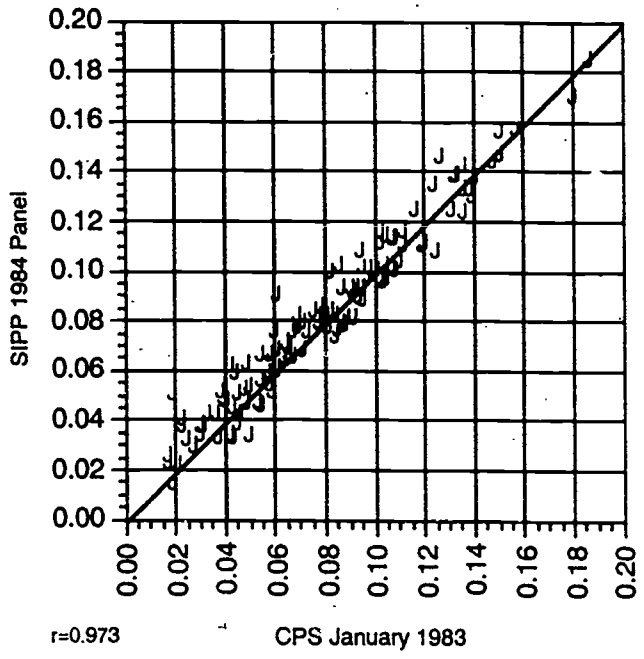
Using the above definitions along with a two-category variable for gender, we addressed the issue of the similarities and differences among the sampled populations. We knew that the January 1983 CPS and the SIPP 1984 panels should have been similar because they are separated by only a brief period of time. In addition, both were household surveys of the non-institutionalized United States population and both were administered by the Bureau of Labor Statistics using nearly identical sampling frames.

For any sampled population, each of the 128 separate "buckets" defined above will account for a specific percentage of the total population. The question we asked was simply, "Are the corresponding buckets for any two surveys roughly the same size?" More specifically, we focused on the square roots of these bucket percentages, since they, unlike the raw tallies, yield a distribution that is approximately normal.

Figure 3 shows a comparison between the square roots of the population percents for each bucket for the January 1983 CPS and the 1984 SIPP. The solid line marks the 45° slope along which the points in the graph would lie if each category represented exactly the same population percent in both surveys. While there is some variation between the two surveys, the sampled populations look remarkably similar. The product-moment correlation between the two measures is 0.97. Insofar as our analytic framework taps the relationship between gender, education, income, and age, we concluded that the January 1983 CPS and 1984 SIPP drew their samples from the same population.

Thus far, we have eliminated two potential causes for the significant differences between the estimates of training derived from the January 1983 CPS and the 1984 SIPP: linguistic discrepancies and population differences. Essentially, the two surveys asked highly similar questions of two, nearly identical population samples.

Figure 3
Square Roots of Population Percents



To explore further the underlying differences between the two surveys, we developed a modeling strategy that allowed us to compare the relative propensity of different groups within the population to report that they had received training. As an analytic companion to our linguistic crosswalk, the staff of the National Center for the Educational Quality of the Workforce compiled the results of this modeling in two volumes of tabular data entitled, *Statistical Companions to the Crosswalk of National Data Sets Focusing on Worker Training.*[11]

Use of a Logit Model to Produce an Odds-Tree Representation

The dependent variable in our model became the odds that respondents with a particular combination of characteristics would report that they received training. Again, those characteristics reflected our categories of education, age, income, and gender. Two considerations led us to use a logistic analysis to estimate the odds of receiving training. The question we now posed was not *how much* training that respondents reported (a variable outcome), but *whether* the respondent did or did not report the receipt of training (a discrete outcome). A logistic analysis yields parameters in the form of odds that are readily interpretable as well as lending themselves to a concise graphical presentation.

The rationale behind the logistic analysis is rather straight-forward. For each of the 128 analytic buckets in our model, there is a probability P_i that individual members of the group will respond positively to a given training question. The value of P_i can vary from 0 to 1. The expression $\frac{P_i}{1-P_i}$ gives the relative likelihood of

someone in bucket i reporting that they had received training. If the probability of receiving training is 0.5, then for every person who received training there is one person who did not, and the relative likelihood, or odds, of reporting that one had received training is 1 to 1. If the probability of a given cell is .75, then the relative likelihood is 3 to 1. Similarly, if the probability is .25, the odds would be 1 to 3. The term $\frac{P_i}{1-P_i}$ can vary from 0 to ∞. The term $Ln\left\{\frac{P_i}{1-P_i}\right\}$, known as the logit, is the log of the odds of the event occurring; in this case it is the receipt of training. The logit can vary from $-\infty$ to ∞. It is this value that is predicted when we perform a logistic analysis.

If we let $Ln\left\{\frac{P_i}{1-P_i}\right\}=Y_i$, then our model takes the form of $Y_i = \beta X_i + \varepsilon_i$, where β is a vector of parameters given by a maximum-likelihood estimator of the logistic distribution, X_i is a vector of variables (in our case dummy variables for cohort, income, education, and gender), and ε_i is a stochastic error term which should be normally distributed. The vector β is easily interpreted if the base for the logarithms is chosen carefully. For our analysis we chose a base-2 logarithm so that changes in Y_i are easily interpreted in terms of powers of two. A unit change in Y_i represents a doubling (or halving) of the odds of receiving training, a change of two units in Y_i would represent a quadrupling (or quartering) of the odds, a change of three units would represent changes of a factor of eight, and so on.[12]

Along with the logit analysis, we designed a graphic representation that would allow us to observe the variations in the basic incidence of training among our national surveys.[13] The result—what we have come to call an "odds tree"—consists of an intercept that represents the basic odds for receiving training for all the categories in the model and of adjacent bars that represent the degree to which the odds for respondents in each category differed from the basic odds. The intercept serves as the "trunk" of the odds tree, while the bar graphs resemble "branches." We have found that these odds trees greatly facilitate a discussion of training numbers; not only can we observe a vertical comparison of individual odds compared to the intercept (which also establishes monotonic or curvilinear relationships), but also we can sum up the values of bars from different categories horizontally, allowing us to estimate training for someone who possesses characteristics of more than one category (a woman with a bachelor's degree whose income falls in the first quartile, for example).

Figure 4 illustrates this graphical form. In this case we use the odds tree to present the results of the logit analysis for the January 1983 CPS. The solid vertical line represents the unweighted average of all the cells in our analytic space and in this case intersects the horizontal axis just above or to the left of the "2 to 1" mark. Averaged over all the cells, for every 2 respondents who replied they had received training, 1 replied that he or she had not.

Several other points concerning the responses to the January 1983 CPS questions on training can be observed in the above graph. First, we note that both education and income are monotonically related to training. Having a bachelor's degree or better more than doubles the odds of responding that training has been received, relative to the unweighted average. Not having a high school diploma reduces those odds by more than 50 percent. Those without high school diplomas have odds of receiving training that are less than 20 percent the odds of respondents with at least a bachelor's degree. Respondents with only a high school diploma and only some college fall between these two extremes.

Similarly, being in the highest income quartile increases the average odds by a factor slightly less than 2. Being in the lowest income quartile cuts by more than half the odds of a respondent saying that they had received training relative to the average. Everything else being equal, women have greater odds than men of responding that they received training. Averaged over the sixty-four possible categories, for every 5 males who responded that they received training, another 3 responded that they did not; for every 5 females who responded that they received training, 3 responded that they did not.

Figure 4 refers to the union of two separate questions asking about the training received by respondents: training that qualified the respondent for a specific job and training that provided skill improvement. Figures 5 and 6 present the odds trees for each question separately.

Several differences are worth noting when comparing the logit analyses of the separate questions, Figures 5 and 6, with the analysis presented in Figure 4. The most obvious is the shift of the "trunks" in Figures 5 and 6 to the left, detailing what we already knew: namely, that data for Figure 4 is the union of the data for Figures 5 and 6. When the question becomes "Did you receive any training, either qualifying or skill improvement?" there is a clearer income effect; the "branches" on Figure 4 are clearly longer than those on Figures 5 and 6.

More apparent, however, are the basic similarities among the three graphs—the odds trees, in fact, look alike. What we conclude is that, in their relation to gender, income, age, and education, there is little appreciable difference between qualifying and skill improvement training as measured by the January 1983 CPS.

Figure 4

CPS Jan, 1983 (Any Training) • Results of Logit Analysis

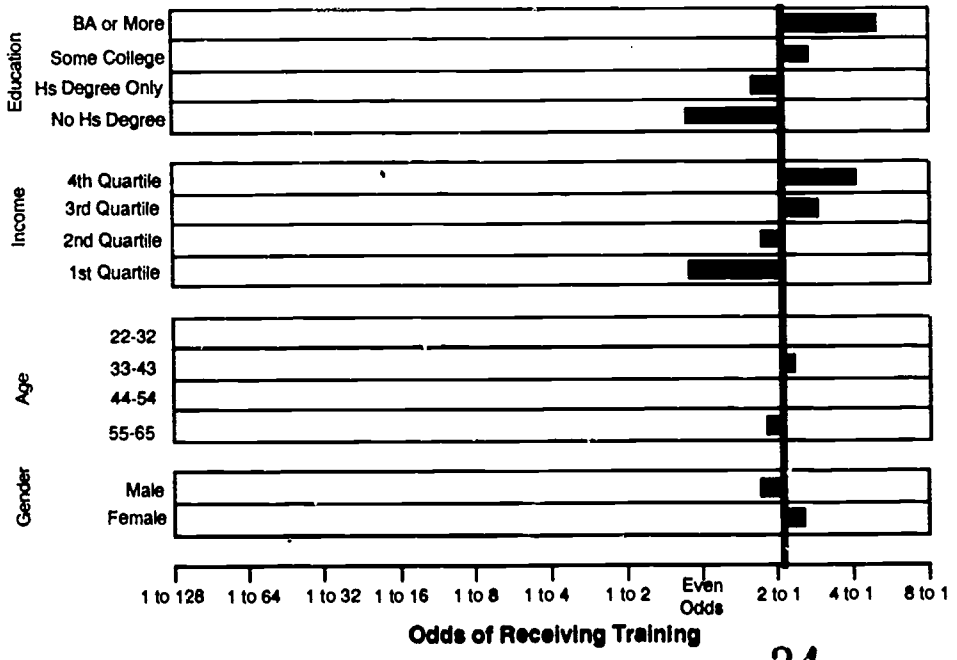


Figure 5

CPS Jan, 1983 (Qualifying Training) • Results of Logit Analysis

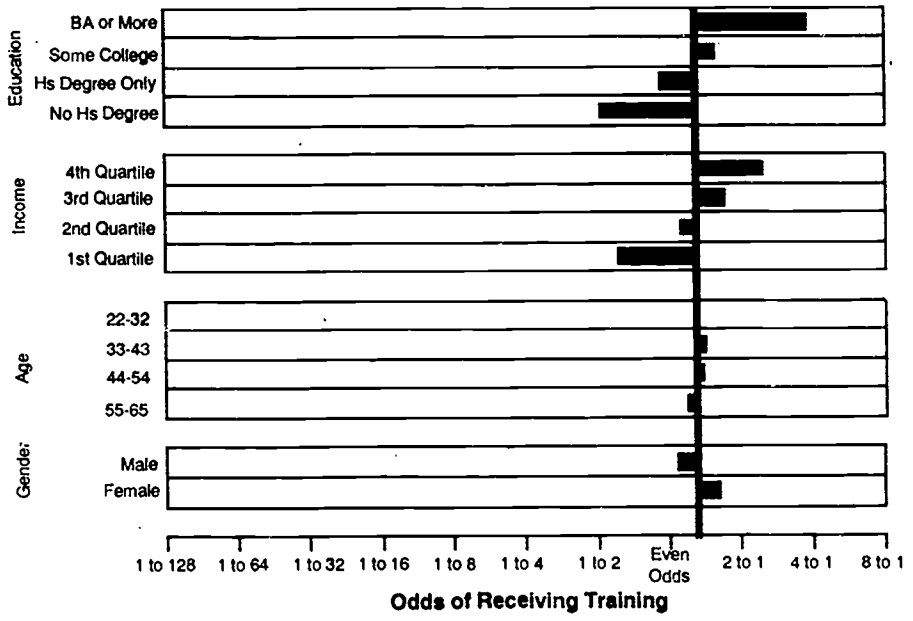
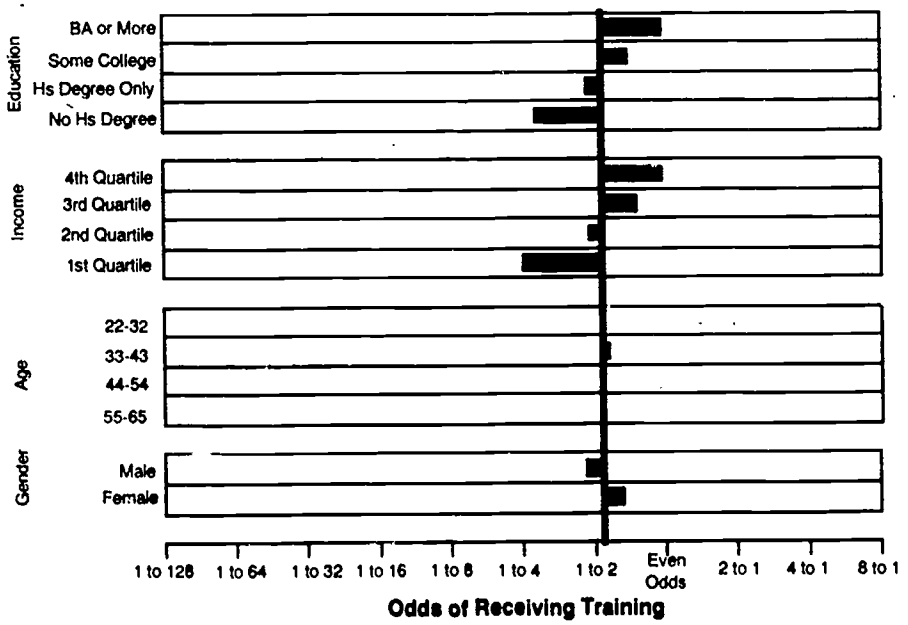


Figure 6

CPS Jan, 1983 (Skill Improvemnt Training) • Results of Logit Analysis



Odds Tree and Estimated Model: January 1991 CPS

Thus far our analysis has offered interesting ways to compare and contrast different elements of the same survey. We turn next to the usefulness of our architecture in discerning differences and similarities between surveys. Figure 7 presents the results of a logit analysis performed on the responses to the two training questions from the January 1991 CPS that were identical to the training questions asked in the January 1983 CPS. Except for the slight shift of the trunk to the right that reflects the fact that a higher proportion of the respondents reported the receipt of training in 1991 than they did in 1983, the resulting odds trees again are remarkably similar. It is also the case that the odds trees (not shown) for the separate questions detailing qualifying and skill improvement training from the January 1991 CPS appear exactly like their counterparts from the January 1983 survey (Figures 5 and 6, above).

We also asked: "If we use weights derived from the logit model for the January 1983 CPS, how well can we predict the results of the January 1991 CPS?" Figure 8 presents that forecast. The parallel tracking of the actual data and the predicted results help persuade us that the increase in training rates between 1983 and 1991 can not be attributed to differences in gender, age, income, or education.

Figure 7

CPS Jan, 1991 (Any Training) • Results of Logit Analysis

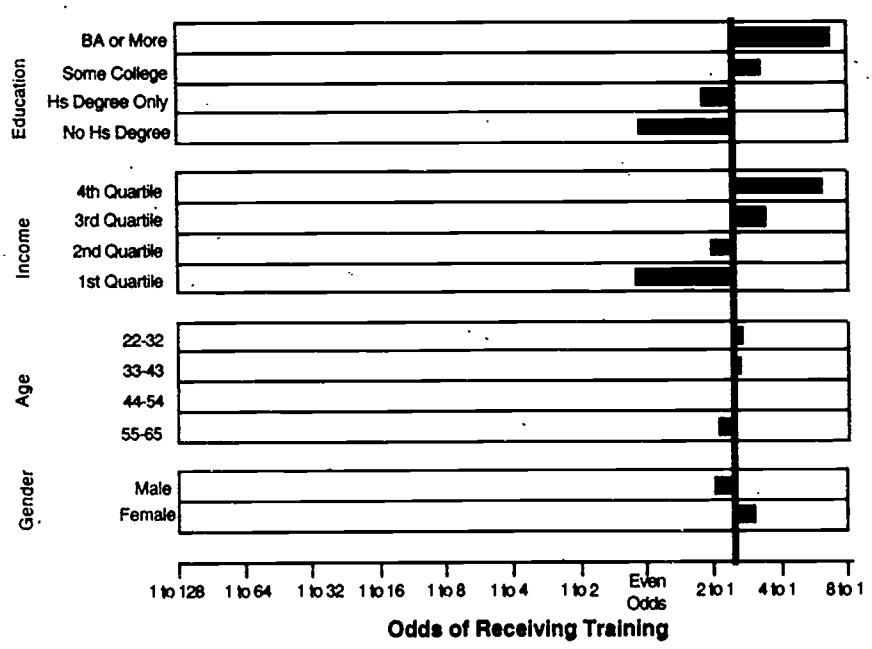
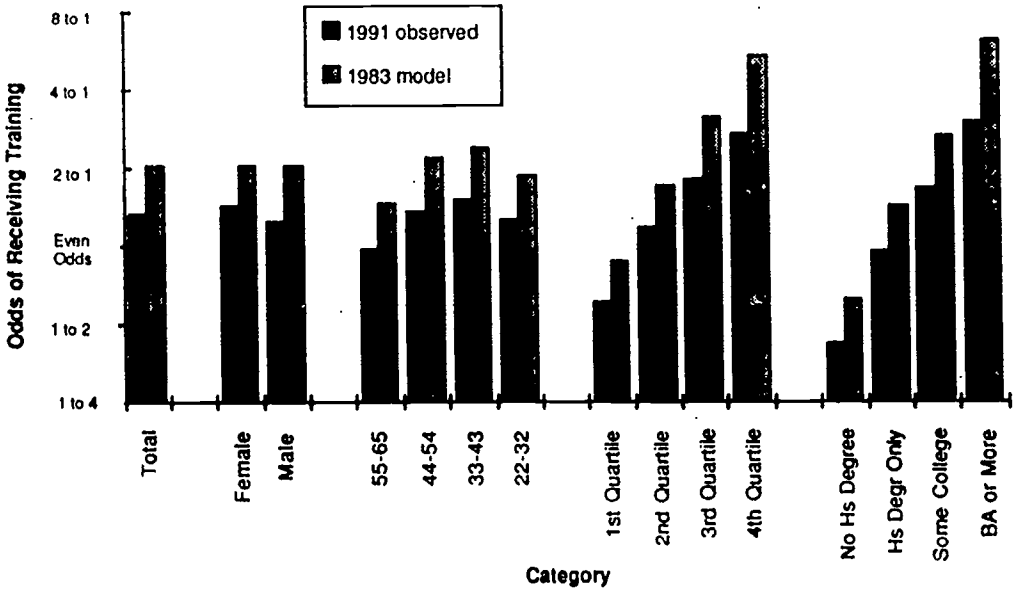


Figure 8

1991 Observations vs. 1983 Predictions



Survey Similarities

Based on these comparisons, our conclusion was that the 1991 survey was a valid follow-up to the 1983 survey in terms of the underlying structure of responses: training increases monotonically with education and income; women, when controlling for income, age, and education, are more likely to receive training than men; and age, once income, gender, and education are controlled for, has little consistent impact on who reports the receipt of training. We concluded that the rightward shift of the trunk for 1991 indicated a measurable increase in the receipt of training over an eight-year period.

The comparison of the two CPS surveys also increased our confidence in the analytic architecture we had developed, because we expected to find similarities and did so. The odds trees provided an easily interpretable graphic for identifying the common structure underlying the responses to survey training questions.

Odds Tree and Estimated Model: SIPP 1984

We turn next to the 1984 panel of the Survey of Income and Program Participation (SIPP)—the survey with one of the lowest affirmative responses to the training question—to ask, "Can our architecture help explain differences as well as validate similarities between survey results?" The odds tree derived from the logit model is displayed below in Figure 9.

The first difference between the SIPP odds tree and those for the two CPS surveys (Figures 4 and 7 above) is the expected shift of the trunk to the left. On average, for every person who responded in the SIPP instrument that they had received training, almost four people responded that they had not. This ratio represents the inverse of the odds reported in the 1983 CPS survey.

What is more important, however, is the fact that the SIPP-CPS differences are not limited to the absolute magnitude of the response rates. The general pattern of the responses—that is, the shape of each odds tree in terms of its branches—is fundamentally different. While the relationship between income and training is monotonic in the SIPP data, the range of variation between the top and bottom income quartiles is much smaller

than in the CPS. In the January 1991 CPS survey, the odds of receiving some type of training increased by almost a factor of seven when moving from the bottom to the top income quartile. In the 1983 version of that survey the odds increased about six-and-one-half times when comparing the top to the bottom income quartile. In the 1984 SIPP panel, on the other hand, the increase in odds when moving from the bottom to the top income quartile is a factor of one-and-one-half. In both of the CPS surveys there is a moderate gender effect: females tend to be more likely to respond that they had received training than comparable men. In the SIPP, on the other hand, the effect is slight and in the opposite direction.

Perhaps the most striking difference between the two surveys has to do with the relationship between levels of education and propensity to respond that training has been received. In the CPS there is a strong and monotonic relationship between education and training responses. In general, those with more advanced degrees also reported they had received more training; those with less education reported less training. In the SIPP we see a curvilinear relationship. Those without a high school diploma are least likely to say they had received training (as in the CPS). In contrast with the CPS, SIPP respondents with only a high school diploma, all else being equal, are the most likely to say they had been recipients of training. Those with some college, but not a bachelor's degree are the second most likely group, and those with a bachelor's degree or more rank just above those with no high school diploma.

These results are not unique to the 1984 SIPP panel. Just as the CPS training supplements showed a consistent underlying structure, the different SIPP panels also show a similar—though not identical—structure. Figures 10 and 11 display the results of the logit model for the 1986 and 1987 SIPP panels respectively.

Figure 9
SIPP 1984, Wave 3 • Results of Logit Analysis

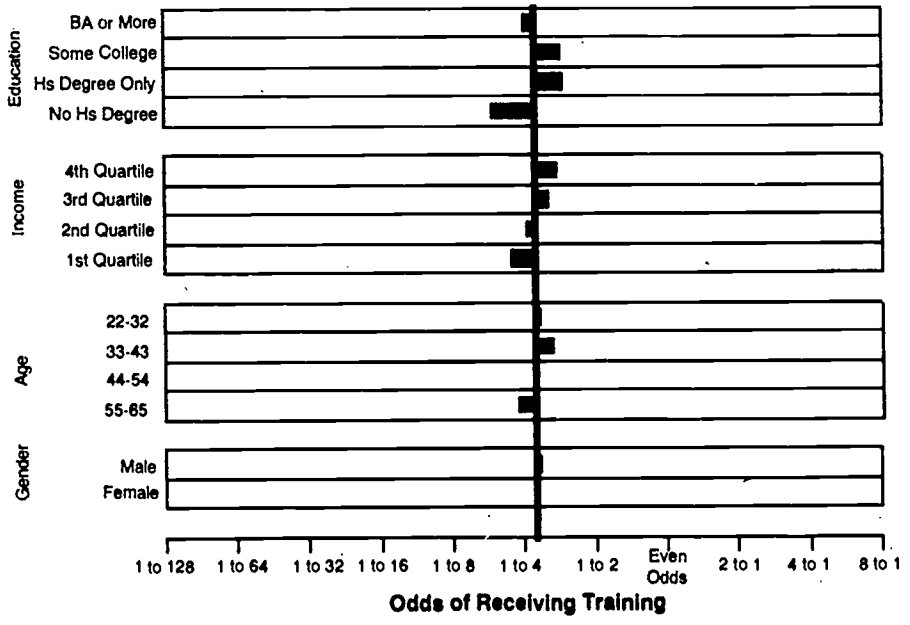


Figure 10

SIPP 1986, Wave 2 • Results of Logit Analysis

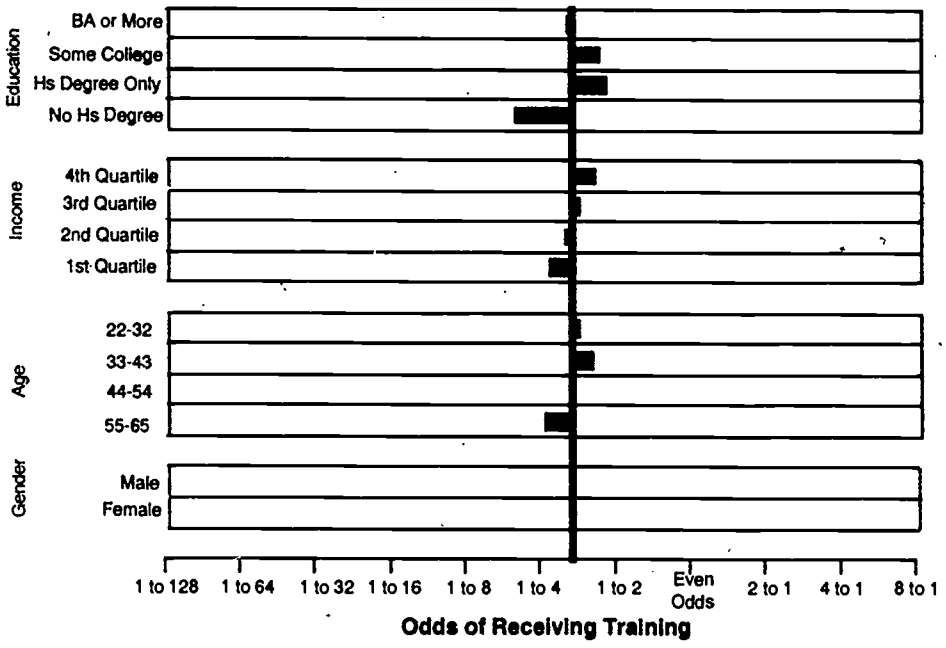
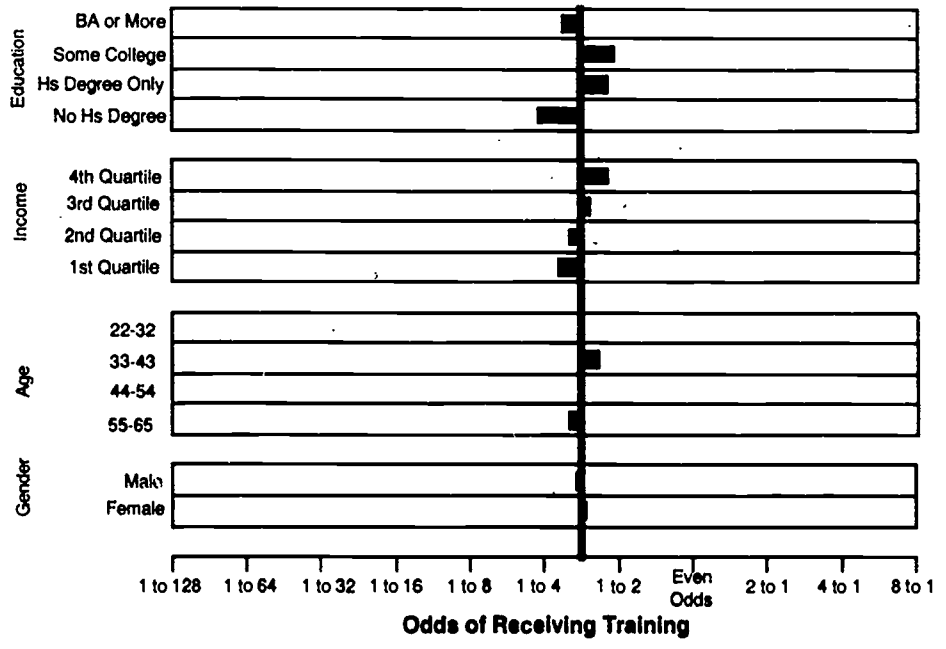


Figure 11

SIPP 1987, Wave 2 • Results of Logit Analysis



Goodness of Fit

Choosing a logit model as the basis for our analytic architecture allowed a ready comparison among different data sets in which the dependent variable was Boolean (reported receiving training; did not report receiving training) and the independent variables were group characteristics that were not necessarily ordered. It is a procedure that allowed us to test directly for non-linear relationships between training and our four population characteristics: education, income, age, and gender.

Unlike simple regression models, there is no statistic analogous to an R^2 associated with the logit analysis—the notion of percent variance simply loses its meaning when predicting a Boolean dependent variable. It is still possible, however, to assess a model's capacity to predict training rates in a rather intuitive way. Logit analyses do provide a series of measures, which include chi-square statistics and their associated probabilities, a goodness of fit measure (c), and association of predicted probabilities and observations in the form concordant and discordant pairs. For us, it is the last measure that has proved to be the most satisfying way to gauge whether one logit model or another better fits the data. The concordant pair analysis examines all the possible pairs of respondents with different responses. A pair is *concordant* if the respondent who reported receiving training had higher predicted odds of doing so than the respondent who did not report receiving training. A pair is *discordant* if the respondent with training had lower predicted odds than the respondent without training. If the predicted odds were identical then the pair is a *tie*.

Table 2 presents the percent of concordant pairs for the logit models presented in Figures 4 and 7, January 1983 and January 1991 CPS respectively, and Figure 9, the 1984 SIPP panel. It is clear that the CPS models provide substantially better fits than the SIPP model. We concluded that for the SIPP there were likely variables other than education, age, income, and gender that helped to explain who reported the receipt of training—variables that did not play the same role in explaining responses to the two CPS surveys.

Table 2

Survey	Percent Pairs Concordant
CPS January 1983 (Any Training)	73%
CPS January 1991 (Any Training)	76%
SIPP 1984 (Wave 3)	59%

Analysis of Sample and Textual Differences

We return, then, to the central question with which we began our discussion. Why should two national surveys administered roughly at the same time that ask basically the same questions of nearly identical population samples yield such widely divergent responses? In some sense, the mystery is deepened by the discovery that the structure of the responses are also different. In the survey that yielded the higher estimate of the incidence of training, there was a clear, monotonic relationship between educational credentials and the reported receipt of training. In the other, the relationship between educational credentials and training was both less certain and curvilinear. If neither sample differences nor question syntax are the answer, what other elements of our first hypothesis might suggest a reasonable explanation?

Survey Length

The CPS training supplements are added onto a standard Commerce Department household survey that is administered monthly. The CPS itself has the well-defined purpose of providing data on labor force activity. Comprehensive data are collected on the employment status, occupation, and industry of the respondents. The survey is relatively short, taking only 10 to 12 minutes per subject. The SIPP is a more broadly based survey with the purpose of providing "comprehensive information on the economic resources of the American people and on how public transfer and tax programs affect their financial circumstances" (Kasprzyk 1988, 1).

A more detailed survey than the CPS, SIPP requires almost 25 to 30 minutes per subject to administer, with the training questions asked towards the end of the instrument. One possible source of the discrepancies between CPS and SIPP simply may be the length of the latter, which could induce a significant number of respondents to shorten the time of the interview by answering trigger questions negatively in order to avoid more detailed follow-up questions.

Question Context

The fatigue factor, in itself, cannot explain the results of our logit analysis—unless one assumes it is the more educated who want and know how to shorten the survey by answering the "trigger" questions negatively. A more plausible explanation lies in the differing nature and order of the surveys themselves.

In the CPS surveys, the training supplement immediately follows a series of queries asking about the respondents' jobs and their work. The SIPP topical modules focusing on training immediately follow a section of questions asking about the Food Stamp program, SSI, and participation in other government-sponsored income maintenance programs. Our hypothesis is that

a significant number of respondents who were not participants in these programs reported they had not received training simply because, in their minds, the survey associated training with participation in a public welfare program. The curvilinear relationship between training and education in the SIPP responses becomes more explicable under this scenario: the more educated the respondent (and the less likely to benefit from public welfare), the less likely he or she will respond affirmatively to the SIPP training question. On the other hand, those without high school diplomas—whether or not they participated in a public welfare program—did in fact receive little training, however that concept was understood by the respondent. The questions that remain to be explained are why income monotonically relates to training in both the SIPP and CPS surveys and why the relationship is markedly stronger in the latter than in the former.

Training as Mirage

We turn now to the second of the hypotheses introduced at the outset of this paper: the context of the training question becomes extremely important because of the "slippery" definition of training itself. Since training, as a concept, may have little intrinsic meaning for many respondents, they may infer what the question signifies by drawing conclusions from the purpose of the survey and the nature of the preceding questions. Why do estimates of the incidence of training vary so widely? Because there is nothing specific enough to measure. It is in this sense that training is something of a mirage—visible in the distance, but intangible at close proximity.

There are important policy implications attached to such a conclusion. What has emerged over the last half-decade is an important consensus among policy makers about the importance of making direct investments in the continuing educational quality of the workforce. In most proposals, such investments translate into the creation and funding of new training programs for first-time workers as well as those made redundant by technological and economic change. What the conflicting results of the surveys suggest is that even as an opportunity for public investment, training may appear more real to the policy maker than to the intended beneficiary. Training, as a concept, needs to be better understood—and in a real sense, owned—by those whom work-related training is expected to benefit. The call should not simply be for new initiatives and increased funding, but for a focused effort to create a real context for training.

It is interesting to note that across all the surveys included in our analysis, there was remarkable consistency in the reporting of educational credentials and their relation to age, income, and gender. Even to the extent that individuals exaggerated their educational attainment, they apparently did so in a very consistent manner. Neither the length of the survey, the context, nor the specific content of the educational questions had much impact on the proportion of the sampled population reporting either graduation from high school or receipt of a college degree.

Education vs. Training

It was this clear and consistent difference in how respondents reported their educational attainment as opposed to the receipt of work-related training that yielded our third and frankly most speculative hypothesis: that the differences across the range of national surveys document that old intuition that Americans believe in education while down-playing, even demeaning, the importance of training. The education commu-

nity has long focused on the differences between education and training—arguing that the former is specific and narrow, while the latter is broad and general. Training, as an educational concept, is reduced to a focus on vocational skills and on what a worker needs to perform a specific job better. Education, on the other hand, is portrayed as being about the acquisition of knowledge, about learning how to think critically and solve problems.

We suspect that such distinctions between education and training—if they are in fact real—pale in importance to the most obvious distinction between the two: in the United States education is principally about credentials and training is principally without such distinctions. In a modern economy, credentials confer property rights just as, in an earlier age, land and entry into a father's (or uncle's or grandfather's) occupation or craft allowed middle-class families to pass on their status from father to son. Training in the United States is almost wholly without that sense of credentialing. There are no degrees and few requirements outside of a limited number of highly technical occupations and skilled crafts. One explanation for why training is hard to measure consistently is simply that it is so unlike education—not in terms of style or content, but in terms of tangibility. Put simply, it may be the absence of credentials that makes training such a mirage.

Beneath the surface, however, there may be a larger lesson—perhaps even a deeper structure—that the national surveys partially illuminate. When we examine all the surveys, two rough groupings emerge: those surveys associated with an educational agency, purpose, or process on the one hand and, on the other, those surveys more directly associated with the making of either welfare or economic policy. The three longitudinal surveys in our set—NLS-72, High School and Beyond, and NLS-Y—help to illustrate this point. Each survey follows a separate youth cohort: NLS-72 follows high school seniors who graduated in 1972; High School and Beyond follows the high school graduating class of 1980; and NLS-Y follows a sample of youth who were 14 to 21 in 1979.

The first of the longitudinal studies, the National Center for Educational Statistics' National Longitudinal Survey of the High School Class of 1972, has consistently asked its panel high school seniors to report the receipt of work-related education and training in each of its follow-ups (1973, 1984, 1976, 1979, and 1986). Figure 12 presents the odds tree reporting the cumulative probability of a respondent reporting the receipt of training. Remarkably, each structure is similar to the odds trees for the two CPS surveys focusing on training—CPS 1983 and CPS 1991. The receipt of training increases monotonically with increases in both education and income. For this cohort of high school seniors, training was an expected activity, with the odds of reporting its receipt at close to 8 to 1.

The National Center for Educational Statistics also commissioned a parallel longitudinal study that began tracking 1980 high school seniors and sophomores. This study has come to be known as High School and Beyond which, like NLS-72, has consistently asked about work-related education and training in each of its three follow-ups (1982, 1984, and 1986). Figure 13 presents the cumulative odds tree for the reported receipt of any training. It also resembles the basic CPS odds trees, except that those who have earned a BA/BS report significantly less training than expected—an artifact telling us that in 1986, the year of the last follow up, most of the sample of college graduates had just earned their degrees.

Figure 12

NLS-72 Any Training Received (First 5 Follow-Ups): All Races • Results of Logit Analysis

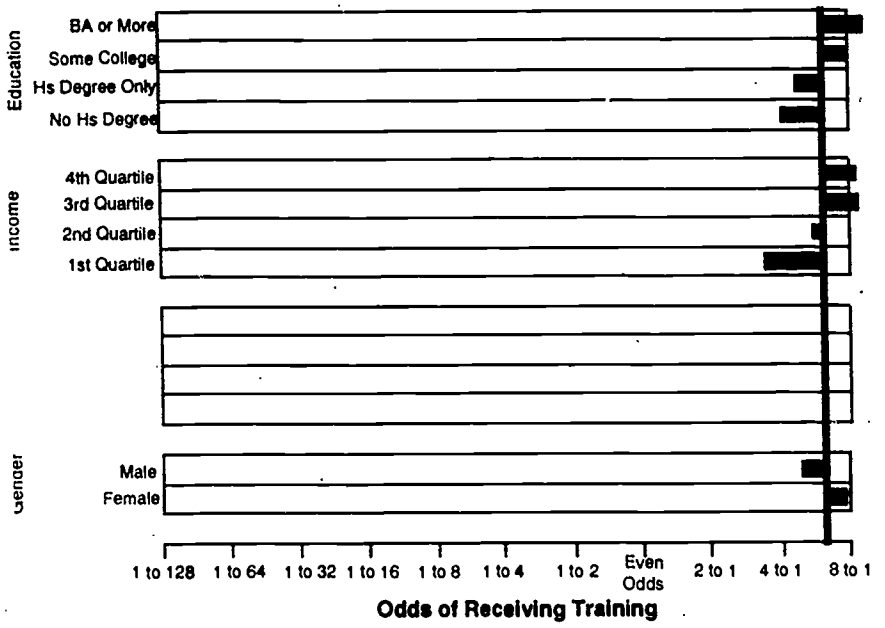
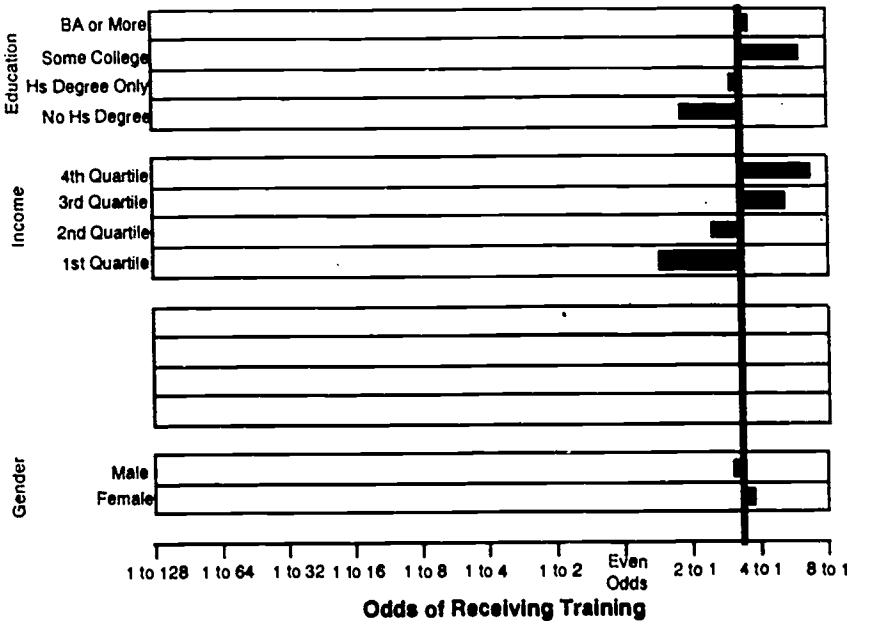


Figure 13

HSB Any Training Received (First 3 Follow-Ups): All Races • Results of Logit Analysis



The remaining longitudinal study of a youth cohort was developed by the Bureau of Labor Statistics largely to track the cohort's progress through the labor market. Given its focus, it is not surprising that NLS-Y yields quite different results. Figure 14 shows the odds tree reflecting the report of private training. Here is the curvilinear relationship between educational attainment and the receipt of training that we first observed in SIPP 1984. There is a similar reduction in the overall reporting of such training, although the relationship between income bands and reported receipt of training is stronger in NLS-Y than in SIPP 1984.

NLS-Y also asked respondents to report the receipt of government training. The odds tree depicting any government training, Figure 15, demonstrates how government-sponsored training has been well-targeted and reinforces the often stereotypical portrait of the populations such programs are expected to benefit—those without educational attainment and those with the lowest income.

What we have come to conclude is not that training has *no* meaning in the American context; rather, it has *two* meanings. Americans think of job training as either career advancement for the educated or as a second opportunity for the disadvantaged—two stereotypes deeply rooted in the policies and practices of the last forty years.

The history of work-related education and training in the United States is, in fact, divided—containing two streams of development, each with its own definitions and values, resulting in quite different policies and practices. The first type of work-related education and training is an outgrowth of corporate America. The customs of American firms have always shaped how people learn to work. In the decades following the Second World War, most major firms developed substantial training establishments and opportunities, distributed principally as a prelude to advancement within the firm. Many smaller, particularly high-tech, companies came to provide a variety of "off-site" opportunities for their most skilled employees to learn new techniques and applications. Training in these settings became a hallmark of personal success—a signal that the employee was truly valued by the firm. For the most part, these opportunities were distributed to the firms' most educated employees—a clear case of further advantage for the most advantaged.

Over the years a second and separate training establishment has evolved through the action of public policy. Federal legislation has created an alphabet soup of government initiatives—MDTA, CETA, JTPA, and TAA, to name the best known. Like training efforts in the private sector, these programs have often lacked effective leadership, becoming fragmented or redundant and frequently falling victim to a shift in political winds. From this perspective, the contradictory findings of the national surveys reporting the incidence of training in general and of the CPS and SIPP surveys in particular make perfect sense: one inadvertently taps into the common wisdom about private-sector training and its association with education and personal advancement, while the other, in an equally unplanned way, triggers reactions to publicly sponsored training. Until now, assumptions about the proper relationship of analytic data to public policy have rested on the presumption that these national data sets measure what they were commissioned to measure.

Figure 14

NLS-Y, Any Private Training 1979-1988: All Races • Results of Logit Analysis

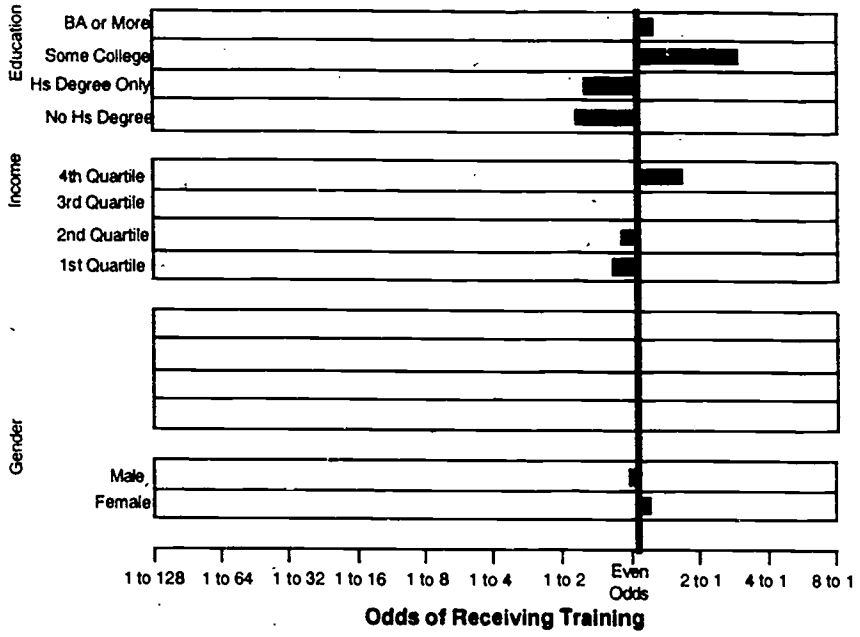
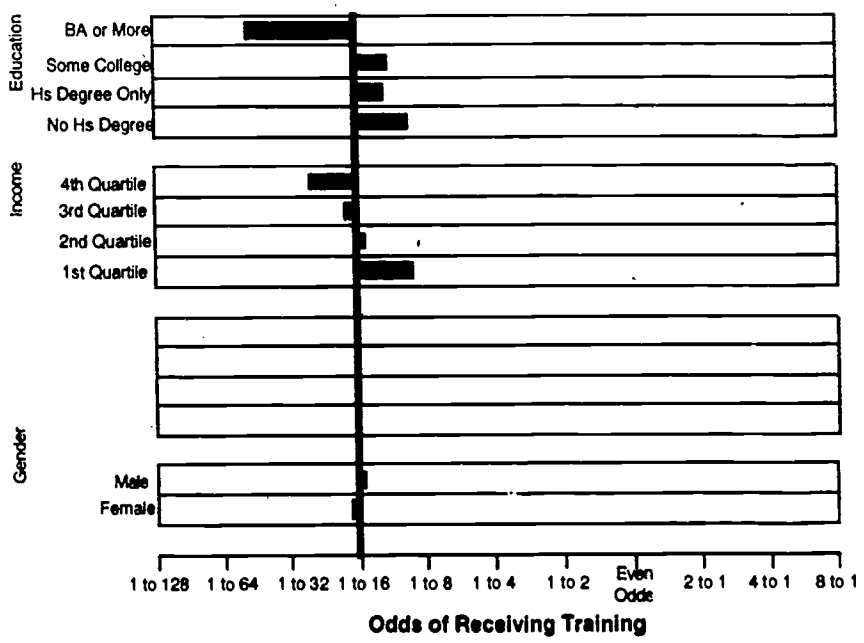


Figure 15

NLS-Y, Any Govt Training 1979-1988: All Races • Results of Logit Analysis



Conclusions and Recommendations

We began our explorations assuming that there was a less complex set of answers explaining why the national surveys produced such contradictory results. We expected to separate the wheat from the staff—assumed the linguistic cross-walk along with the logistic analysis would identify the surveys which did the best job. What we sought was a reliable set of estimates telling us who got trained by whom.

Our conclusion is that such estimates are not possible: that in the technical sense, the surveys do not measure fully what they purport to measure. Taken collectively, however, the surveys provide an invaluable insight into the nature of work-related education and training in the United States: how it is perceived, how it is often considered to be contradictory in nature, and how important its association with credentialed education actually is.

These findings come at an important time. The growing interest in both the educational quality of the workforce and the shifting relationship among jobs, skills, and training is creating n demands for both public and private initiatives. Fueled by economic necessity as well as electoral politics, the emerging national debate over the efficacy of the nation's investments in work-related education and training on the one hand and the need to make the school-to-work transition more purposeful and rational on the other is creating increased demand for data to measure the current scale and scope of how and when the nation invests in the educational quality of its workforce.

Our most specific recommendations—just three in number, each focusing on how to construct more reliable survey instruments—respond to this need for better data.

1. Questions focusing on the incidence of work-related education and training need to be consistently "bundled" with questions dealing explicitly with work, with the kinds of skills the respondent needs to know to best perform his or her current job, and with the respondent's sense of the role training plays within his or her workplace.
2. Where possible, the surveys themselves ought to involve matched samples of employing establishments (or enterprises) and their employees. For the most part, surveys focusing on work-related education and training have queried one or the other of these populations but seldom both. There are important exceptions. A dataset recently released by the Survey Research Laboratory at the University of Illinois as part of its "National Organizations Study" first sampled individuals and then queried their employers about the types of training they provided, representing an important first step. Another is the World-Bank's "Enterprise Training Strategies and Productivity: A Cross-National Study," a multinational survey of firms and their employees; the American survey for this effort is being conducted by EQW.
3. More explicit questions ought to be developed that focus on training credentials and certificates—when are they issued, by whom, and with

what value. Such questions ought to be asked just after questions about educational attainment and degrees.

Our larger set of conclusions and tentative recommendations—based on our analysis of the national surveys as well as the results from related EQW projects—involves closing the gap between the two kinds of training and related education that the national surveys tap. Closing this gap likely requires a continuum of job-connected education and training options available not only to unskilled and highly-skilled workers, but also to the broad middle-segment of the nation's labor force. Even as the decline of traditional manufacturing jobs has lessened economic opportunities for those who have traditionally sought blue-collar careers, the development of new technical occupations is offering middle-class security for thousands more. Demand for skilled, white-coat technicians—computer programmers, medical technicians, paralegals, engineering technicians, to name just a few—continues to grow.[11]

The importance of these technicians, however, remains largely unrecognized. The nature of their occupations is defined, for now, by a hierarchy that excludes them from the ranks of professional staff. As a result, such workers lack clearly defined career paths, status, and, most importantly, credentials.

Indeed credentials may be the key to training reform not just for technical crafts but for jobs and workers of all types. Growing interest in performance standards for secondary and higher education could lead the way for a similar reordering of training requirements. Just as a high school or college diploma should warrant the acquisition of certain predefined skills, comparable credentials should vouch for measurable competencies gained through accredited private or public training programs.

The creation of portable, standardized credentials would require comprehensive revision of the nation's occupational categories and detailed specification of skills for each occupation. Considerable time, as well as money and imagination, would be necessary to develop such a system. The likely advantages, however, would almost certainly justify the effort. Tying training more closely to skills could give new meaning to equal opportunity, erasing the stigma attached to public training and furnishing powerful incentives for lifelong learning.

Solving the riddle of training statistics will not automatically solve the problems of work-related education and training in the United States. In the unraveling of survey discrepancies, however, important clues have come to light, illuminating the major challenges of training reform.

In practical terms, closing the gap between public and private training could be accomplished through a system of national standards and transportable credentials. Such a system would facilitate skills acquisition and occupational mobility not only for individuals at either end of the socio-economic spectrum, but also for technicians and other front-line workers in the often-neglected middle segment of the nation's labor force. It is an imposing, but not impossible, challenge. As built-in barriers and stereotypes begin to crumble, American firms and the workers they employ can reasonably look forward to a time when effective, job-connected skills training—distributed nationwide through a network of locally-based, private and public suppliers—proves itself to be a vision grounded in reality.

Endnotes

[1] For a comprehensive sense of the components of this study, please read the following publications in conjunction with this paper: *A Crosswalk of Data Sets Focusing on Worker Training*, National Center on the Educational Quality of the Workforce, Philadelphia, PA (1992); *Statistical Companions to the Crosswalk of National Data Sets Focusing on Worker Training*, Volumes 1 and 2, National Center on the Educational Quality of the Workforce, Philadelphia, PA (1993); and "Measuring Public Policy: Muddled Mazes and Old Dilemmas" by Robert Zemsky, Distinguished Lectures in the Social Sciences, Northern Illinois University (1992).

[2] *Overview of CPS Sampling Design and Methodology*, available from the Bureau of the Census.

[3] "How Workers Get Their Training." U.S. Department of Labor, Bureau of Labor Statistics. Bulletin 2226, February 1985; "How Workers Get Their Training: A 1991 Update." U.S. Department of Labor, Bureau of Labor Statistics. Bulletin 2407, August 1992.

[4] *National Longitudinal Survey of Youth*. Washington, DC: U.S. Department of Labor, Bureau of Labor Statistics.

[5] For a detailed description of all five cohort studies, see the *NLS Handbook 1991*, Center for Human Resource Research, The Ohio State University, Bureau of Labor Statistics, U.S. Department of Labor, Contract #J-9-J-7-0090.

[6] U.S. Department of Commerce. 1988. *Survey of Income and Program Participation*. Washington, DC: Bureau of the Census. Form SIPP-5020 (6-1-88).

[7] National Center for Educational Statistics. 1987. *The National Longitudinal Study of the High School Class of 1972 (NLS-72): Fifth Follow-Up (1986)*. Washington, DC: Department of Education, Office of Educational Research and Improvement.

[8] National Center for Educational Statistics. 1987. *High School and Beyond 1980 Sophomore Cohort Third Follow-Up*. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

[9] There are some notable exceptions to this tendency to concentrate only on a single data source. See the work by Lee Lillard and Hong Tan, *Private Sector Training: Who Gets It and What Are Its Effects?* (1986).

[10] Individual income data in the CPS survey are only available for one-quarter of the sample.

[11] *Statistical Companions to the Crosswalk of National Data Sets Focusing on Worker Training* (National Center on the Educational Quality of the Workforce 1993) can be obtained by contacting the Center.

[12] We obtained a description of the logit models from Hanuschek and Jackson's *Statistical Methods for Social Scientists* (1977) and the SAS Institute Inc.'s *SAS/STAT User's Guide* (1989).

[13] The authors owe a special debt to Joel Levine of Dartmouth College for his help in developing the logistical architecture. He was simultaneously critic and colleague, equally concerned with "stretching the envelope" and "getting it right."

[14] Our knowledge of technical work is drawn principally from the work of EQW researcher Stephen Barley of Cornell University. *Fortune* Magazine recently featured Dr. Barley's work on technical occupations in their May 17, 1993, cover story, "How Will We Work in the Year 2000?" by Walter Kiechel. His papers on the changing technical workforce have been published by EQW: "The New Crafts: The Rise of the Technical Labor Force and Its Implication for the Organization of Work" (1992); "Practice Makes Perfect: Emergency Medical Technicians and the Social Negotiation of a Skilled Occupational Identity" (1992); "In the Backrooms of Science: Notes on the Work of Technicians in Science Labs" (1993); and "What Do Technicians Do?" (1993).

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