A PROGRAM OF CENSUS-RELATED STUDIES OF SCIENTIFIC AND TECHNICAL PERSONNEL

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The Advisory Panel to the National Science Foundation and the President's Committee on Scientists and Engineers recommended that a survey be undertaken of ". . . a large sample of persons recorded in the 1960 Census enumeration as college graduates or as persons currently or last employed in scientific and technical positions, whether college graduates or not, to determine relationships between training and subsequent occupation."[1] Seeking to implement this recommendation, the National Science Foundation requested that the National Opinion Research Center, affiliated with the University of Chicago, prepare a planning statement[2] on a series of post-enumeration studies of scientific and professional workers and college graduates.

The planning statement provided the basis for implementing this recommendation of the Advisory Panel. These studies will employ as their basic reference point the 1960 Census of Population which classified one-fourth of the population by a number of key characteristics such as education and occupation. Using the Decennial Census as the frame, samples ranging in size from one thousand to five thousand persons per occupational title are being drawn from over forty scientific and professional occupations classified as "Professional, Technical and Kindred" workers under the three-digit occupational code. Once these persons are identified, information collected in the 1960 Census will be supplemented at comparatively low cost by mail questionnaire later this winter.

The questionnaire, now undergoing extensive field testing, covers four topics: first, job duties; second, career patterns and job mobility; third, training history; and fourth, social and professional characteristics.

DUTIES: Certain important questions about professional and other workers and their job activities cannot be adequately answered by the present Census occupational classification system. For instance, the word "research" is not included in the scheme, and "researchers" are scattered among many different categories. Although elementary and secondary teachers are separated, college professors and instructors are not grouped by level or type of school, and "mathematics professors and instructors" cover a range from junior college to advanced graduate level teaching. The Census also cannot reveal information about multiple jobs (the teacher who also consults, the engineer who also teaches) and "joint appointments."

Perhaps even more important, however, is that for many jobs, the exact meaning of the job title is unknown. Although great effort has gone into detailed studies of what factory workers and farmers do on their jobs (time and motion studies), little is known about the actual job requirements and duties of many professional jobs. Thus, John Smith's job as a "research chemist" may or may not involve teaching classes, training of assistants, consulting to industry and government, writing proposals for research, contract negotiations, project administration and purchasing, hiring and firing, reading up on the literature, writing reports, and so on. Similarly, what engineers, accountants, economists, and technicians "really do" is not actually known.

It may be assumed that each occupational label actually covers a range of these clusters of activities. Under the umbrella of "engineering" may be found people who are mostly administrators or salesmen and people who are mostly technicians and draftsmen. Similarly, college professort range from the classroom teacher to the man who essentially directs a research organization; and psychologists include people who counsel and give therapy to troubled individuals (or groups), experimental physiologists and "human engineers" who design and improve equipment.

What these professionals do in terms of their particular cluster of duties is only one aspect of their jobs; a full picture entails additional information about the organization of their work. Historically, the professional was a "solo practitioner" who provided services to a particular client or groups of clients. He either was self-employed, or like the teacher, worked alone even though employed by an organization. Today, professional work increasingly is done in groups. The research team in the laboratory, group practice, program directors, section leaders: all these groups and/or titles reflect a growing organization of professional work. In order to understand these jobs, then, we must know whether the professional has a superior, collaborating professionals and subordinates.

Therefore, we plan to consider the details of job activities, and the organizational context of work to provide information on these questions. Each subject in the study will be asked to indicate what duties were part of his job and

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[1] "A Program for National Information on Scientific and Technical Personnel," National Science Foundation, NSF 58-28, p. 6.

[2] I am indebted for many of the ideas presented at this session to James A. Davis, Senior Study Director, National Opinion Research Center, who prepared the planning statement.

which ones are key elements. A number of analyses may be made from such data.

First, by re-weighing the stratified sample of respondents, it should be possible to make national estimates for 1960 of the proportion of professional or highly educated workers in terms of categories not covered by the Census: e.g., the proportion involved in research, the proportion who teach, the proportion who are involved in administration, etc.

Second, these materials can enhance the utility of data derived from the 1960 Census. By factor analysis or analogous statistical techniques it may be possible to describe dimensions of activities or clusters of activities which will aid in interpreting the Census materials. Thus, it may be possible to find sub-types within a Census category differentiated in type of work, or by inter-correlating Census categories over activities (i.e., comparing pairs of jobs in terms of similarity or difference in activities), locating occupations which, although classified separately, have similar patterns of work.

In order to assess interpersonal environments of professional work, questions are directed at three levels of organizational hierarchy. Above the respondent, we wish to know whether he has a boss, and the key elements in the work activity of this superior. At the same level as the professional, we ask whether there are co-workers and what they do. At the administrative level below the respondent, questions are asked about his subordinates, if any, and their key activities. These data will permit a description of the division of labor among professionals and scientists within the context of the employing organization.

TRAINING: High levels of advanced training are the hallmark, in fact the definition, of most professional and technical jobs. Compared with the general population, the people in these jobs have such high levels of education that to consider training as a problem seems, at first glance, a false issue. However, many of the fields in question are developing at such a rapid rate that professional training as little as five or six years old may be outmoded, unless supplemented by more recent ideas and knowledge. Also, if it is correct that professional jobs are actually complexes of specific duties rather than applications of single skills, many professionals may be well trained for parts of their jobs, but undertrained for others.

As a first step in identifying relationships between training and subsequent employment, we plan to collect information on formal training in detail beyond that of years completed as reported in the Census. Data can be gathered on the specific degrees and fields of specialization, both graduate and undergraduate, specific institution, and sources of financial support for undergraduate or professional training. Second, we include questions concerning "brush-up" training by asking about correspondence courses, in-service training programs, apprentice training and so on. When all these data are matched against specific occupations and clusters of job duties, they can give a fairlyprecise description of the training of American scientists and technicians. Furthermore, statistical analysis of job histories and background characteristics of the respondent can provide insight into the processes accounting for differences in levels of training and duties performed on the job.

CAREER PATTERNS AND MOVEMENT: Much more needs to be known about processes over time by which trained people are allocated to various jobs and institutions, the career paths which characterize a profession and the flow of professionals between various types of employers. Procedures to secure such information include the following: As a start, schedules will be collected early in 1962. Thus, a number of the respondents will no longer be working at the jobs which they reported to the Decennial Census field worker. It will, of course, be necessary to ask these changers about their April 1960 jobs to make the analysis in terms of the occupations enumerated in 1960. This situation will provide a natural design for studying job changes, as it will be possible to contrast changers and non-changers, and to contrast the old and new jobs of changers.

At the same time, the two year interval will not give enough of a time spread to develop findings on long-run career patterns. Therefore, each respondent will be asked selected items of information on his first full time job held after reaching age 25. It should be stressed that these materials will not be complete job histories, since it is not uncommon for civil engineers, for example, to have had so many jobs in so many places that a complete job history would require a lengthy questionnaire. Rather, it is planned to get brief over-all characterizations of the mobility history since finishing school sufficient to separate respondents into broad categories: those who have always had the same job with the same employer; those who have always worked for the same employer, but in different types of jobs; those who have done essentially similar work, but for a large number of employers, etc.

Some possible uses of these two sets of data are as follows: First, the recent mobility data will provide an assessment of the flow between various employers, geographical regions, and functions. Are more professionals moving from academic to industrial jobs than vice versa? Are more people moving into administration than out of it? Are certain regions of the country attracting a high share of the mobile professionals? These and similar questions may be answered from the current mobility data.

The retrospective job history data also will make possible the establishment of typical and

variant career histories for specific occupations and for respondents with specific types of training. They should give clues on continuity in professional careers, in the routes to particular destinations in the job market (how does one get to be a project director, consultant, professor of medicine, government project director?), and by comparison of the early jobs of older and younger respondents, perhaps some insight into historical shifts in the career patterns of professionals. Taken as a whole, these findings should tell much about the interaction of supply and demand, and perhaps locate high and low turnover situations which can be exploited to improve the recruitment of professionals.

Finally, the questionnaire will permit us to supplement the current fund of information in the following three areas: (1) Professional characteristics: This includes memberships in professional associations, information which will help assess the validity of membership lists in professional societies as inter-censal indices of professional size. (2) Fertility: This includes the number and ages of the respondent's children as a possible factor in social mobility and as a measure of the reproductive rates of a crucial segment of the society. (3) Occupational attitudes: Although this research is not an attitude survey, a few questions are asked about the relative importance of, and satisfaction with, selected aspects of occupations. These data should permit us to identify the cluster of values which characterize specific occupations and provide additional clues on continuity of employment and turnover among persons employed in April 1960 as engineers, natural scientists, physical scientists, etc.

Although a somewhat truncated description of the scope of these studies has been presented today, clearly the data to be gathered in this post-censal survey of scientific manpower will be relevant for any formulation of policy which seeks to relate training to subsequent employment in these fields. Furthermore, we expect that the data will aid substantially in advancing a comparative analysis of the professions in American society.