THE POSTCENSAL STUDIES PROGRAM: BACKGROUND AND CONTENT

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The need for data on the Nation's resources of all types of manpower has become more urgent as an awareness grows that such information is vital in planning and evaluating many economic, educational, and scientific policies and programs in all sectors of the economy. In particular, our concern regarding our resources of high-level manpower required to carry out the multitude of tasks in science and technology has been reflected in the National Science Foundation's programs of scientific manpower studies. These programs have been in effect since the establishment of the National Science Foundation more than a decade ago, and although the number and variety of studies and surveys supported by the Foundation in recent years has been quite extensive, the realization that we have yet much to accomplish is with us at all times.

The genesis of the Postcensal Studies Program goes back to 1957 when the Foundation together with the President's Committee on Scientists and Engineers appointed a special advisory panel to review requirements for scientific manpower data. In its report[1/] issued in 1958, this panel found, not surprisingly, that on the whole, data on the number, demand, supply, utilization, and other economic and social characteristics of scientific and technical personnel were not adequate for formulating policies and undertaking programs related to the welfare and security of the Nation. Among the projects recommended as highly urgent was "a special survey 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 occupations." It was reasoned that the 1960 Census would provide a rare opportunity (not available again for possibly another 10 years) to obtain valuable data directly and efficiently from the individuals classified in scientific and technical occupations regarding their demographic, economic, and social characteristics. In addition, by surveying all types of college graduates, regardless of occupation, comparable data would be provided on other highly trained personnel in other professions (such as law and medicine), in the humanities, in business, and in managerial and administrative positions in business and government as well as those currently not in the labor force.

With the knowledge that Census Bureau data processing would have available by 1962 a tape with the occupational sample information, the National Science Foundation in 1960 began to consider the feasibility of undertaking such a major project, and requested that the National Opinion Research Center, affiliated with the University of Chicago, prepare a planning statement on a series of postcensal studies of scientific and professional workers and college graduates. A detailed planning statement was prepared which provided the initial basis for the proposed studies. During the first part of 1961, the Foundation, aware of the interests and missions of other Federal agencies, initiated a series of meetings with these agencies to acquaint them with the proposed studies and provide them with the opportunity to participate in or co-sponsor the nation-wide survey under consideration. By late fall, 1961, four other Federal agencies--the U. S. Office of Education, National Institues of Health, Bureau of Labor Statistics, and the Veterans Administration--had made definite commitments to participate in the survey and provide the necessary support.

Beginning in the Spring of 1961, the National Opinion Research Center with the aid and consultation of the National Science Foundation and the Bureau of the Census began to develop a basic mail questionnaire which would be used as the primary survey instrument for the Postcensal Studies Program. Since another paper has developed in detail the mechanics and operation of the survey itself, the remainder of this paper will discuss the content of the questionnaire and some of the possible uses of the data which we were seeking.

The availability of a large sample based on the entire population was very attractive bait for requesting information on an extremely wide variety of subjects which could well have covered numerous economic, demographic, sociological, and psychological areas. The temptation to run wild, so to speak, was held in check by the very obvious realizations that the burden imposed on the respondents might be such as to obviate any possible success in obtaining a meaningful rate of response. In addition, of course, was the fact that the Foundation's program of manpower studies enables us to obtain data from a variety of sources, much of which would both complement and supplement data derived through the Postcensal Studies Program. These manpower studies include among others, the National Register of Scientific and Technical Personnel, employment surveys of scientific and technical personnel in various economic sectors, follow-up studies of college graduates, and pilot efforts dealing with the labor market behavior and mobility of persons in selected occupations.

The content of the Postcensal Studies Program can be reviewed in some detail through an examination of the survey questionnaire itself. Even with self-imposed limitations, the final version of the basic questionnaire ran to eight "fully-packed" pages with an additional sheet enclosed containing a list of pre-coded fields of specialization to be used in answering questions dealing with employment and training. For

1/ A Program for National Information on Scientific and Technical Personnel, NSF 58-28, National Science Foundation, 1958.

a small sample of persons in occupations in which the National Institutes of Health had particular interest, another one page supplemental questionnaire was added dealing in detail with questions of financial support received by the respondent for both training and research purposes.

To begin with, among the main foci of interest were questions pertaining to the employment, occupation, and job activities of persons classified in selected professional, scientific, and technical occupations during the 1960 Census. In the 1960 Census schedule, the amount of information available pertaining to a person's work activities is quite limited. In fact, the only direct questions deal with what a person does (in terms of an occupational classification) and what type of employer he works for. Even information collected by both Government and non-government organizations for studies dealing with job analysis or vocational guidance have provided largely some general outlines when dealing with professional and technical personnel. The occupational label used in classifying personnel such as "engineer", "chemist", or "college professor" actually covers persons in a wide range of specializations.

Therefore, we were interested in determining first, for the most current period possible, how many engineers, for example, were working in civil compared to nuclear engineering?; how many chemists considered themselves to be in organic chemistry compared to physical chemistry?; and, what fields college teachers considered their primary area of specialization? Beyond this, we were hopeful of obtaining some insight into the extent to which interdisciplinary work in science and technology has resulted in engineers working in an area of the physical or life sciences, physicists concerning themselves primarily with some aspect of the medical sciences, or mathematicians calling astronomy their field of work specialization.

Another equally important area of job information is the activities or duties that are actually performed; that is, what do people classified in professional and technical occupations of interest to us "really do" in their jobs. Most of our information in this area, up to the present time, comes from other surveys which give us only an indication of the functions in which an individual is primarily engaged; for example, the National Register and the employment surveys mentioned earlier. Although we may have some indication that a certain number of physicists may be involved in "research", what the varied job requirements or duties of these personnel are, has not really been known. For some, this may mean that aside from engaging in applied research, the job may entail consulting customers on technical matters, coordinating a team of other professional personnel, and writing technical reports; for others, there may be administrative duties, and making estimates of markets for new products. For persons in other occupations, such as engineers, mathematicians, economists, and college teachers, there are of course a similar wide range of activities which make up the different types of jobs in which such personnel are engaged. In addition to obtaining an overview of the varied activities making up the jobs of professional and technical workers, respondents in the study were also requested to indicate which two activities were primary in the sense of most time being spent on them.

The organization of work in professional and technical occupations and the interpersonal relationships in the work environment is another area in which little information has been developed. Although in the past, the professional, in particular, was either self-employed or worked largely alone even when employed in an organization, the development of the professions and the complexities of scientific and technical work in an increasingly industrialized setting have resulted in considerable changes in the organizational environment. In order to obtain some understanding of this environment, a series of questions were directed at the respondent regarding the size of organizational unit in which employed; the number of employees being supervised, if any; whether he works as part of a team, either with personnel from his own field of specialization or from others; whether he has an immediate supervisor, and if so, if the supervisor's field of specialization is similar to his.

If our knowledge concerning the current employment and job activities of professional and technical personnel has been rather limited, this has been even more so about the process over time by which such highly trained persons are allocated to various jobs and employers, the career paths which may characterize different professions, and the movement of professional and technical personnel between various employers, occupations, and work specializations. It was determined that some insight into this complex area would be helpful in dealing with an assortment of problems including the supply and demand of scientific and technical personnel. To this end, questions on employment and job activities were related to three points in time--current employment (e.g., mid-1962 when the survey schedules were sent out), April 1960 (the date of the decennial census when the persons in these occupations were originally enumerated), and the first full-time job held at age 24. It was obvious, of course, that such information could not provide complete work histories, but it would give us a broad overview of mobility patterns. For these time periods, it will be possible to analyze many factors in relation to changers and nonchangers among the various occupational groups; for example, there are those who have always had the same occupation with the same employer; those who have changed employers one or more times but remained in the same occupations; those who have remained with the same type of employer and occupations but whose area of work specialization has shifted during their careers, etc.

What insights can be provided by such data? The period 1960-1962 has been marked by, among

other things, an increase in vast Federal Government expenditures for research and development, a build-up of activities in both government and industry for the space program, an increase in existing as well as new programs for medical and health research, an increased emphasis on the development of new products in many science-oriented industries, and an expansion of college and university facilities to accomodate the influx of new students and provide for expanding research programs. Against this background, the recent mobility data will provide an evaluation of the movement between employers, jobs, activities, and fields of specializations. For example, are more scientists moving from academic employers to industrial jobs than vice versa? Are a greater proportion of engineers concerned with administrative or supervisory duties than heretofore? Are certain industries attracting a higher proportion of the mobile personnel? Does there appear to be a shifting or upgrading of persons in non-professional jobs (the technician occupations) to professional occupations?

By going back to the age 24 starting point for job histories, it may be possible to establish typical and variant career histories for specific occupations and occupational groups, for respondents with specific levels and types of training, and for those with certain demographic characteristics. Several additional general questions on employment which were included will provide some further insights into the overall work history patterns: respondents were asked to indicate all the different types of employers worked for; the number of different employers for the current field of work specialization as well as the total number of years worked in the present field of specialization; and finally, some data on the different fields of work specialization in which the respondent was engaged during his career other than those already indicated for the specific points in time requested.

Turning now to our third main area of inquiry--training--an intensive effort has been made to obtain a considerable amount of detail on various facets of both formal education and informal types of training. By and large, persons in the occupations covered in this survey have a fairly high level of training, especially when compared to the general population. Not only is some information in this area available from a variety of other studies, but we are also aware that the requirements for employment in these professional, scientific, and technical occupations require this background--even more so in the past several decades.

To begin with, since information on training was obtained as of 1962, we were able to update the Census occupational information on number of years of formal training completed. However, our primary interest lay beyond this data, in that we wanted to determine some of the specifics of higher education obtained in relation to subsequent employment. Data was therefore requested on major fields of specialization for undergraduate and graduate study at every institution attended as well as the different types of degrees granted, where appropriate. As a subsidiary question, we requested information on sources of financial support received by respondents for undergraduate and graduate or professional training. This will provide some historical insights on the varied sources of support obtained by persons who received their training in different fields of study. In addition, because of our general knowledge that a substantial amount of training takes place outside of the formal educational system, several questions were included about informal types of training received, such as company training programs, military training applicable to civilian occupations, home study correspondence courses, special workshops and seminars, etc. Some of the more apparent uses of this information includes: a detailed description of the formal education and training of persons in various professional, scientific, and technical occupations; an analysis of current occupation and field of work specialization as well as overall job histories in relation to major fields of study at both undergraduate and graduate levels; the extent to which persons with less than a college degree are employed in professional occupations, and what types of informal training as well as experience may have contributed to their attaining such positions; and, an analysis of the personal and other background characteristics of the respondents to determine whether any insight can be obtained regarding differences in levels of training and subject matter studied.

Lastly, as previously indicated, some information was sought on background and personal characteristics both to supplement data available from other sources and as factors to relate to data obtained in the areas dealing with employment and training.

The information obtained in several of these areas includes: (1) Attitudes toward work in terms of the respondent's current occupation--respondents were asked to indicate the relative importance of and degree of satisfaction with selected characteristics of occupations. Information provided here may aid in identifying clusters of values which characterize specific occupations or groups of occupations. In addition, we may obtain clues regarding continuity of employment and future turnover among persons in various occupations, and in relation to such factors as age, geographic location, and training background. (2) Marital status and fertility--this includes both the marital status of the respondent as well as the number and ages of the respondent's children as possible factors in job mobility. Also, we are provided with a measure of the reproductive rates of an important segment of the population. (3) Professional characteristics--this area covers membership in professional associations and data on publication of articles or books and presentation of papers at professional meetings. Obviously, these two characteristics are only a few of the many which could be explored regarding status or professionalism among the occupations being studied.

The second major group covered in the Post-

censal Survey encompasses a sample of all college graduates broken into a number of subgroups. The two main subgroups included: (1) those in the labor force in 1960 employed in all other occupations not covered in what might be called our target occupation sample; and (2) those in the labor reserve in 1960 (employed at some time between 1950 and 1960 in occupations covered in our professional and technical occupations sample). For all these respondents, information was also obtained on their work and career histories, training background, and various personal characteristics. Not only will the data provided by the persons in this group result in a comparative analysis of the Nation's college-educated population, but in terms of our own particular interests, we will be able to determine in large measure the extent to which persons trained in scientific and technical fields were, in 1960, working in occupations seemingly unrelated to this training; the same for persons who started their careers in professional, scientific, and technical occupations and were employed elsewhere in 1960; and finally, what potential exists among those in the professional and technical labor reserve in 1960 for possible reemployment in professional, scientific, and technical fields.

In closing, I should like to reiterate our hope that the program of postcensal studies outlined here will provide many insights helpful in contending with manpower problems affecting all sectors of the economy and the national welfare. The data and information culled from these studies and added to information from other past, current, and future studies will hopefully bring us closer to the day when the formulation of policies affecting our highly trained manpower will be undertaken with much greater assurance and confidence than heretofore.