Enumerating Full-Time Programmers

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Data from the 1970 Census and the Department of Labor's Area Wage Surveys are used to derive estimates of the number of full-time programmers employed during the years 1969 through 1973. The 1973 figure of 180,000 is considerably less than suggested in earlier reports. It is recommended that educational administrators consider whether the many courses aimed at training programmers are justified on a vocational basis.

Key Words and Phrases: programmer, employment, 1970 Census, Area Wage Survey

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The number of digital computers in use in the United States has increased dramatically over the last 25 years and it has generally been believed that the number of programmers has increased correspondingly. In order to test this belief, at least as far as full-time programmers are concerned, we have analyzed the 1970 Census reports and recent Area Wage Surveys conducted by the Bureau of Labor Statistics. From this analysis we conclude that there has indeed been an increase in the number of full-time programmers but not to the explosive extent suggested previously.

We recognize that a significant and probably growing amount of programming is being performed by individuals whose primary occupation is other than programming. Unfortunately current government data give no information on such people, and therefore we have had to exclude them from the present discussion.

Earlier Reports

In 1966, AFIPS [1] published an overview of the information processing industry. This report quoted various industry estimates which projected that by 1970 there would be between 200,000 and 650,000 programmers. Carlson [2] in 1971 testified that consensus data would appear to support the approximation of 250,000 programmers in 1970 increasing to 500,000 in 1975. Gilchrist and Weber

[3] in 1972 estimated that there were 210,000 programmers employed in 1970. The 1970-71 edition of the Occupational Outlook Handbook [4] published by the U.S. Department of Labor estimated that there were approximately 175,000 programmers in 1968, and the 1972-73 edition of the Handbook [5] states that "nearly 200,000 programmers were employed in 1970."

All the above reports presumably relate to full-time programmers, although this is not explicitly stated. However, since the number of people who know enough about programming to write simple programs in languages such as BASIC and FORTRAN is undoubtedly much larger than even the largest number suggested in the reports, it is reasonable to believe that the reports all refer to full-time programmers. Closer examination of the reports indicates that the differences are due not so much to definitional problems but rather to a simple lack of basic data.

1970 Census

As part of the 1970 decennial census, people in a 20 percent sample of the U.S. population were asked to give their occupations. From the responses to this question the Bureau of the Census extrapolated that the nationwide total number of programmers was 161,377 (see [6]).

A further breakdown by sex, race

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and Spanish Heritage is shown in Table I.

Although the Census is intended to be an accurate enumeration of all residents, there are difficulties in achieving this objective. For example, it is well known that not everybody is counted. In addition, when a new and somewhat ill-defined occupation such as that of programmer is involved, there is the problem of differences in self-classification. For example, if people have a choice to name one of two occupations, they will probably choose the one which has the higher prestige. Thus a computer operator who is doing some programming may report himself as a programmer, whereas an engineer who is spending full time at programming may report himself as an engineer.

To evaluate the accuracy of the Census, it is usual to look for other sources of data with which the Census data can be compared. We have chosen for our comparison the data from the Area Wage Surveys which are periodically made of the standard metropolitan areas.

Comparison of Census and Area Wage Survey Data

The fiscal year 1970 Area Wage Surveys included data on computer related occupations for 55 of the Standard Metropolitan Statistical Areas. Of these 55, 37 provide complete enough information on which to base estimates of total U.S. employment of programmers. Any estimates based on these data could of course differ from the Census "count" in that the individual's occupation is determined by the employer, who is guided by a Labor Department interviewer. Nevertheless, from a detailed analysis, Weber and Gilchrist [7] found that the Area Wage Survey data extrapolated to a total programmer employment figure of 158,000 in 1970. This is in surprisingly close agreement with the Census and suggests that the "true" figure is probably close to 160,000.

Trend of Employment

Since the Census is conducted only every ten years, it cannot be directly compared with surveys taken at other times, and in particular, it cannot be used to determine trends in a newly

Table I. A Number of	A 1970 Ce f Programm	nsus Brea iers	kdown of
	Male	Female	Total
All	124.956	36,381	161,337
Negro Spanish	4,008	1,829	5,837
Heritage	2,957	602	3,559

Table II. Estimated Employment of	
Computer Programmers by Year for	1969
to 1973 Based on Area Wage Survey	Data

	Number of
Year	Programmers
1969	150,000
1970	160,000
1971	170,000
1972	180,000
1973	180,000

formed occupation. The Area Wage Surveys are, however, conducted annually, and the strong correspondence between the data in our extrapolation from this series and the data in the 1970 Census leads us to use the same extrapolation technique to derive estimates of the number of programmers employed in the period 1969 to 1973. The results are given in Table II.

It should be noted that the results shown for the later years of the series are based on larger samples. We would therefore expect that the most recent figures are the more reliable.

Conclusion

The data presented above clearly suggest that previous estimates of employment of computer programmers have been much to high. A consequence of our conclusion should be careful appraisals by educational administrators in both public and private sectors as to whether the large number of courses aimed at training programmers is justifiable on a vocational basis. Fewer employment opportunities than had been forecast caused a very significant drop in the number of so-called "Private EDP Schools," and we wonder whether similar overproduction problems may not face the Junior and Community Colleges next as there has been a considerable increase in the number of data processing courses in those institutions.

Nothing in our comments and conclusions should be taken as being against offering students instruction on computing and programming. In

Communications of the ACM fact, we believe that some knowledge of these areas is vital to almost everyone today. We do however want to point out as clearly as possible that employment opportunities for *full-time* programmers are not unlimited and that, in fact, they are less than have been estimated by many people.

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