

Longitudinal Data Sets: Evidence for Ontogenetic Development or Chronicles of Cultural Change

K. Warner Schaie

The Pennsylvania State University

Limitations of single-cohort data sets are discussed, and their pitfalls are illustrated by means of a multiple-cohort study of the cognitive ability of spatial orientation. The questions of gender differences in age changes and experimental attrition are further illustrated by examining a study of the questionnaire-derived personality traits of social responsibility. Finally, implications are suggested for the internal and external validity of inferences drawn from analysis of the Ginzberg-Yohalem data set.

It is the purpose of this paper to examine some of the threats to internal and external validity in the study of women and social change. In particular I would like to call attention to one of the major interpretational problems associated with longitudinal data sets: the difficulty of untangling maturational change over time from unique environmental inputs (socio-cultural change) that have occurred between the measurement points involved in a particular study. I will also deal with the issue of experimental mortality (attrition of study panel participants) as it impairs the generalizability of findings from a given study. Although these problems are characteristic of all longitudinal work, they deserve particular attention in this context, because we still lack sufficient empirical evidence to be certain whether the interaction of socio-cultural change and maturational variable occur in identical fashion for men and women, whether the effects of experimental mortality are equivalent across the sexes, or whether the effects of socio-cultural change operate within the same time frame and/or intensity with respect to dependent variables of interest in the study of women.

Correspondence regarding this article may be addressed to K. Warner Schaie, Division of Individual and Family Studies, College of Human Development, The Pennsylvania State University, University Park P.A. 16802.

In order to sensitize the reader to the methodological issues involved, I will briefly describe data from my own research on intellectual abilities and personality traits, with particular attention to the issue of whether and for what parameters interaction between socio-cultural change, subject attrition, and sex of participants become matters of concern. I will then discuss the implications of these concerns for the analysis of the Ginzberg-Yohalem data set, and provide some recommendations as to additional data which should be collected if the existing data are to be explored meaningfully and if a basis for more secure generalization is to be obtained.

Longitudinal Data Sets in Studies of Human Behavior

It has long been argued that longitudinal studies must be conducted if we are to learn anything about intra-individual change over time as well as to distinguish normative patterns and individual deviations that lead to unique developmental progressions for some sub-groups in the population. What is frequently forgotten, however, is that the environment does not remain constant, and that the longitudinal account for a single cohort may be no more than a group autobiography, chronicling how social change has impacted the behavior of a set of individuals as they are developing through a particular historical period: If only a single cohort is followed, there is then no assurance that any findings obtained will be replicable for any other cohort. Single cohort studies in the social sciences, therefore, can only generate hypotheses, which must be evaluated by replication upon another comparable cohort; they can never generate normative "laws" (cf. Schaie, 1972, 1977).

In addition to the problem of external validity introduced by the confounding of ontogenetic changes and specific socio-cultural impact over a given period of time, longitudinal studies may suffer in internal validity because of systematic attrition. That is, the characteristics of individuals successfully followed are not necessarily identical with the total sample initially surveyed (cf. Schaie, Labouvie, & Barrett, 1973). In particular, there is a tendency for attrition to affect the less able, those who tend to express less socially desirable attitudes, subjects who are in relatively poor health, those who are not highly motivated, and those who overreact to the ineptness of inexperienced interviewers. Finally, without the presence of a control group that is surveyed only once, we do not know to what extent the initial survey itself has had an impact upon the thinking of those subjects who were successfully followed.

The fallacy of single cohort data can best be illustrated by referring to the study of intellectual development where we have systematically

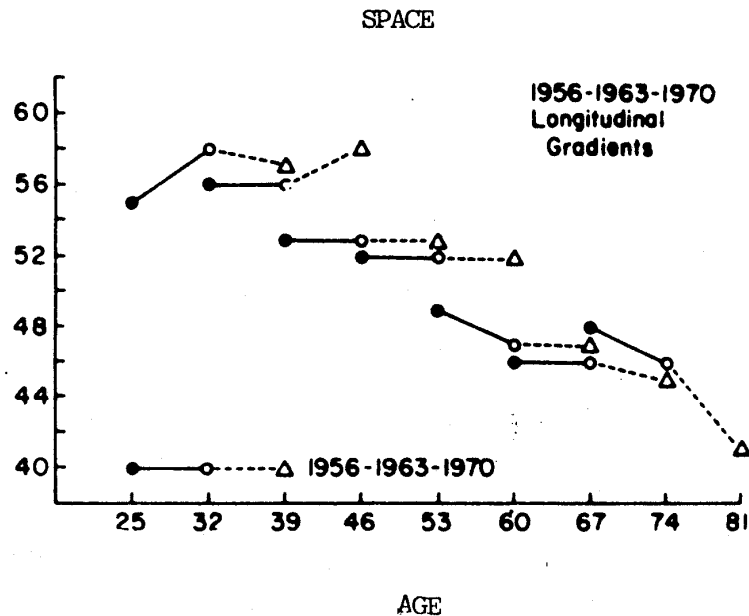


Fig. 1. Longitudinal changes over a fourteen-year period on the Primary Mental Ability of Spatial Orientation. (From Schaie & Labouvie-Vief, (1974). Copyright by the American Psychological Association. Reprinted by permission).

followed successive cohorts over time. Figure 1 shows a series of fourteen-year longitudinal studies at different ages (from Schaie & Labouvie-Vief, 1974) for scores on the Primary Mental Ability of Spatial Orientation. Inspection of this figure shows clearly that successive cohorts attain higher levels of functioning at comparable ages; and, further, that the slopes of the three point gradients change as well. We concluded, therefore, that it would be extremely hazardous to generalize a developmental function over a particular age range from any data set obtained on a single cohort.

Sex differences, in favor of males, are typically found on measures of spatial orientation. It is of interest therefore to consider whether such effects might differ across age and time or be differentially affected by attrition or retest effects. Remarkably enough, all of these effects occurred with very similar patterns in men and women. Perhaps such cross-sex similarity should not surprise us for ability measures, even when reliable

sex differences in performance level are found; socialization and early learning patterns may simply be too strong to permit differential development. Matters are not likely to be as straightforward when we consider attitudes, personality traits, and other characteristics traditionally assessed by survey and other self-report methods.

The problems enumerated above are certainly not specific to ability tests. They become of even greater concern in other areas of inquiry and the matter of differential effects by sex must certainly be considered. I will next review some data from a 44-item true-false questionnaire designed to measure the trait of social responsibility (Gough, McCloskey, & Meehl, 1952). These data come from a longitudinal-sequential study of age changes over the adult life-span from the twenties to the eighties for both men and women. This example will illustrate several points: First we will show that the limitations of single-cohort data extend to the realm of attitude measurement and self-report; second, we will examine whether attrition effects may be gender-specific; and third, more importantly, we will show that trends for attitude change may operate in a gender-specific manner in some but not all historical periods.

The data reviewed here were collected at three points in time: 1956, 1963, and 1970. Figure 2 shows the results for seven short-term longitudinal studies over this period. There are substantial differences in level of social responsibility, with the middle-aged cohorts being highest and the young-adult cohort the lowest. It appears that at similar ages successive cohorts show lower social responsibility. But in addition there is an apparent trend for the younger cohorts to change in a more responsible direction while a downward trend is shown by the older generations (Schaie & Parham, 1974).

Our next question, in the present context, of course, is whether these changes occur uniformly across the sexes or whether there are differential patterns. The complexity of this issue becomes apparent immediately when we note that there were no significant sex differences in 1956, but that sex differences in favor of women appeared by 1963. These trends would not have been detected if we had only followed the sample initially examined in 1956; they were identified first in a new sample examined in 1963. Of course, what this means is that we cannot be certain that attitudinal change will move in a parallel fashion for the sexes at all times. Quite the contrary.

But to what extent are the observed changes moderated by the effects of dropout, that is, the tendency in panel studies to be faced with loss of subjects in ways that may be related to the dependent variable of interest? To study this matter, we segregated subjects tested in 1956 and 1963 into

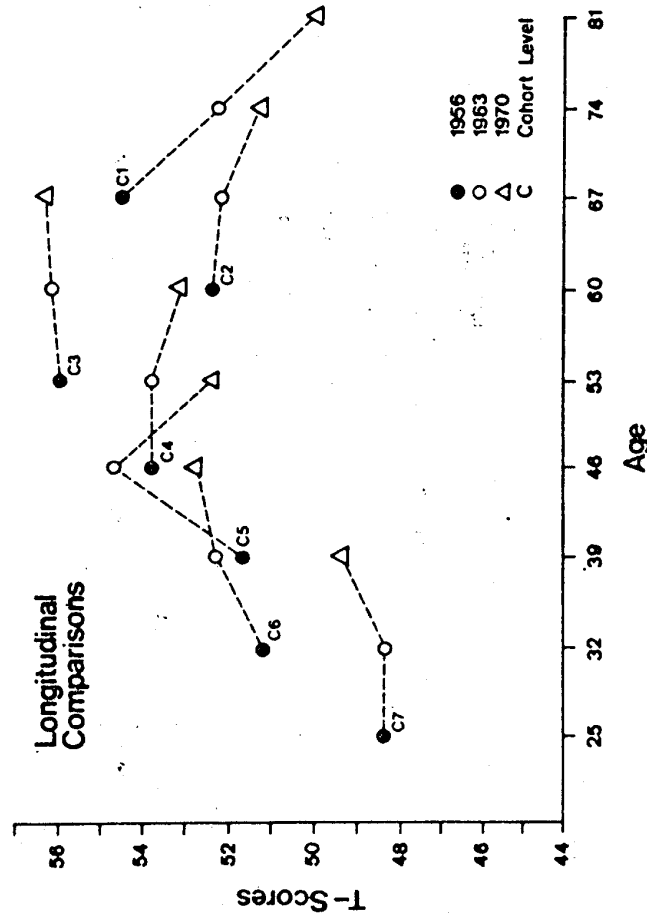


Fig. 2. Longitudinal changes over a fourteen-year period on a scale of Social Responsibility. (From Schaie & Parham, (1974). Copyright by the American Psychological Association. (Reprinted by permission).

subsamples who participated in the subsequent seven-year follow-up or who could not be retrieved for that purpose.

As expected, there is a huge drop-out effect; that is, the individuals who returned for a second assessment session rated themselves substantially higher on the social responsibility scale than did those who did not return. There was no systematic interaction between sex and drop-out. However, when the design controls for drop-out, a significant sex by cohort interaction, first noted in the cross-sequential independent measurement study, becomes more pronounced and worthy of interpretation.

If we now wish to consider how sex differences in social responsibility change as a function of socio-cultural impact we can next graph an age by sex by time array as was done in Figure 3. The data for the first time period would suggest that men tend to increase in reported social responsibility with age, while women show such increment only into the fifties and then drop. A very different pattern, however, appears over the second time period. Here women show a virtually level pattern peaking in responsibility at age 39, while men seem to drop in responsibility with age. On the average, women appear to describe themselves as more responsible, but the gender difference is age-specific. Moreover, there was an overall drop in reported responsibility over time for the younger men, but not for the younger women. Similar data for other questionnaire-derived personality traits have also been studied (see Schaie & Parham, 1976).

Implications for the Ginzberg-Yohalem Data Set

We can now turn to the issue of how the above examples become relevant to the analysis and design of additional data collections for other data sets. The reader will note that we have raised at least two issues directly relevant to the Ginzberg-Yohalem data (see Ginzberg and Associates, 1966). The first is concerned with internal validity and relates to the fact that systematic attrition in a longitudinal study may affect the validity of conclusions drawn even for the particular cohort under investigation. This problem could be addressed by appropriate drop-out analysis. That is, we would wish to determine differences in our dependent variables at the initial interview between those individuals who were successfully followed and those who dropped out. We could then compute regressions (for our followed subjects) of the follow-up observations upon the initial observations, and use these to estimate what follow-up data we might have obtained on those individuals who actually could not be followed.

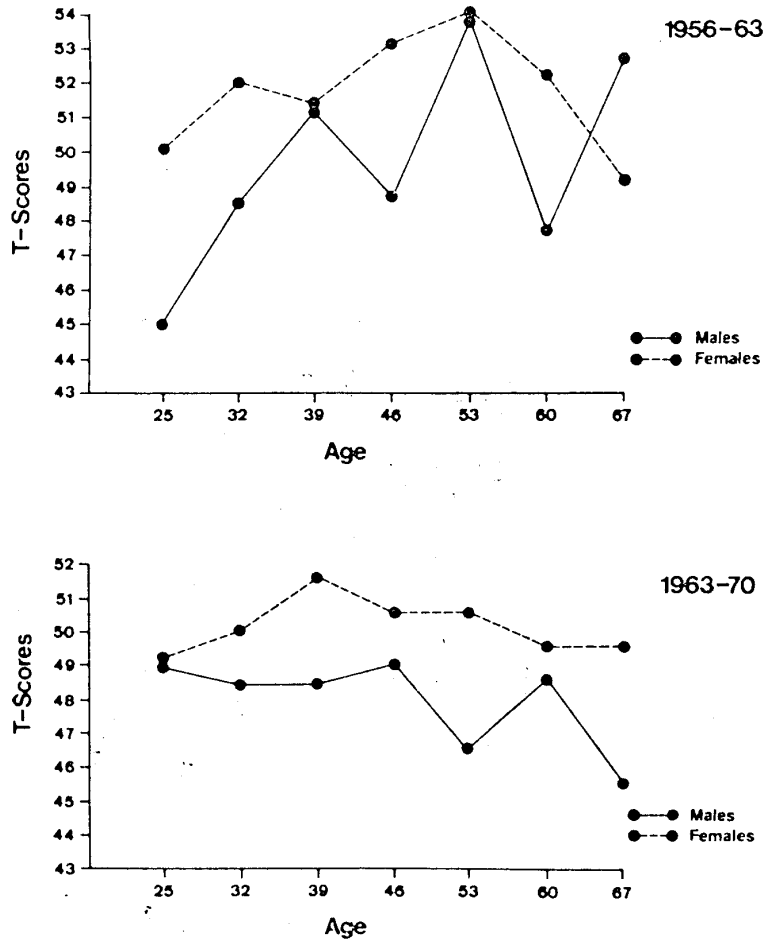


Fig. 3. Change over time in reported social responsibility by age and sex. (From: Schaie & Parham, (1974). Copyright by the American Psychological Association. Reprinted by permission).

The second issue is that of external validity. That is, we have no way of telling whether observed changes would generalize to a different historical period. This issue is particularly important for the data set under consideration, because it covers the historical period that includes the initiation of aggressive affirmative action programs and consciousness

raising activities, and these may have resulted in career decisions and opportunities that are historically unique. I see no alternative here but to collect additional data. Such data, however, ought to be of two kinds. First, we need to know how a new cohort would respond to the interview materials at the same age as the individuals included in the prior study. But we would also want to assess a group of individuals who are now eleven years (time span in data set) past the age at which they might have been first interviewed as members of the target population. Only data of this kind would permit us to conclude whether or not the present data set can offer a basis for generalization.

Let me add another observation on data sets which include many more observations on individual participants than there are participants (sometimes referred to as the "negative degrees of freedom" problem). Because of the difficulty of obtaining reliable estimates of changes over time on complex variables, it is generally desirable to collapse data into more limited scales which, by containing a number of items, might achieve more desirable metric properties. One way to proceed here would be to eliminate variables that show little variance and to combine others into scales. An appropriate approach would include either categorical factor analysis or some other clustering procedure. If there was sufficient reduction in the number of variables it might then be possible to apply methods of structural analysis to test alternate models suggested by the data set, by means of formal methods of linear structural analysis (e.g., Jöreskog & Sörbom, 1978).

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