MONITORING AND INTERPRETING TURNING POINTS IN EDUCATIONAL INDICATORS

Abbott L. Ferriss, Emory University

In 1965, when the 125th annual meeting of the American Statistical Association was held in Philadelphia, Wilbert E. Moore and Eleanor Bernert Sheldon presented a paper entitled, "Monitoring Social Change: A Conceptual and Programmatic Statement" (8). In it they called for contributions to understanding "large-scale structural change in American society" and the collection and analysis of new and better data. Their focus on social change, "large-scale structural transformations", was to monitor indicators of "structural alternations" so as to use "such information for entry into the system, to alter the magnitudes, speed, or even direction of change in terms of explicit, normative criteria" (p. 144). The scheme they presented at that meeting eventually grew into the volume, Indicators of Social Change (11). Since then a kind of "social indicators movement" has arisen. The program of the current meeting of the A.S.A. schedules at least five sessions explicitly on social indicators, and the N.S.F. program of research support for social indicators exceeds two million dollars (FY71).

I wish to point out the critical role played by turning points in the process of monitoring the social systems, with particular reference to education, and to illustrate some of the problems of interpreting current turning points and comment on the importance of the monitorship function.

The Monitorship Function

In the literature on social indicators (1) (10), it appears that insufficient attention is devoted to the monitorship function called for by Moore and Sheldon. There is concern with finding appropriate statistical indicators, with tracing the interrelationship of an indicator through a social system, with developing models that will help to predict the future, but insufficient attention to identifying critical turning points in available statistical indices and tracing out the implications of such changes. Perhaps, in the field of education, what passes for monitorship comes with the announcement each year of the results of a new periodic survey, showing that the new data reveals a percentage increase or decrease over the last year, with reference only to the evidence of the survey being reported. Monitorship should be more than this.

What is needed to monitor a social system? Statistical time series of characteristics of the system are the first requirement. For maximum clarity in interpretation, these time series should be the elements in a theoretical model that is capable of expressing cause-effect or, as a minimum, associated sequences of sufficient reliability to predict a future state of the system. The evidence of past trends in the major statistical elements of the system should be at hand. Predictions of trends in the major statistical elements, also, are quite useful, in that they serve to foretell possible turning points.

The monitorship function, itself, consists of placing the new observation of the current year in its context with the past. Has a turning point occurred? Does the new observation deviate markedly from past trends? If so, does the change have significant consequence for the future, particularly for other normatively significant elements in the system?

In presenting such implications the monitor must draw information, not merely from the "new" datum of the current survey, but he must incorporate knowledge from the entire range of studies that have attempted to understand the phenomena of the system. Parenthetically, it is for the latter reason that those who conduct and report periodic surveys are not always the best interpreters and monitors of the periodic statistics that they generate. Reports of new data from periodic surveys seldom incorporate data from other studies.

If the monitor judges that a turning point indicates changes in other significant elements of the system, then the consequences of the change must be specified. The monitorship function has been completed when these consequences are identified and the information placed in the hands of decision makers whose decisions bear upon the phenomena under study.

Educational Indicators

The field of education can boast that it displays a long list of statistical time series (6). Not all, however, are theoretically nor even normatively significant. For example, the vast arrays of financial statistics cannot be interlocked with changes in the amount of learning that has taken place. Models also have been constructed of various features of the educational system, and some of these models, even, enable prediction, such as predictions of enrollment, of teachers required, and of degrees granted. Unfortunately, not all of the normatively relevant observations in education have been periodically and systemat-

ically made: witness the lack of time series on the quality of elementary and secondary school learning, on a measure of education other than the time devoted to it, on indicators of the dysfunctional results of the secondary school's emphasis upon achievement among those who lack an achievement orientation, the lack of a measure of quality by field in post-baccalaureate education, and others too numerous to mention. Even with these deficiencies, however, the educational system displays a greater wealth of time series than other institutional areas, except, of course, the economic area.

The potential consumers of the results of monitoring the educational system include all those who make decisions relative to educational policies or programs. Educational staffs, boards of control, the legislators, the departments of education, and the associations of teachers, etc., in short, all who hold a stake in the educational process should be informed of turning points in educational indicators, and alerted to the implications of the change.

Educational indicators are statistical time series that reflect the state of some feature of the educational system. While educational indicators respond to major events that affect the social system, such as wars, major depressions or prolonged periods of prosperity, they are not strictly cyclical. Many series display a long-term growth that is characteristic of our expanding population and economy. Major structural changes of the society have direct effect upon educational indicators. One of these is the shift from farming to industrial and commercial occupations, and the continuing transition to service occupations; these structural transformations have influenced the content of the curriculum and the specialization of the educational output. National policies concerning education have unquestioned bearing upon the educational system: the decision to support or to limit the support of graduate education, the Supreme Court decision ordering school desegregation, the support of pre-school educational centers --these and many other national policies have influenced trends in various educational indicators.

I would like to illustrate several turning points in educational indicators and suggest interpretations and implications in keeping with the monitorship function, outlined above.

Example 1: Continuation Ratio, 10th to 11th Grade

The ratio of school enrollment in successive grades provides an indicator of school retention (6, pp. 29-44). Over the nearly sixty-year span shown in Figure 1, the continuation ratio of 10th graders presents almost a sinewave. The secular trend, however, has been strongly upward despite the numerous turning points. The two major World Wars and the Korean Conflict have been distinctly negative influences. From inspection it appears that some economic depressions adversely affect continuation in school while others do not. Partial correlation coefficients, however, clarify these relationships. With the long-term trend held constant, the continuation ratio is positively associated with unemployment (.45), negatively associated with the per capita gross national product (-.36), and, of course, negatively associated with the expansion of military forces (-.26). That dropouts are more likely to occur during prosperous periods has also been observed by Beverly Duncan (5, p. 128). The effect of military expansion might be interpreted as entrance into the civilian labor force as well as joining the Armed Forces. In any event, these two factors and the linear trend explain 88 percent of the variance in the 10th to 11th grade continuation ratio. While other influences undoubtedly stimulate retention or affect dropouts, a more elaborate model would be required along with additional time series to adequately explain the turning points in school continuation and enable their prediction.

Example 2: Ratio, Baccalaureates to High School Graduates Four Years Earlier

The ratio of baccalaureates to high school graduates four years earlier (6, pp. 107-112) presents several turning points of interest in the study of major events, societal trends and policies affecting the educational system. The ratio itself is an imprecise measure, since its assumption is not uniformly met across time: the assumption that high school graduates uniformly proceed immediately to college and graduate four years later with a bachelor's degree. This defect in the statistic is illustrated by the artifically rapid increase after World War II, reaching its peak in 1950, as a mass of veterans, delayed in their education, graduated. The turning point about 1954 signifies a return of the system to more normal student input-output relationship.

Before 1895 baccalaureate degrees were

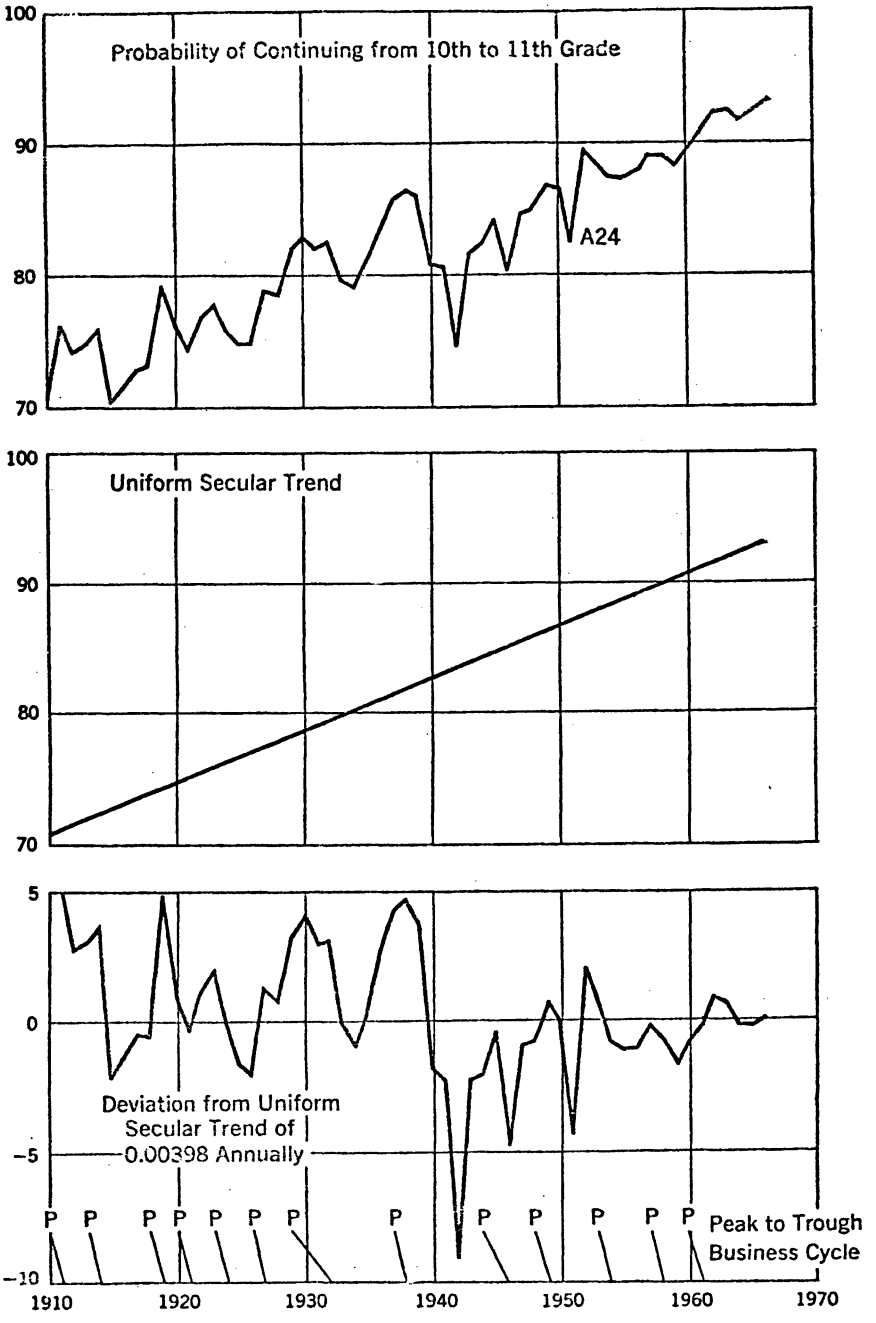

FIGURE 1. Tenth to Eleventh Grade Continuation Ratio, 1910-1966

Source: (6. p. 30)

granted to approximately half of the high school graduates four years earlier. The ratio dropped after 1895 because of the increasing rate of attendance in secondary schools. The need for vocationally trained employees that came as a result of industrialization following the Civil War, finally, in the 1890's, reached secondary education. The number of high school graduates, expressed as a percent of the population 17 years of age, began to increase. However, they did not continue to college and bachelor's degrees four years later did not then begin to increase. The secondary school was "transformed", as Martin Trow has reminded us (9), into a vocational system, not for the elite few as it had been, but for the masses. The turning point in this ratio, then, in the mid-1890's set in motion a trend that did not reach its trough -- and hence its upturn -- until after World War I. Industrial and commercial expansion during and after World War I created a demand for college trained engineers, accountants, business executives, and the like. Educational policies responded and a mild upturn in

the ratio was the result. As the Depression of the 1930's came on, per capita baccalaureate production at first faltered and then, as the prospects of an international conflict became apparent about 1937, began to increase and peaked in 1940. With World War II college and universities produced far fewer graduates. Under these conditions, the ratio declined and bottomed-out about 1947.

The ratio appears to have reached a modest level of 28 per hundred high school graduates four years earlier. Projections suggest that the ratio will remain at this level in the immediate future: no turning point is anticipated.

Aside from the adjustment of the educational system to World War II, the educational policies that have brought about these major turning points in this educational indicator were the consequence of industrial, economic, and social changes of the last half of the last century, changes that created a demand for vocational education. The vast increase in the proportion of clerical and kindred workers experienced by the occupational structure verifies the change. American secondary education has now returned to the need for a college preparatory system of education and, as Trow says, continues to contend with a number of policy issues and problems that hinge upon this change.

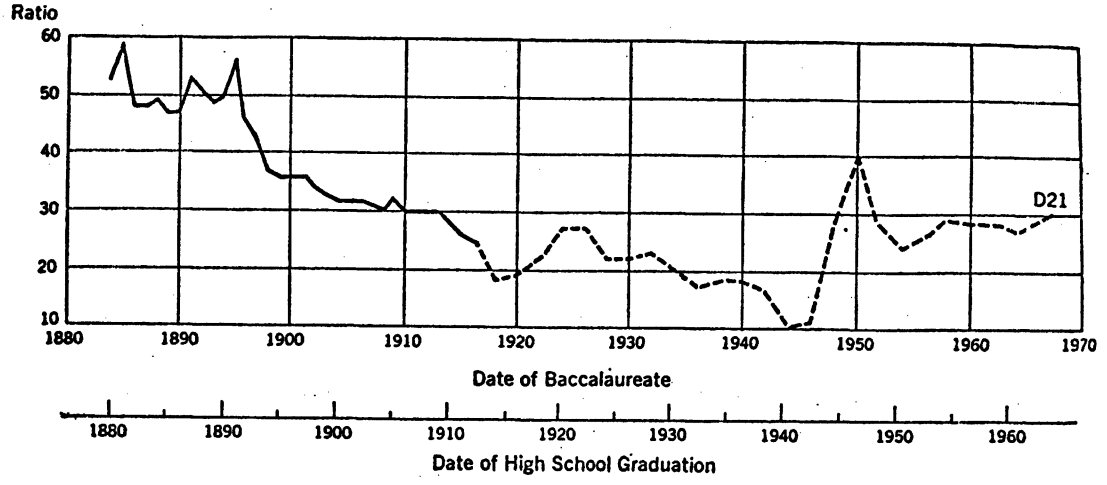

FIGURE 2. Ratio, Baccalaureates to 100 High School Graduates Four Years Earlier, 1884-1967

Source: (6, p. 110)

Example 3: School Enrollment of 18-19 Year Old Males

School enrollment is the subject of a supplement to the October Current Population Survey (2). The percent of 18 and 19 year olds enrolled in school by sex is shown in Figure 3. The decline in enrollment of this age group of males bears significantly upon future college enrollment and the future educational attainment of the labor force. In two years, 1968 to 1970, the percent of white 18-19 year old males enrolled in school declined 5.5 percentage points while non-white males, 18-19, declined 9.6 percentage points.

To investigate the influencing factors, the analyst would require information in time series on the number of 18 and 19 year olds drafted into military service, by month, the marriage rate of 18 and 19 year olds, the number of 18 and 19 year olds by sex in the labor force, unemployed, seeking work, and so forth, the number of 18 and 19 year olds by sex receiving unemployment benefits, and other such indicators.

Only an approximate assessment of these influences is possible. Between October 1969 and October 1971, the number of 18 and 19 year old males enrolled in school declined by approximately 53,000. In 1968, 60.4 percent were in school and an estimated 15.6 percent were in the Armed Forces. The next year the percent in the Armed Forces dropped to 12 percent and the next year to below 11 percent. Deferments from Selective Service to attend school have dropped about 1 million since 1968 (4). If Selective Service policies prior to the adoption in December 1970 of the lottery system encouraged school attendance (youth enrolling to avoid military service), then the lottery system and the reduced size of recent draft calls have tended to discourage school attendance.

Meanwhile, the labor force participation

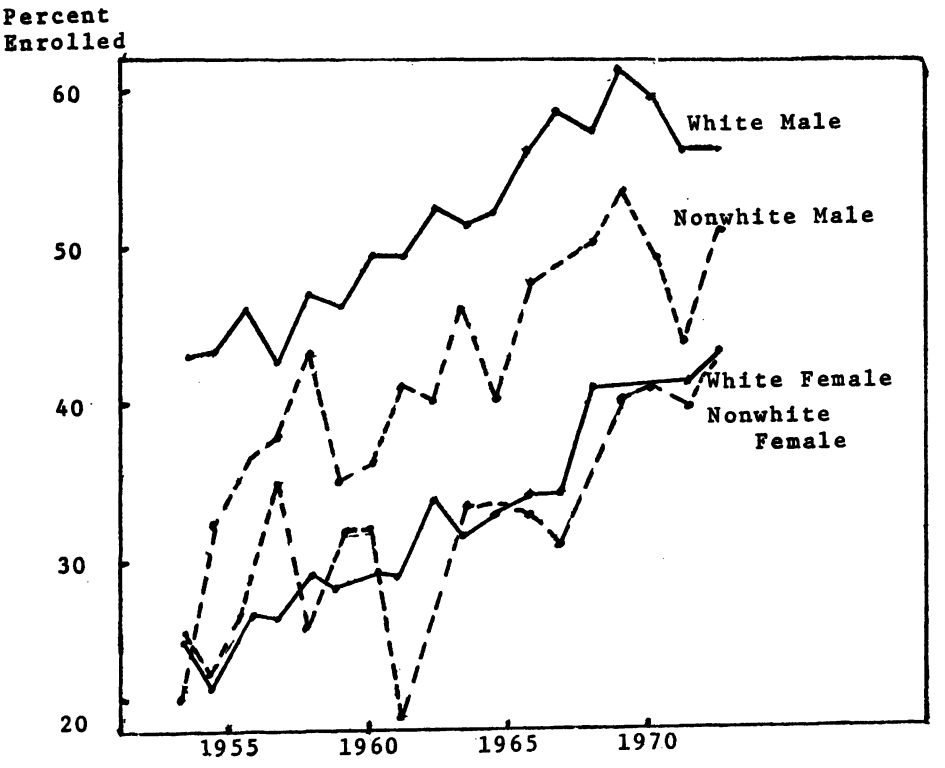

FIGURE 3. Percent of the Population 18 and 19 Years of Age Enrolled in School, 1954 - 1971 (October), by Sex and Color

Source: (7, p.23) (2)

rate (of 18 and 19 year old males) has remained fairly constant at 70 percent. The labor force participation rates of the enrolled 18-19 year old males and the rates of the non-enrolled males both dropped from 1969 to 1970. During 1971 the unemployment rate averaged 15 percent.

In sum, the percent enrolled in school is declining. The percent in the Armed Forces is declining. The labor force participation rate is constant, and the unemployment rate is high.

Other influences may be discouraging school attendance. There may be a negative reaction among youth to the achievement orientation within education. There also may be a reaction against the "Establishment" that is manifested in rejecting school attendance. There may be other interpretations.

Identifying the underlying cause is perhaps the most important function of monitoring social indicators, but estimating the future consequences of the turning of an indicator, also, is important. In this case it is quite obvious that a decline in educational attainment of the cohort at a future age will take place. The increments in enrollment of the 18-19 year olds are followed two years later by increments in the educational attainment of 20-21 year olds, as Table 1 illustrates. This educational deficiency is likely to follow this cohort through its life cycle.

TABLE 1. Incremental Change in School Enrollment and Educational Attainment For Cohorts

Year of Enrollment Increment	Increment in Percent Enrollment of 18-19 Year Old Males	Increment in Percent with at least 1 Year of College of 20-21 Year Olds (Two Years Later)
1966 to 1967	-1.5	-1.3
1967 to 1968	+1.4	+1.8
1968 to 1969	-1.0	-2.1
1969 to 1970	-5.0	?

Source: (2) and (3)

Concluding Remarks

The turning points in three educational indicators that were examined have illustrated the process of interpretation of educational indicators. The multivariate analysis of the 10th to 11th grade continuation ratio produced a definitive interpretation but it would be improved through the addition of predictors. The socio-historical mode of interpretation of the ratio of baccalaureates to high school graduates four years earlier rests upon the validity of a number of logical and factual assumptions. The analysis undoubtedly could be augmented by additional time series that would support the interpretation. Finally, the drop in the percent enrolled of 18-19 year old males can only partially be explained by the change in Selective Service policies. The search for more substantial explanations has not thus far been rewarding.

This paper has not attempted to elaborate upon the models implied in the examples presented. Neither has it attempted to review problems of forecasting turning points in education. Both topics, however, are important steps in developing adequate interpretations. Finally, monitoring educational indicators is for the purpose of informing decision makers, and nothing has been said as to how decision makers in education are to be identified and the signals implied by turning points relayed to them. There is, however, a tested method for accomplishing this task.

Continuous monitorship of educational indicators, conducted in the manner described above, would facilitate the development of policy and programs to adjust to disfunctional educational trends. Interpreting turning points through identifying the directing forces that undergird the change would lead directly to knowledge of the cause-effect sequences that affect the educational system. Many educational indicators are available. Studies of interaction among significant elements within the educational system have been and continue to be made. The time now has come when systematic monitorship of the educational system may produce real contributions to policy and program development.

REFERENCES

(1) Agocs, Carol, "Social Indicators: Selected Readings," The Annals of the American Academy of Political and Social Sciences, March, 1970, 127-132.

(2) Census, U.S. Bureau of, School Enrollment, Series P-20, Washington: Government Printing Office, for dates indicated.

(3) Census, U.S. Bureau of, Educational Attainment, Series P-20, Washington: Government Printing Office, for dates indicated.

(4) Director, Selective Service System, Semiannual Report of the Director of Selective Service, Washington, D.C.: U.S. Government Printing Office, 1971.

(5) Duncan, Beverly, "Dropouts and the Unemployed," The Journal of Political Economy, LXXIII (April 1965): 121-134.

(6) Ferriss, Abbott L., Indicators of Trends in American Education, New York: The Russell Sage Foundation, 1969.

(7) ———, Indicators of Trends in the Status of American Women, New York: The Russell Sage Foundation, 1971.

(8) Moore, Wilbert E., and Eleanor Bernert Sheldon, "Monitoring Social Change: A Conceptual and Programmatic Statement," in Proceedings of the Social Statistics Section, The American Statistical Association, Washington: American Statistical Association, 1965, pp. 144-149.

(9) Sheldon, Eleanor Bernert, and Wilbert E. Moore, Indicators of Social Change: Concepts and Measurements, New York: The Russell Sage Foundation. 1968.

(10) Trow, Martin, "The Second Transformation of American Secondary Education," International Journal of Comparative Sociology, II, 1961, 144-166.

(11) Wilcox, Leslie D., Ralph M. Brooks, George M. Beal, and Gerald E. Klonglan "Social Indicators: Recent Trends and Selected Bibliography," Sociological Inquiry, 42 (1) (1972): 37-50