Professor Dudley Seers
Institute of Development Studies
University of Sussex
Falmer, Brighton, Sussex.
BN1 9RE

AN INTEGRATED SYSTEM OF TABLES AND INDICATORS

FOR SOCIAL AND DEMOGRAPHIC ANALYSIS AND PLANNING[1]

During the past few years, it has become increasingly
obvious that economic growth does not in itself solve
social problems, and there has been a worldwide shift
from economic to social concerns. One consequence has
been a boom in 'social indicators'; another a search
for an integrated system of social and demographic statistics
which could provide a framework for the social aspects of
planning and thus supplement the system of national income
accounting.[2]

This search can be seen, in fact, as an attempt to do for
statistics in the social field what national income accounting
has done for economic statistics. That system has made it
possible for us to trace the connections between output,

---

[1]   An earlier draft of this paper was first presented to a
conference on statistical policy at the Institute of
Development Studies in the summer of 1975.   I am grateful
for comments from Ms. Nancy Baster, Mr. John Blacker,
Professor A.K.Sen and Professor Richard Stone.

[2]   The international standard is the "System of National
Accounts" (United Nations, 1968), known as the SNA.

consumption and investment, factor incomes, public
finance, foreign trade, etc. Its additive possibilities
make it feasible to pose policy choices in terms of their
respective quantitive effects (at least in the short run
and in global terms), eg between policies yielding increments
in private consumption and public. Practically all official
economic indicators can be housed in it - index numbers of
industrial production, retail sales, export volume, etc.
So monitoring the consequences of policies is straightforward.
With its comprehensiveness and enforced consistency, national
income accounting has stimulated an enormous proliferation
of economic statistics, and facilitated both academic research
and government policymaking. In fact, one could say
that it has been a major influence in the development
of economics and in strengthening this discipline relative
to the other social sciences.

Clearly a coherent statistical system can have a great
impact.[3] An important attempt at the systemisation of
social statistics is "Towards a System of Social and
Demographic Statistics", (United Nations, 1975) by Richard
Stone (who was of course also one of the principal architects
of the SNA). The SSDS, as it is known for short, encompasses
a wide range of statistical material, and although suggestions
are made for the standardisation of definitions, to call

---

[3] This impact is not necessarily always beneficial: the
promotion of the SNA has led in many countries to the
production of accounts of very poor quality, which are
arranged in ways not really convenient, in the local context
for either analysis or policy, especially when long-term
structural changes are on the agenda.

the end-product a "system" is stretching the meaning of
the word somewhat.

"Social and demographic statistics" cover such a hetero-
geneous field that the search for a completely comprehensive
system is perhaps a vain one.   Nevertheless, the advantages
of systemisation would be so great that it is worth considering
whether a stronger and more integrated framework than SSDS
could be constructed for at least part of this field.   One
really needs for social analysis and the social aspects of
planning what the SNA provides for economic statistics:-

   (i)   A system of tables that bring together leading

   variables in a way that permits the effects of exogenous

   changes, including the changes in policies,to be

   quantified and compared ex ante or ex post in

   relation to specified objectives.

   (ii) A family of indicators that slot into this

   framework permitting intertemporal (and international)

   comparisons.

Although the SSDS does not really meet these needs, Richard
Stone's work provides a clue on how to do so.   I shall
follow this clue here and suggest a set of tables and an
associated family of social indicators.   These could be
developed into a core system within the SSDS.

In "Towards an SSDS" (5.37 - 5.42), Stone discusses the
"decomposition of life expectancies" into the length of time

someone   can expect to spend in school, to be economically

active, etc.   He has, in fact, done this elsewhere for

what he calls the "active sequence", by using social

matrices to follow a cohort through a sequence of "states".

being diminished as it progresses in two ways

by mortality or by movement into a subsequent state.[4]

Table 1 shows his results.   A point to note about this

table is that it brings together various important different

social statistics.   The total expectation of life at birth

is of course itself a social indicator in the field of

health, reflecting nutrition, medical services, etc.   The

expected number of years at school can be compared with the

legal requirement at that time (10 years) and with similar

figures for other years, throwing light on the utilisation

of the educational system. The period in 'further education'

has an obvious significance, as does that in 'economic

activity'.

(i)   A system of additive tables

Table 1 is not sufficiently detailed to accommodate many

areas of social concern.   Economic activity in particular

is a very broad category, but one could in principle show,

for example, how many of those years a new-born child

could expect to spend unemployed, granted the unemployment

rates of the year concerned.   We could further decompose

the "active sequence" to something like Table 2.

---

[4]   The theory of multiple decrement tables, with some examples
and further references is discussed in "The Methods and Materials of
Demography"(US Bureau of the Census, 1973), Vol. II pp 455-7.

A table like this would show how long a period the average
person would expect to spend in undesirable states such as
incapacitation, prison, unemployment or unpensioned
retirement, on current (or recent) experience. An indicator
that showed the expected total time to be spent in any
of the undesirable states, as a proportion of life
expectancy, would not be meaningless if one wanted a single
welfare index.

This would be a way of bringing together a number of social
statistics in an additive framework, as SNA does for
economic variables, and of bringing out some connections
between them.   For example, to increase the number of
university students ,and thus raise the expected time that
a child born today will spend at a university, reduces his
or her expectation of unemployment.

This frame could not only be used for social analysis.
It could contain columns for the base-year and end-year of
a plan, showing how much a plan would change the time in
various states. This could also be articulated at places
with economic planning, both directly (the expected time in
employment in various occupations or industries would need
to be consistent with plans for output) and indirectly
(through government capital and current spending on the
social services.)

The table need not be confined to national averages.
Separate columns for males and females would obviously be

needed. Other divisions could of course be used, according to national structure and political concern, eg. for each race. It would also be possible to show separate figures for each area (eg urban/rural or by province or region), or for each socio-economic class, though these would raise problems of interpretation because of migration and social mobility. Finally one could show dispersions around such average expectations.[5]

Other life sequences can also be presented in the same way. One possibility would be a table showing the marital sequence (Table 3). Each of the states shown could be broken down according to whether there were 1, 2, 3, etc. dependent children, and the 'married' state could be sub-divided into 1st, 2nd, 3rd, etc. marriages. Since government policy would hardly take the items of this table as targets (except possibly, age at first marriage), it would be of use rather for analysis of trends and their implications, eg in areas such as fertility and housing demand.

A medical sequence could in principle be prepared showing the time a child born today would expect to be in hospital (at current hospitalisation rates), in other medical institutions, in special schools for the disabled, ill at home, or not sufficiently ill to prevent attendance at school or work. One could also draw up a table showing the

---

[5] I owe this point to Amartya Sen, who points out that such dispersions could be woven into the averages by various systems of weighting.

expected duration of illness from various causes. We
could move as far as the statistics allowed along the path
from the 'input' variables which predominate in Table 1,
towards 'outcome' variables, showing the state of a person's
well-being. Within this general framework, many other
social variables could be handled - eg the number of
years a new born child could expect to be undernourished
or illiterate or badly housed in some sense.

Of course, since states like unemployment or disablement
are intermittent [6], the total unemployment of the average
lifetime could not be easily estimated from social matrices,
and to base a system on such matrices would inhibit its
development. . But Stone's matrices are not
essential for decomposing a life sequence. This could
be done using age-specific rates for the states concerned.
$\overset{o}{X}$, the at-birth expected duration in a certain state X,
such as unemployment, can be expressed as a product of
the at-birth expectation of life during the $(n + 1)^{th}$
year, $_n\overset{e}{E}$ and the incidence of that state in that year,
$_nx$.

Thus $\overset{o}{X} = \Sigma \left(_n\overset{e}{E} . _nx \right)$ (1)

The first factor, at-birth expectation of life during any
particular year, can be taken from a life table. Such a
table is available in almost every country: it may be

---

[6] It could be argued, in fact, that one of the weaknesses
of lifetime aggregations is that they obscure the patterns
(eg how many times a person was unemployed).

slightly out-of-date, but the incidence of mortality is so stable that this will rarely matter much.

The main practical difficulty would be to estimate the age-specific incidences. Ages are usually available in the basic source (eg schools generally record the ages of their pupils), where these are not collected and tabulated nationally, it is not beyond the bounds of possibility to do so. One should not underestimate the difficulties of reconciling data from different sources and using them to construct a comprehensive system of this kind,[7] but it ought not to be impossible in countries with well-developed statistical systems.

A more fundamental problem arises because concepts like "unemployed", "retired", etc. have different meansings from country to country (and even in the same country over a period of time). It would not be appropriate to go into such difficulties here, but two points can be made . In the first place this problem arises in any

---

[7] Because of the inadequate tabulation of ages, Richard Stone had to classify the school population by years enrolled, which gave rise to considerable problems of adjustment, but would not have caused great inaccuracy, because the age of school entry is legally specified in England and Wales.

statistical system, especially in the social field.
Secondly, provided no basic changes occur in the socio-
economic structure, intertemporal comparisons will not be
meaningless: the problem would arise primarily in
international comparisons, which would not be the main
purpose of such a system.

But both the need for statistical detail and the require-
ments of conceptual precision suggest that the system
would be more appropriate for industrial countries, includ-
ing the Soviet Union and Eastern Europe. However, in
most other countries, it could be considered, because of
its flexibility, at least a frame for the development of
social statistics.

It is obvious that this framework can absorb a good many
types of statistical material. Mortality rates fit it
easily because of the use of life tables. It readily
accommodates both longitudinal surveys and data from time
budgets. The former can be used to study associations
between states.: the latter would enable time periods to
be analysed in greater detail. When we say that some male
was in employment for a certain number of years, we mean
that this was typically the way he spent normal working
hours. In addition, of course, he slept, did domestic
chores, travelled to and from work, enjoyed leisure, etc.
Table 2 above could in principle be expressed in hours,
instead of years, and show periods spent on activities
outside the normal hours of school and adult work.

It is possible to accommodate also some other types of data,
by expressing them as life expectancies. Thus occurrences
such as accidents or arrests or having one's house burgled,
can be shown as the number expected in a lifetime.
Subjective data, such as those showing degree of satisfaction,
can be similarly converted. Expected lifetime earnings can
be discounted (as is done in deriving measures for the
benefits of education) and compared for different sexes
and races. To express some types of data in this way
would, however, be rather artificial, and statistics on
structural characteristics (for example, ownership of
land and other property, or the stock of social capital)
would not fit into the system at all.

The suitability of the system for particular countries
raises also political issues. Any quantitative framework
for analysis and planning implies a political philosophy.[8]
The basic assumption behind official use of the system
proposed here would be that the length and pattern of
life of a human being is in some degree the responsibility
of the government of the country where he or she lives.
The preparation of variants showing data separately for (eg)
different races, would carry a tacit assumption that if
some section of the population was significantly worse
off than the national average in some respect, this would

---

[8] "The Political Economy of National Accounting" by
Dudley Seers in Essays in Honour of Hans Singer (Macmillan,
1976). The SNA was developed to meet the needs of Keynesian
economics, especially global demand analysis and management,
at the root of which lies a liberal-conservative view of the
role of the state.

justify special corrective policies. A social development
plan based on such a system would convey the powerful
message that the official intention was to achieve specific
improvements in the quality of life. The usefulness of the
system to an official statistical office depends therefore
largely on the strength of government commitment to solving
social problems.

However, we must not fall into the common trap of assuming that
statistics are only produced for governments. The composition
of the human lifespan is certainly a proper object of
analysis by academic social scientists. It is true that
many social concerns are excluded from Table 2 and could
not be covered by any system because they do not lend
themselves to measurement - eg participation in decision-
making. In addition, some important social experiences,
although in a degree measurable could not easily be expressed
in life expectancies - eg corruption, police brutality and
bureaucratic power - even if data on them were available.
In countries where the legitimacy of the government is in
question a social critic might consider it a weakness of
this statistical framework that it focussed attention on
the social service aspects of state-individual relations.
However, the fact that it provides an articulated frame for
so many types of social relevant data, which could be broken
down to fit particular social models, would make is useful
for researchers, including those with a fundamentally
critical philosophy.

(ii) A family of new social indicators slotting

into the system

Let us turn to the uses of the system for those monitoring
social progress (eg towards plan targets) or social
scientists carrying out dynamic analyses.

It is awkward that the great battery of existing social
statistics, such as rates of school enrolment, cannot be
related directly to the durations in Tables 1 or 2.
This link could, however, be forged. It would be possible
to construct a family of indicators that would form part
of this system, and permit changes in components of life
expectancy to be analysed.

One crude way of doing this would be to treat each component
as a fraction of the total life expectancy. Thus dividing
equation (1) by $\sum_n \overset{o}{E}$ we get

$$\overset{o}{x} / \sum_n \overset{o}{E} = \sum \left(_n\overset{o}{E} \cdot {_n}x \right) / \sum_{an} \overset{o}{E} \qquad \ldots\ldots\ldots\ldots (2)$$

The right-hand side of equation (2) can be looked on as an
average of age-specific rates, each weighted by the
expectation of life for the various ages.   An indicator
of this kind would not, however, be very useful. Applied
to school enrolment, for example, it would cover adult ages,
for which of course the enrolment rates are zero.   A more
useful index could be constructed by confining both the
numerator and the denominator to the school attendance

years - say 5 to 15. The indicator for school enrolment
(s) between these ages becomes:-

$$ {}_5\Sigma_{15} \left({}_n\overset{o}{E} \cdot {}_n a \right) \Big/ {}_5\Sigma_{15} \cdot {}_n\overset{o}{E} \qquad \ldots\ldots\ldots (2A) $$

This will not be very different from what is the conventional
rate of enrolment, obtained by simply dividing all those
enrolled during the ages of compulsory school attendance
by the total in those ages. The coefficient proposed simply
has artificial weights - in effect the survivors at each
age in a stationary population, [9] instead of the actual
population at that age.

Other social coefficients can be built up in the same way.
We can partition the average life expectation at birth, $\overset{o}{E}$,
into segments of a type ${}_m\overset{o}{E}_n$,
the expectation (at birth) of life between the mth and
the nth birthdays, and then divide each of these in turn
into whatever compartments we want.

Table 1 ignores such age ranges, but we could rearrange
that table or Table 2, by breaking the expectation of
life into age groups which are analytically useful, the

---

[9] The average at-birth expectation of life in a year
is the same as the average fraction of a birth cohort
surviving in that year.

most significant probably being pre-school (say 0-5),
school (5-15), working (15-60) and retirement (60-D),
with D standing for death.[10]

The decomposition of life expectancy at birth could then
proceed as in Table 4.   This would immediately yield
more interesting indicators.   The expectation of surviving
the first year is of course an indicator of intrinsic
importance, reflecting infant mortality.   In addition,
rearrangement of these statistics yields other basic socio-
economic ratios and data - viz:-

Child mortality indicator	$4 - {}_{1}\overset{o}{E}_{5}$
School enrolment rate	${}_{5}\overset{o}{S}_{15} \div {}_{5}\overset{o}{E}_{15}$
Labour force participation rate	$\left({}_{15}\overset{o}{M}_{60} + {}_{15}\overset{o}{U}_{60}\right) \div {}_{15}\overset{o}{E}_{60}$
Unemployment rate	${}_{15}\overset{o}{U}_{60} \div \left({}_{15}\overset{o}{M}_{60} + {}_{15}\overset{o}{U}_{60}\right)$
Dependency indicator	$\left({}_{0}\overset{o}{E}_{5} + {}_{5}\overset{o}{E}_{15} + {}_{60}\overset{o}{N}_{D}\right) \div \left({}_{15}\overset{o}{M}_{60} + {}_{60}\overset{o}{M}_{D}\right)$

---

[10]   There is one doubtful implication for social policy which
should be mentioned. The segmentation of the life span suggests
that some activities are only appropriate to certain age groups.
While this is certainly broadly true, the current tendency,
especially in education, is to pay less attention to such
conventions.   A table of this kind would need to be interpreted with
this in mind and perhaps eventually modified.

These rates are not quite the same as their conventional
counterparts because, as pointed out above, they would be
weighted by the numbers in a stationary population.   Such
age-standardised indicators may well, however, for many
purposes be somewhat more useful than simple averages,
weighted implicitly by the current age structure, because
they are unaffected by temporary fluctuations in this
structure, due (eg) to the postwar "baby boom".   The
advantages are particularly obvious when the state concerned
is associated with age, eg participation in the labour force.[11]
Such indicators would enable the influence of age on social
conditions to be eliminated, so that other influences could
be analysed directly.

We could take a step further and use the same life table
for each year of a time series to construct an index number.
This would show what changes have taken place in (eg) school
enrolment apart from those due to variations in fertility
and mortality. - Which makes a virtue of necessity, because
life tables are not available every year, nor is the most
recent usually very up-to-date.

---

[11]   Unemployment is also more common among young adults,
but a Keynesian would no doubt argue that total national
unemployment is determined by the level of global demand,
not by the age structure, which simply influences the way
in which the total is distributed.

Using E_b to show expectation of life in a base year, and E_t in the year concerned, then an index for school enrolment weighted by a base-year stationary population would be

$$_5\Sigma_{15} \left(\overset{o}{E_b} \cdot \mathcal{R}_t \right) \div \, _5\Sigma_{15} \left(\overset{e}{E_b} \cdot \, _2_b \right)$$

A family of socially significant index numbers of this type could be generated with consistent weighting systems for all sequences, analogous to the family of price-weighted series used in economic analysis. Thus we could show what changes in the marital composition of the population would have occurred (or would occur) in the absence of fluctuations in age structure, by expressing expected durations of marriage, divorce, etc. as proportions of the life expectation of those aged over (say) 15, and weighting throughout by the same stationary population. This can be done with any state for which age-specific data are or could be available, eg imprisonment, incapacitation, pensioned retirement, illiteracy, morbidity, etc. Such inded numbers could be used to monitor progress to social targets such as the elimination of illiteracy.

Similar comparisons could be made between parts of a population. Age-weighted indices can be worked out separately for each sex, region, race, social class, etc. using a national life table for all groups. They would show what the rates of school enrolment or

unemployment (eg) would be in white and black parts of a population if the age structures were the same.[12]

* * * * * * * *

To sum up, the integrating potential of this system is clear, and it would act as a powerful stimulus to the development of social statistics and research, as well as providing a much-needed core to the SSDS and facilitating social planning. Indicators of the type described would be unfamiliar, but the acceptance of weighted economic indicators by the public has made it easier to introduce other weighted indices, and in any case the system would be useful even if indicators were not developed along the lines suggested.

The resource costs of such a system, however, would be considerable, and in some countries it could only be a long-term goal. These benefits and costs could only be established by research, preferably by a national statistical office.

---

[12] Analogous points arise if we use this system for international comparisons. Even indicators weighted by either country's stationary population would be useful and in fact might for some purposes be slightly preferable to normal ones (because they would eliminate the consequences of differences in age composition). But it would be in principle possible to improve the analysis by applying an international standardised life table.

DS/BMT
26 May 1976

Table 1

The expectation of life at birth and the main components
of the active sequence: England and Wales, males, 1965-6

(Years)

Pre-school	4.5
School	11.4
Further education	1.0
Economic activity	47.2
Home & retirement	6.8
Total life expectancy	71.0

Source: "The fundamental matrix of the active sequence"
by Richard Stone in Input-output Techniques ed. A.Brady
and A.F.Carter (North Holland, 1972).   The estimates
reproduced here are those "partially adjusted" to achieve
consistency - the total expectation of life is slightly
higher than the Registrar-General's figure for the same
year , 68.5.)

Table 2

Dummy table for social analysis and planning.

The expectation of life at birth and its components.

(Years)

States

Pre-school

Primary school

Secondary school

Absence from school

Technical college, etc.

University

Incapacitation

Prison

Unemployment

Employment

Unpensioned retirement

Pensioned retirement

Total life expectancy

Table 3

Dummy table for social and demographic analysis.

The expectation of life at birth and its main
demographic components: male and female.   (Years)

	Males	Females	Both sexes
States			
Unmarried			
Married			
Divorced			
Widowed			
Total life expectancy			

Table 4

Dummy framework for social and demographic indicators.

The expectation of life at birth & its components by age groups.

(Years)

Ages	State	Expectancy of time in that state	Segment of life expectancy
0-5	Infancy	$_0\overset{o}{E}_1$	$_0\overset{o}{E}_5$
	Pre-school childhood	$_0\overset{o}{E}_5$	
5-15	Enrolled in school	$_5\overset{o}{S}_{15}$	$_5\overset{o}{E}_{15}$
	Other	$_5\overset{o}{O}_{15}$	
15-60	Studying, full-time	$_{15}\overset{o}{S}_{60}$	$_{15}\overset{o}{E}_{60}$
	Employment	$_{15}\overset{o}{M}_{60}$	
	Unemployment	$_{15}\overset{o}{U}_{60}$	
	Not studying or economically active	$_{15}\overset{o}{N}_{60}$	
60-D	Employment	$_{60}\overset{o}{M}_D$	$_{60}\overset{o}{E}_D$
	Retirement	$_{60}\overset{o}{R}_D$	
0-D			$_0\overset{o}{E}_D$