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TECHNIQUES FOR EVALUATING COMPLETENESS OF DEATH REPORTING

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FOREWORD

Knowing about the completeness of death reporting is essential for a number of reasons. First we need to know how complete death reporting is so that we can take remedial actions to improve the situation. Second, when we know how complete death reporting is, we can make the adjustments needed to permit us to use the death rates derived from death registration in such demographic tasks as projecting future populations. The age-and-sex-specific death rates used in these projections may be calculated when registered data on deaths and on the corresponding population by age and sex are available. Even when such data appear to be complete, however, they should not be accepted blindly when being used for such purposes as constructing a life table. Various possibilities exist for age misreporting in population data; such errors may be even more prevalent in age reporting of deaths, causing irregularities in the pattern of age-specific death rates that do not correspond to reality.

This paper presents a number of techniques for evaluating and adjusting data on deaths by age and sex for both missed events (incomplete coverage) and for misreporting of age. In addition to a description of the techniques, computer programs are described which may be used to carry out the required calculations. The few computer programs presented here are but a small portion of the extensive collection of such programs designed to facilitate demographic analysis developed by the U.S. Bureau of the Census and soon to be available in the publication POPULATION ANALYSIS WITH MICROCOMPUTERS and by the United Nations Population Division in MORTPAK.

A diskette which contains the Bureau of the Census spreadsheet programs PRECOA (Preston-Coale Technique) and GRBAL (Growth Balance Technique) is available on request from IIVRS. For information about obtaining the program BENHR (Bennett-Horiuchi Technique) write to the United Nations Population Division, United Nations, New York, NY 10017, U.S.A.

The views expressed in this report are those of the authors' and do not necessarily reflect those of the IIVRS.

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TECHNIQUES FOR EVALUATING COMPLETENESS OF DEATH REPORTING

by
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Center for International Research
U.S. Bureau of the Census, June 1993

Unfortunately, many populations, particularly in developing countries, still do not have a vital registration system that provides information of the required quality or completeness for calculating reliable demographic estimates. In some cases, however, an evaluation of the existing data will suggest that they are adequate if certain adjustments are made. Techniques for evaluating and adjusting such data are presented in this paper. In other cases, no vital registration data exist at all, or the available data are too sparse even for adjustment. Under such conditions, mortality must be estimated indirectly.

Various techniques have been developed to evaluate and correct information on deaths by sex and age in relation to information on population. Data on deaths may be provided not only in vital statistics registers, but also in surveys or censuses that include questions concerning deaths during a specific period of time, for example, deaths of any household members during the past year. If registered deaths can be evaluated and adjusted for errors, they can be used to obtain valuable information about the level and pattern of mortality.

Stable population theory

A number of the techniques for evaluating and adjusting data on mortality are based on the assumption that the population is "stable." A stable population is one in which there has been no migration, and neither fertility nor mortality has changed in the past (Dublin and Lotka, 1925; Lotka, 1934, 1937, and 1939; and United Nations, 1968).

A "stationary" population is a special kind of stable population in which not only have fertility and mortality not changed in the past but crude birth and death rates are equal to one another. As a result of these characteristics, combined with the absence of migration, the stationary population does not grow, and the age distribution does not change over time. Under these conditions, the number of persons alive at age x is equal to the annual number of deaths at ages x and above.

If the population whose completeness of death registration is to be evaluated were a stationary population, the evaluation procedure would be a simple one. If deaths were underregistered in such a population, then the sum of the annual number of registered deaths of age x and above would be smaller than the population at age x; and the ratio of the registered deaths to the population would represent the completeness of death registration. Although this is a useful concept to consider at the outset, real populations are not stationary and so alternatives must be sought.

Since the birth and death rates of a stable population are not necessarily equal (that is, a stable population does not have to be stationary), a stable population might be growing. Although the birth and death rates do not change over time, the two rates are not necessarily at the same level. In this sense, at least some real populations are close to being stable and thus correspond to the situation implicit in some of the evaluation techniques.

PRESTON-COALE TECHNIQUE

One of the techniques to estimate the completeness of registered deaths in relation to population data was developed by Preston and Coale. It requires that information be available on the population growth rate and on both deaths and population by 5-year age groups. It assumes that the population is stable; in other words, that mortality and fertility have not changed during the past and that there has been no migration.

In a stable population with a positive growth rate, the population at age x is greater than the sum of annual deaths for ages x and above. In other words, since the population is growing, the annual deaths over age x pertain to a smaller cohort of births than the cohort of births from which the population at age x has survived. Thus, if the actual population is assumed to be stable, an adjustment of registered deaths is needed so that the sum of deaths for age x and above can be compared to the population age x and above. Based on stable population theory, the adjustment of deaths is made by multiplying deaths by an exponential factor (derived using the population's growth rate and the mean age of the age group). Then, the deaths are cumulated and taken as an estimate of the population at a certain age. This estimate is compared with the actual population at the same age. The ratio of the estimated to the actual population represents the completeness of registered deaths (United Nations, 1983).

While the technique is useful in particular situations, the implicit assumptions about constant mortality and fertility, as well as the absence of migration, may depart considerably from actual conditions in many populations. In practically all countries, mortality has begun to decline and in most of them fertility has also started to change. International migration has often become important as well. Furthermore, the technique requires a knowledge of the growth rate, which has an important role and impact in estimating the population from registered deaths. Finally, results of the technique will be biased if age misreporting of deaths is different from age misreporting of population (see further aspects of this technique in DESCRIPTION below. The calculation of this technique can be performed by using the Bureau of the Census spreadsheet PRECOA; see DOCUMENTATION below.

DESCRIPTION OF TECHNIQUE

Summary

This technique estimates the completeness of reporting of deaths in relation to information on population (United Nations, 1983). It compares a distribution of deaths with a corresponding population, by 5-year age groups. Formulas based on stable population theiry are applied to the available information on deaths to obtain estimated populations at certain ages. These population estimates are compared with the actual populations, and the differences are attributed to incompleteness of the information on deaths.

Data required

(1) Population by 5-year age groups.
(2) Deaths by 5-year age groups.
(3) A population growth rate.

Assumptions

(1) The population has stable characteristics: mortality and fertility were constant during the past, and there was no migration.
(2) Underenumeration of the population is the same in all age groups.
(3) Underenumeration of deaths is the same in all age groups.

Procedure

Complete the following steps to estimate the underenumeration of deaths:

(1) Calculate the required population growth rate based on population information from two censuses. The authors recommend (a) to use the population over age 10 or 15 Years to estmate the growth rate; or (b) to calculate growth rates for the population over ages 10, 15, ..., 60 years and then to select the median growth rate.

(2) An optional step is to adjust the population to the midpoint of the year to which the deaths refer. As the purpose is to evaluate the reporting of deaths in relation to the population to obtain age-specific mortality rates, this step usually is not needed.

(3) Based on the number of deaths and growth rates, estimate the population for all ages except the open-ended age group as:

$$EP_x = EP_{x+5} \cdot \exp(5r) + D_{x,x+4} \cdot \exp(2.5r)$$

Where:

EP is the estimated population at exact age x;
r is the growth rate; and
D represents the number deaths.

(4) For the open-ended age group x+, estimate the population at age x as:

$$EP_x = D_{x+} \ \exp\ [r.z_x]$$

Where the factor of the exponent z_x was estimated by the authors using correlation coefficients obtained from stable population based on the mortality from Coale-Demeny Model life tables and relating the factor z_x to the growth rate and to the exponential of the ratio of deaths for ages 45+ and 10+.

(5) Use the estimated populations at exact ages EP_x to estimate the population in 5-year age groups as:

$$EP_{x,x+4} = 2.5 \cdot [EP_x + EP_{x+5}$$

(6) Calculate the completeness of death reporting by dividing the estimated total population by the actual total population in the same ages:

$$C = EP/P$$

Where EP and P represent the total estimated and actual populations, respectively. These totals usually pertain to ages 5 years and over.

(7) To adjust the number of deaths for underreporting, divide the number of registered deaths by the factor C.

Suggestions

The ratios mentioned above in step (6) should be calculated for all age groups. When these ratios for different ages resemble a horizontal straight line, they support the results of the technique. The departure of these ratios from a horizontal straight line indicates either that the population is not stable or quasi-stable, or that there are serious errors in the data (such as differential underenumeration of population and registration of deaths by age). In this case, the results must be interpreted with caution.

Advantages

The technique provides an evaluation of the information on deaths based on only one census of population.

Limitations

The results will be affected by the following conditions:

(1) Different degrees of completeness in the population and death information by age.
(2) Strong age misreporting of both population and deaths.
(3) Lack of stable or quasi-stable condition of the population.
(4) Lack of a good estimate of the population growth rate.

Software

The Bureau of the Census has developed a spreadsheet to apply this technique to a distribution of deaths and population. The spreadsheet is called PRECOA and its documentation is given below.

DOCUMENTATION: PRECOA [a/]

This spreadsheet estimates the completeness of reporting of adult deaths using the Preston-Coale method.

Input Cell	Item
A!	Table number. Type both "Table" and the number.
A2	Country name and year (e.g., Burundi: 1975). Type over "COUNTRY: YEAR".
C8	Sex code: Male=1, Female-2, Both sexes-3.
C9	Coale Demeny region (used to get estimates in open ended age group).
C10	Average annual rate of population growth (percent).
C14 & C15	Ages to use for estimates of completeness. Enter the beginning age of the first and last 5-year age group to be used in estimating the mean implied completeness.
B26-B43	* Deaths by 5-year age groups.
C26-C43	* Population by 5-year age groups.

* For both deaths and population, enter the data up to and including the open-ended age group. The open-ended age group must be the same for both deaths and population and must be in the range 65+ to 85+. Enter 0 for the age groups after the open-ended age group. Labels will change automatically after calculation.

A47-F53	Sources of the input data.
A54	Filename, disk name, date, and initials. Type all of these into the same cell.

Results Cell	Item
A56-E86	Mean implied completeness and ratios of estimated to reported population by age.

Graphs Cell	Item
Graphl	Ratios of estimated to reported populations.

a/ U.S. Bureau of the Census, PAS:PRECOA, VER. 1.00, 14 Feb. 1992

Table
COUNTRY: YEAR
Preston-Coale Method
A Estimation Control Paramaters

Item	Value	Comments
Sex code	2	Male=1, Female=2, Both sexes=3
Region *	1	See below
Growth rate (percent)	2.87	
AGES TO USE FOR ESTIMATE **		
First age	5	
Last age	80	

* Coale-Demeny region to use in estimating open-ended age group.
1=West 2=North 3=East 4=South
** Initial age of 5-year age group

B Reported Deaths and Population by Age

Age	Deaths D(x,x+5)	Population N(x,x+5)
0-4	6,909	214,089
5-9	610	190,234
10-14	214	149,538
15-19	266	125,040
20-24	291	113,490
25-29	271	91,663
30-34	315	77,711
35-39	349	72,936
40-44	338	56,942
45-49	357	46,205
50-54	385	38,616
55-59	387	26,154
60-64	647	29,273
65-69	449	14,964
70-74	504	11,205
75-79	400	8,000
80-84	500	5,000
85+	460	3,000
Total	13,652	1,274,060

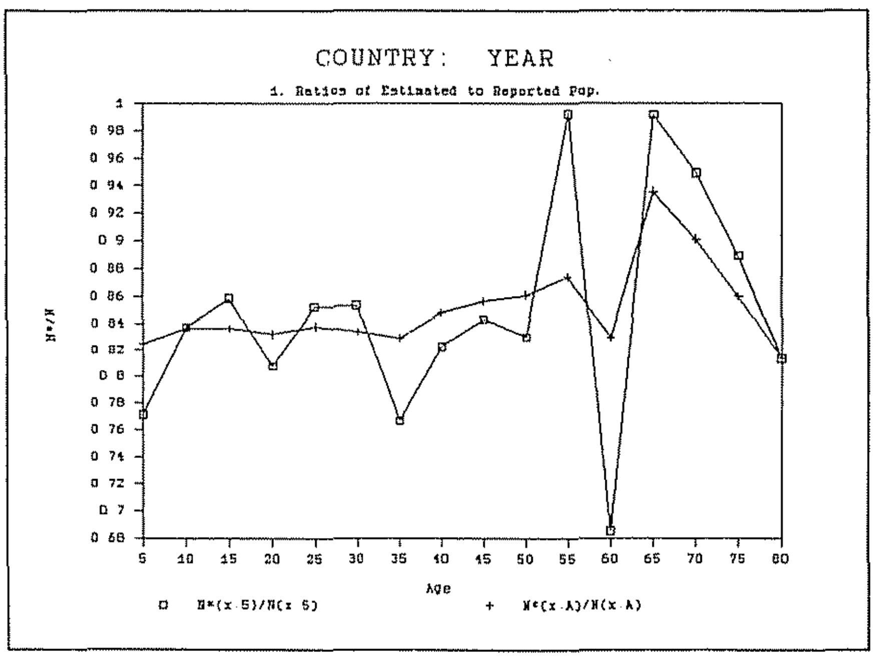
[FILENAME] [DISK NAME] [DATE] [INITIALS]

Table
COUNTRY: YEAR
Preston-Coale Method
C Mean Implied Completeness and Ratios of Estimated to Reported Population by Age: Female

Item and age, x	5-year ages N'(x,5)/ N(x,5)	Cumulative N'(x to A)/ N(x to A)
Mean implied completeness (percent) *	84.77	85.06
POPULATION RATIOS		
5	0.7713	0.8248
10	0.8372	0.8366
15	0.8584	0.8364
20	0.8079	0.8318
25	0.8523	0.8374
30	0.8534	0.8339
35	0.7666	0.8290
40	0.8225	0.8483
45	0.8432	0.8564
50	0.8293	0.8610
55	0.9921	0.8740
60	0.6857	0.8289
65	0.9916	0.9358
70	0.9494	0.9014
75	0.8890	0.8600
80	0.8134	0.8134

* Based on age groups from x=5 to x=80.
Note: Based on Coale-Demeny West factors

PRECOA: GRAPH1



GROWTH BALANCE TECHNIQUE

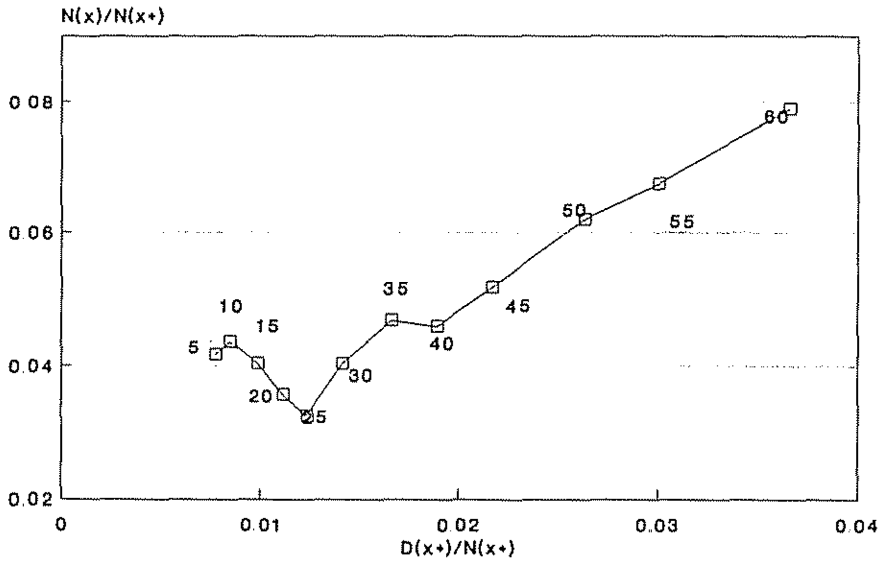
Another technique for evaluating the completeness of death registration in relation to population data was developed by Brass. Like the Preston-Coale technique, it is based on stable population theory and thus has the same assumptions of constant fertility and mortality and the absence of migration. However, the growth balance equation has an advantage over the previous technique in that it does not require knowledge of the population growth rate. In fact, if the population meets the assumptions and in addition has no age misreporting, the technique provides an estimate not only of the completeness of death registration but of the population growth rate as well (Brass, 1975; United Nations, 1983).

This technique is based on the basic observation that the birth rate of a population equals the growth rate plus the death rate; hence the name: "growth balance equation" method. For each group age x years and over (for example, 5 years and over, 10 years and over, 15 years and over), the technique estimates: (a) a "birth rate" calculated as the ratio of persons at exact age x to the population age x and over; and (b) a "death rate" calculated as the ratio of deaths ages x and over to the population of the same ages. If the population is stable, the birth and death rates for each cumulative age group are linearly related (forming a straight line on a graph). The y-intercept of this line is the population growth rate, and the slope (the coefficient of the death rate) represents the reciprocal of the completeness of death registration, or an adjustment factor for the number of deaths. In a particular analysis, if all the points actually follow a linear trend, the results may be accepted.

Real populations, of course, often diverge from the ideal conditions for applying the technique. Populations usually are not precisely stable, there is often age misreporting of the population and of deaths, and there is often differential completeness in the registration of population and of deaths by age. As a result, the pairs of birth and death rates for each age group may not fall in a straight line (see figure III-5). In such a case, the author of the technique suggests separating the points into two groups, computing the average birth rate and death rate in each, and then fitting a straight line to the pairs of points. The slope of the adjusted line would thus represent an average adjustment factor for registered deaths.

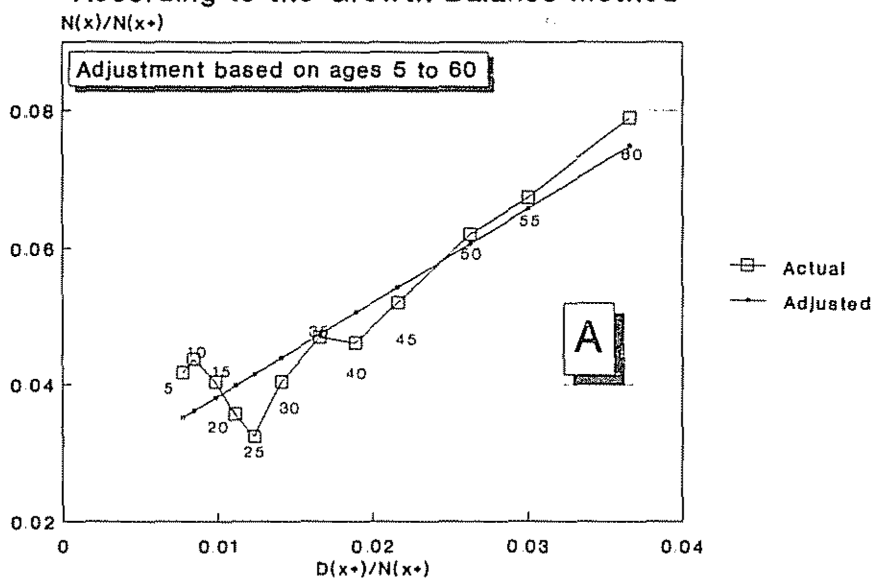
When this adjustment is required, a decision must be made as to which points should be used for fitting the straight line to the data to determine the final adjustment factor, that is, whether to use all the points or only those resembling a straight line. For example, if the population's fertility has started to decline, points calculated using very young ages may be biased due to this violation of the assumptions. Under this circumstance, it would be desirable to eliminate such points from the analysis. However, there are no rigid criteria for determining which points should be omitted and which one included, and the estimated completeness of death registration could vary significantly depending on the points selected for fitting the straight line (see figure III-6, A and B). In general, the greater the departure from linearity, the greater the caution in accepting the results (see description below). The Bureau of the Census developed the spreadsheet GRBAL for applying this technique; see documentation below.

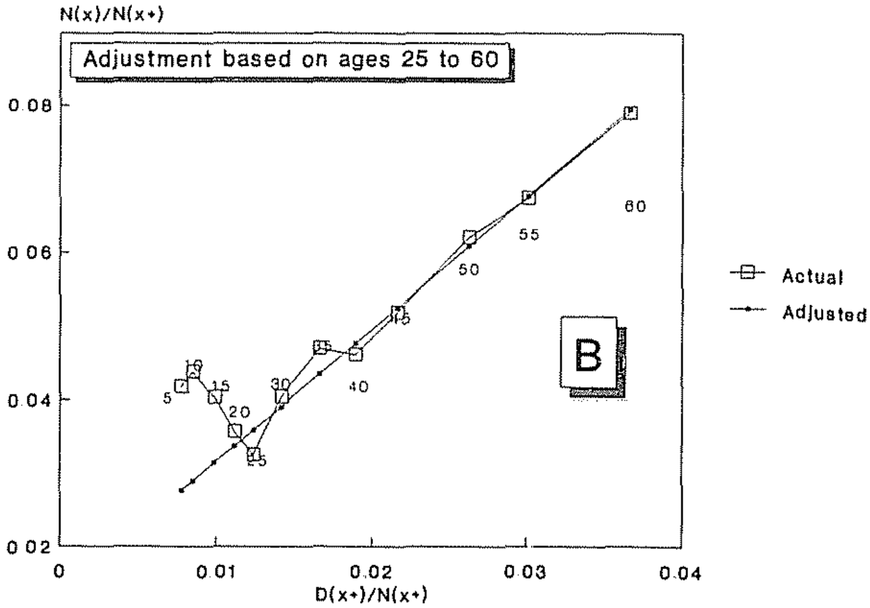
Figure III-5. Growth Balance Equation:
Burkina Faso, 1976



Note: Numbers inside figure represent ages.

Figure III-6. Age-Specific Death Rates
According to the Growth Balance Method





Note: Numbers inside figures represent ages.

DESCRIPTION OF TECHNIQUE

Summary

This technique estimates the completeness of reporting of deaths over age 5 years in relation to information on population (Brass, 1975). It compares the distribution of deaths in relation to the distribution of population, both by age. Deaths usually pertain to a period of 1 year and, if possible, data on both deaths and population should refer to the same year.

Data required

(1) Deaths by age, preferably by 5-year age groups. Deaths can be for both sexes combined or for each sex individually.
(2) Population with the same age and sex breakdown as deaths. If possible, the time reference should be midyear of the year to which the deaths pertain.

Assumptions

(1) The population has stable characteristics: mortality and fertility were constant during the past, and there was no migration.
(2) Completeness of death registration is the same for all age groups over age 5 or 10 years.
(3) There is no age misreporting of the population or of deaths.

Procedure

Accepting the above assumptions, estimate the completeness of reporting of deaths over age 5 or 10 years as follows:

(1) Calculate the population at exact ages ending in digits 0 and 5, for ages 5 years and above, as follows:

> Sum the population for two consecutive age groups and divide the sum by the number of years spanning the two age groups (for example, for two 5-year age groups, divide by 10). Other interpolation methods can also be used.

(2) Calculate the cumulated population for ages x and over by cumulating the population reported in each age group. For 5-year age groups, do this for ages 5+, 10+ and so forth.

(3) Calculate the cumulated number of deaths for the same ages as was done for the population.

(4) Calculate the ratios of the cumulated deaths and population, by age (partial death rates), as well as the ratios of the population at exact age x to the cumulated population for the same age x+ (partial birth rates).

(5) Plot these ratios on a graph as follows:

On Y-axis: Partial birth rates
On X-axis: partial death rates

If the population meets the assumptions of the technique, the points of the graph should lie on a straight line. Deviations from linearity are expected because actual populations are not stable and because the data usually have errors. Results of the technique should be accepted only if the points lie close to a straight line, particularly those points pertaining to ages 10 to 55 years. The points may fail to lie on a straight line as a consequence of:

(a) age misreporting;
(b) non-stability of the population; or
(c) differential completeness in reporting of deaths by age.

(6) Select the best fitting line, as follows:

(a) Examine the graph. If a large proportion of the points lie on or near a straight line, fit a straight line to the points. Choose at least 9 points, if possible.

(b) To fit the straight line, follow either one of two methods:

(i) Use least squares.
(ii) Compute averages of selected points to derive two average points and use the two to calculate the straight line equation. For instance, if there are 10 acceptable points, make two groups of 5 points each and take the average of the abscissas and ordinates of the points. The average coordinates represent the average point of the groups. If there are 9 points, group the first 3 (or 4) points and the last 3 (or 4) points, and take the appropriate averages.

(7) Calculate the completeness of reporting of deaths by estimating the slope of the line as follows:

(a) If the method used was least squares, take the slope and follow the instructions in step (c) below.

(b) If the method used was the average, calculate the slope of the line passing through the two average points, and then follow the instructions in step (c) below.

(c) Obtain the degree of completeness of reporting of deaths by taking the reciprocal of the slope (one divided by the slope).

(8) Adjust the number of deaths as follows:

Multiply the number of deaths by the estimated adjustment factor for deaths from step 7 (c) above. This adjusted number of deaths should be used to calculate the age-specific mortality rates.

Advantages

This technique provides information on the quality of the data and permits an adjustment in cases where the population meets the assumptions made in developing the method.

Limitations

(1) A rapid change in mortality may produce a bias in the estimation of the completeness of reporting of deaths, but slow changes in mortality over a long period of time will have only a small impact on the completeness estimate.

(2) Recent changes in fertility will cause the points that include the younger ages not to be in line with the other points. However, the results still can be used if they are based on the ages which were not affected by the change in fertility.

(3) Migration will have an effect on the results if the age structure of the migrants differs from that of the population.

(4) Age misreporting and differential completeness of reporting of the population by age may have the largest impact on the estimation of the factor for adjusting the number of deaths.

(5) The estimation of completeness refers only to deaths at ages 5 years and above. Infant and child deathsare not evaluated by this technique.

Software

There is a microcomputer spreadsheet that may be used to make all the calculations to estimate the completeness of reporting of deaths. The program is called GRBAL, and its documentation is presented below.

DOCUMENTATION: GRBAL[a/]

This spreadsheet estimated the completeness of reporting of adult deaths using the Brass growth balance equation method. The estimates are based on fitting a straight line to certain points on the graph of the partial birth rate vs. the partial death rate. This program allows the user to estimate two different lines using the grouped mean method.

Input Cell	Item
A1	Table number. Type both "Table" and the number.
A2	Country name and year (e.g., Burundi: 1975). Type over "COUNTRY: YEAR".
B8	Sex code: Male=1, Female=2, Both sexes=3.
B17	*Line 1, younger age group, first age.
C17	*Line 1, younger age group, last age.
B18	*Line 1, older age group, first age.
C18	*Line 1, older age group, last age.
B22	*Line 2, younger age group, first age.
C22	*Line 2, younger age group, last age.
B23	*Line 2, older age group, first age.
C23	*Line 2, older age group, last age.
	* Since the fitting is based on measures cumulated for all ages above a certain age, each age specified must be a multiple of 5.
B32-B45	Deaths by 5-year age groups.
C32-C45	Population by 5-year age groups.

a/ U.S. Bureau of the Census PAS:GRBAL, VER 1.00, 10 Feb. 1992

A49-G52	Sources of the input data.
A53	Filename, disk name, date and initials. Type all of these into the same cell.

Results

Cell	Item
A55-E91	Slope, intercept, completeness, and observed and fitted points.

GRAPHS

Name	Item
GRAPH1	Partial Birth and Death Rates

Table
COUNTRY: YEAR
Brass Growth Balance Equation Method

A Sex Code

Item	Value	Comments
Sex code	2	Male=1. Female=2. Both sexes=3

B Ages to Use for Fitting Lines

Item	First age *	Last age *
LINE 1		
Younger group	5	30
Older group	35	60
LINE 2		
Younger group	15	30
Older group	35	50

* Initial age of 5-year age group

C Reported Deaths and Population by Age

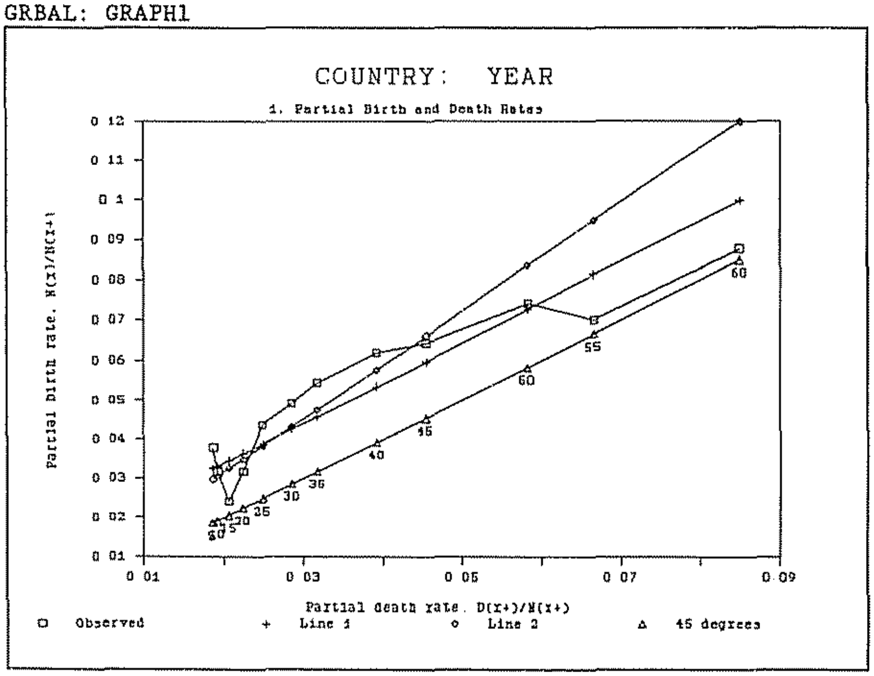
Age	Deaths D(x,x+5)	Population N(x,x+5)
0-4	35.375	371.590
5-9	4.898	309.273
10-14	1,272	162,262
15-19	1,178	158.917
20-24	2.332	210.418
25-29	2,487	208,976
30-34	2.698	160,131
35-39	1.910	161.112
40-44	2.052	103.997
45-49	1.903	104.045
50-54	2,083	58,792
55-59	1.634	53.990
60-64	2.946	39.845
65+	6,132	67.015
Total	68.900	2.170,363

[FILENAME] [DISK NAME] [DATE] [INITIALS]

Table
COUNTRY: YEAR
Brass Growth Balance Equation Method
D. Slope, Intercept, Completeness, and Observed and Fitted Points
Female

Item and age	Horizontal axis D(x+)/N(x+)	Vertical axis N(x)/N(x+) Observed	Line 1	Line 2
Slope (correction factor)			1.0141	1.3584
Intercept (growth rate)			0.0137	0.0045
Completeness of reporting of deaths (percent)			98.60	73.62
AGES USED FOR FITTING				
Younger group			5-30	15-30
Older group			35-60	35-50
PLOTTED POINTS				
5	0.0186	0.0379	0.0326	0.0298
10	0.0192	0.0317	0.0332	0.0306
15	0.0206	0.0242	0.0346	0.0325
20	0.0224	0.0316	0.0364	0.0349
25	0.0249	0.0438	0.0389	0.0383
30	0.0285	0.0493	0.0426	0.0432
35	0.0317	0.0546	0.0458	0.0475
40	0.0392	0.0620	0.0534	0.0577
45	0.0454	0.0643	0.0598	0.0662
50	0.0583	0.0741	0.0728	0.0836
55	0.0666	0.0701	0.0812	0.0949
60	0.0850	0.0878	0.0999	0.1199

GRBAL: GRAPH1



BENNETT-HORIUCHI TECHNIQUE

A more recent technique by Bennett and Horiuchi (1981) for estimating underregistration of deaths does not assume that the population is stable, but more information is required for its application: a distribution of population by 5-year age groups from two censuses and registered deaths during the intercensal period. It assumes that completeness and age misreporting are the same in the two censuses and that migration is nil. However, if the population has been exposed to migration during the intercensal period, the technique can still provide acceptable results if the age and sex characteristics of the migrants are known so migrants can be subtracted from the population figures.

This technique estimates a population for each age group and compares it with the enumerated population in the same age group. The estimated population is based on registered deaths, a population at each exact age derived from census information, and an intercensal growth rate of the population in each age group.

Like the other techniques, this one is affected by migration. Immigration will cause death registration to appear to be more complete, while emigration will cause it to appear less complete. Also, differential coverage of the population between the two censuses will have an impact. The population of both censuses is used to calculate growth rates, which in turn are used together with data on deaths to obtain an estimated population to be compared with the census population. If the first census is underenumerated in relation to the second, death registration will appear to be more complete; conversely, if the second census is underenumerated in relation to the first, death registration will appear to be less complete. Finally, the technique assumes no age misreporting under age 50 years; thus, if these ages were not reported properly, the results may be biased. This technique is explained in the DESCRIPTION below. A computer program that may be used to apply this technique is called BENHR in the United Nations MORTPAK package.

DESCRIPTION OF TECHNIQUE

Summary

This technique estimates the completeness of death registration above a certain age x during an intercensal period, based on population distributions from two consecutive censuses (Bennett and Horiuchi, 1981). Age x is the age above which the degree of completeness of death registration can be assumed to be uniform, usually taken to be age 5 years. The technique also provides a set of adjusted death rates by age, as well as estimated life expectancies for ages 5 years and above during the intercensal period.

Data required

(1) Population age distributions from two consecutive censuses, by 5-year age groups.
(2) Number of registered deaths during the intercensal period, by 5-year age groups.

Assumptions

(1) The population was not exposed to migration during the intercensal period.
(2) Both censuses have the same degree of completeness.
(3) Age misreporting occurs only after age 50 years.
(4) Degree of completeness of death registration is uniform above age 5 years.

Procedure

The method uses the number of registered deaths and population growth rates for each age group (same ages in both censuses), to estimate the expected population at certain ages. A comparison of the expected population with the population enumerated in the censuses provides the degree of completeness of death registration.

Advantages

(1) The technique does not assume that the population is stable. This is an advantage over similar techniques that require such an assumption.

(2) In addition to estimating completeness of death registration, the results may be used to evaluate the base information used: If the estimated degree of completeness at different ages is similar, the base information may be considered consistent. If the estimates of completeness differ considerably from age to age, then the base information may contain errors or may not meet the assumptions of the technique. If this is the case, the results should be used with caution.

Limitations

(1) Migration has an effect on the estimation of completeness of death registration. If there has been immigration, the result will indicate a better degree of completeness than is actually true. Outmigration will mislead the user to believe that death registration is less complete than it actually is.

(2) The technique is sensitive to different degrees of enumeration in the two consecutive censuses:

(a) Relative underenumeration in the first census (or overenumeration in the second) would raise the estimated degree of completeness of death registration.

(b) Relative overenumeration in the first census (or underenumeration in the second) would reduce the estimated degree of completeness of death registration.

(3) The technique does not evaluate completeness of registration of deaths under age 5 years. Infant and child deaths usually have a higher degree of underregistration than deaths at other ages.

Software

The computer program BENHR in the United Nations MORTPAK will made the calculations to estimate the completeness of death registration.

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