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THE CALCULATION OF CRUDE BIRTH AND
DEATH RATES FROM REPEATED OBSERVATION
IN A RURAL PILOT ZONE IN SENEGAL

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DEATH RATES FROM REPEATED OBSERVATION
IN A RURAL PILOT ZONE IN SENEGAL^{1/}

1. Objects of the inquiry

- a) To obtain an accurate record of births and deaths in a fixed zone, independently of the civil registration records; to compare the results with the records of the civil registration offices and with those of the retrospective sample survey of 1960-61; to calculate the cost of the operation.
- b) At the same time to study the operation of civil registration in the zone in order to discover the problems that may arise and to put forward suggestions for the improvement of the system.^{2/}

1/ By P. Cantrelle, Office de la Recherche Scientifique et Technique Outre-Mer.

2/ These suggestions are given in detail in the report: Civil registration and other sources of demographic data in Senegal, by P. Cantrelle, United Nations Technical Assistance Expert in Senegal.

2.

Method

The population studied. Two arrondissements, NIAKHAR and PAOS-KOTO, each with about 30,000 inhabitants, were selected in the ground-nut growing Region of Sine-Saloum; however, the unexpected slowness of the pace of work led to the reduction of the total population by one half in the second zone.

The census count of 33,000 inhabitants in NIAKHAR and of 17,000 in PAOS-KOTO, a total of 50,000, would in two years provide an observed population of 100,000, a total large enough for the estimation of statistically reliable birth and death rates. It is in fact hoped that the study will be continued for 3 consecutive years, thus permitting in addition the calculation of average rates for the 2 zones.

In the course of the initial census, residents present and absent and transients were recorded on family forms. After the census in each village a book was given to the chief of the village in which he was to record or have recorded, births, deaths and marriages occurring since the census.

A supervisor later made 3 visits at quarterly intervals in the course of which he recorded the events which occurred in each village since the initial census, on the one hand the events included in the books of the chiefs, on the other hand events not included there but coming to the supervisor's knowledge.

After the census, the information obtained was transferred on to family forms.

A little more than a year after the initial census, the same team of enumerators carried out a follow-up survey in each family, correcting errors in the initial census, adding new arrivals and any births omitted in the quarterly visits and noting departures and any deaths that may have been omitted. Blue ink was used for the initial census, red ink for all later operations. (See below an account of the stages of the operation and the cost).

3. Results

The population enumerated in the initial census was adjusted in accordance with the results of the follow-up survey.

The understanding of the nature and the relative importance of the different types of errors may prove very useful in the design of future operations.

Omissions are the most important; 1.6 per cent and 3.8 per cent of the respective populations of NIAKHAR and PAOS-KOTO were omitted.

Some of these were picked up through the declarations of deaths: 38 of 515 omitted were traced in NIAKHAR and 27 of 647 in PAOS-KOTO.

On the assumption that the mortality of the "population" omitted from the enumeration was the same as that of the total population, 31.9 and 24.8 per 1000, one might estimate the following omissions:-

1,190 instead of 515, perhaps 3.5 per cent in all
1,188 " " 674, " 6.5 per cent in all,

but in the case of such small numbers the correction is rather risky. Therefore the estimation of the total population will be based on the actual observations.

Errors relating to residents were of less importance: 1.2 per cent and 2.2 per cent:

- transients wrongly recorded as resident;
- former residents, who had emigrated before the initial census but whom the family had reported as still belonging to it.

These people had changed residence, moving either outside the zone being studied or to a village in the same zone. In certain cases, double counting was indicated when the follow-up survey data were matched with the family forms but often matching would be too time-consuming.

Errors of identification were negligible (0.7 and 1.2 per 1000):

- recording of the same person under 2 different names on the same family form;
- person unknown, doubtless because of an inadequate identifying entry;
- there were rare cases of someone listed in the census but already dead at the time of the census.

Errors in machine tabulation were likewise negligible at least in regard to the total population. Double counts and omissions balanced almost exactly.

Over all, errors of omission were more important than errors of excess but they almost cancelled out.

4. The initial census count when corrected was as follows:

	NIAKHAR	PAOS-KOTO
Initial census	32,996	17,472
Corrected	33,091	17,719
Percentage correction	+ 0.3	+ 1.7

5. The total population one year after the initial census was calculated on the basis of the follow-up survey (See table 1): initial census count + (births and immigrants) - (deaths and emigrants)

Table 1 - Resident Population

Initial census, corrected	NIAKHAR	PAOS-KOTO	SIMB ^{1/} SALCUR
Births	1,592	947	1,346 ^{1/}
Deaths	1,063	438	638 ^{1/}
Immigrants	1,254	996	Difference assumed to be zero
Emigrants	1,207	1,716	
Total end of 12 months	33,667	17,510	32,761 ^{1/}
Average	33,379	17,615	(32,400)

^{1/} Demographic survey 1960-61 - rural sample inflated in accord with the 1/20 sampling fraction.

Table 1 - Resident Population

	NIAKHAR	PAOS-KOTO	SINE ^{1/} SALOUN (32,055)
Initial census, corrected	33,091	17,719	(32,055)
Births	1,592	947	1,346 ^{1/}
Deaths	1,063	436	638 ^{1/}
Immigrants	1,254	996	Difference assumed to be zero
Emigrants	1,207	1,716	
<hr/>			
Total at end of 12 months	33,667	17,510	33,763 ^{1/}
Average	33,379	17,615	(32,409)

6.

Population Present

The reported number of residents absent and of transients seems incorrect. There were considerable variations from enumerator to enumerator: 0.2 per cent to 8.4 per cent absent and 0.3 per cent to 5.1 per cent transient, each enumerator having recorded an average of 3,700 persons.

On general grounds, there appears to be no connection between absenteeism and transient visits: there is no reason why absentees should be systematically replaced by transients. However, for a given enumerator one observes a close relation between the two, which biases the results: a good enumerator will look out both for absentees and transients while a less careful interviewer will neglect both.

It would be risky to correct the bias, and all that has been done is to add to the transients recorded in the initial census the transients wrongly recorded as residents, perhaps as follows:-

585 + 156: 741 at NIAKHAR
877 + 281: 1,158 at PAOS-KOTO

^{1/} Demographic survey 1960-61 - rural sample inflated in accord with the 1/20 sampling fraction.

The total population present will then be:-

	NIAKHAR	PAOS-KOTO
Resident population	33,091	17,719
Absentees recorded	- 1,482	- 528
Transients	+ 741	+ 1,158
	<u>32,350</u>	<u>18,349</u>

From the follow-up survey it did not seem worthwhile to take account of absentees.

7. Births and deaths according to residence

The majority of the vital events declared took place in the village of residence; the following are the results for the resident population:

	NIAKHAR		PAOS-KOTO	
	Births	Deaths	Births	Deaths
In the villages	1,574	1,033	923	411
In another village in the zone	3	18	6	2
Outside the zone	15	12	18	23
Total	<u>1,592</u>	<u>1,063</u>	<u>947</u>	<u>436</u>

It is in fact plausible that there should be a fairly large proportion of events occurring outside the place of residence, especially in the case of births because often a mother may remain for a time away from her husband's residence after her marriage or she may return to her parents for the delivery of the child. Amongst the Séreres the father takes the child to his place for baptism, which occurs within 8 days of birth; he then considers the place of baptism as the place of birth.

A few events were recorded for the transient population. When these referred to transients whose usual residence was within the zone, it was possible to match the record with the record in the place of residence.

The remaining instances relate to persons whose usual residence was outside the zone:-

NIAKHAR		births and 14 deaths
PAOS-KOTO	12	" " 4 "

It is possible that a number of events in this last category were not recorded.

8. Crude Rates

The birth rate, when calculated for the average resident population for the year, varies very little according to whether the base population is corrected or not but the variation is greater between the 2 zones.

	NIAKHAR	PAOS-KOTO
Not corrected	47.8	54.1
Corrected	47.7	53.8

The rate for the Region of Sine-Saloum derived from the 1960-61 retrospective sample survey is decidedly lower (41.5). It is probable that this result is biased by omissions.

The death rate calculated in the same way is likewise little affected by correction of the base population, but the variation between the 2 zones is even greater than that for the birth rate:

	NIAKHAR	PAOS-KOTO
Not corrected	31.9	24.9
Corrected	31.8	24.8

The only comparable figure for the resident population and the population present is the mortality quotient:

	NIAKHAR	PAOS-KOTO
Population resident not corrected	32.2	25.0
Population corrected	32.1	24.6
Pop. present not corrected	33.1	23.4
" " corrected	32.8	22.7

The death rate for the resident population in 1960 in the Region of Sine-Saloum is markedly lower (19.7). Even taking account of possible variations from year to year, an impression remains that omissions have led to an underestimation of the death rate as of the birth rate.

9. Methods of recording births and deaths

In the pilot zone 4 methods were used:-

- A - Declaration in the civil registration offices
- B - Recording in the books issued to the village chiefs
- C - Declaration to the supervisor in the course of the 3 visits, at quarterly intervals, to the villages
- D - Follow-up survey of families at the end of the year.

The results are as follows:-

	NIAKHAR		PAOS-KOTO	
	Births	Deaths	Births	Deaths
	Number of events			
A	156	4	25	-
B	649	300	431	106
C	1,131	498	609	187
D	1,268	537	674	262

	NIAKHAR		PAOS-KOTO	
	Births	Deaths	Births	Deaths
	Percentage			

A	12	1	4	-
B	51	56	64	40
C	89	93	90	71
D	100	100	100	100

The minute proportion of events declared in the civil registration offices is notable. In NIAKHAR village, which has a registration office, only 38 births were registered out of a total of 120, or about 32 per cent.

It is worth remarking that there was an improvement from quarter to quarter in the proportion of events recorded in the books of the village chiefs.

10. Conduct of the operations

	Date of commencement	Duration in months		Personnel	
		NIAKHAR	PAOS-KOTO	Super-visors	Enumerators
Initial census	10/62	1½	1	2	13
Round 1	1/63	2	1	2	-
" 2	4/63	2	1½	2	-
" 3	8/63	2	1¾	2	-
Follow-up	12/63	2	1½	2	6

11. Cost of the first phase (Oct. 62 to June 64) in francs C.F.A.

	Total first phase	Of which, follow-up cost:
Personnel	4,242,000	1,774,000
Equipment	2,237,000	926,000
Total	6,479,000	2,700,000
in U.S. \$ about	25,900	10,800

not including salary and expenses of the expert who supervised the project, and

- administrative expenses of the secretariat
- depreciation of 4 vehicles (2 CV)
- use of premises and of the mechanical unit

12.

CONCLUSIONS

The data on births and deaths collected through civil registration in the rural areas is inadequate for the calculation of rates and it is necessary to have recourse to demographic surveys.

Retrospective inquiries are subject to under-reporting unless one has high-quality personnel under good supervision. The under-reporting does not affect the total population figure but does affect the number of births and deaths. The cost of continuous observation seems to exceed the funds usually available.

Repeated observation is more effective if one visit per year is made to each family than if one visit per quarter is made to each village.

Finally it is easier and more effective to study the resident population than the population present; likewise it is easier to study the total population than the vital events.

It is proposed to continue the study for 2 more years, on the one hand to assess the value of the method and on the other hand to estimate annual variations in the death rate.