An Estimate of the Birth Rate in East and West Pakistan

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This paper presents the results of an attempt at estimating the current birth rates in East and West Pakistan. In the absence of an adequate registration system, estimates of vital rates are dependent on alternative sources of data and various techniques of estimation. In the case of Pakistan, where registration systems are extremely defective, the two major alternative sources of data are the Population Growth Estimation (PGE) experiment and the (1951 and 1961) decennial censuses of population.

The PGE is an attempt to acquire knowledge of the level of birth and death rates in Pakistan by matching information obtained, for a sample of the population, from periodic surveys and continuous registration of events as they occur [3, pp. 37-65]. Preliminary findings from data collected in 1962 indicate, for total Pakistan, a birth rate of 56 and a death rate of 18, resulting in a growth rate of 38 [11]. A subsequent report based on slightly modified data, and presenting results for both sections of the country, indicates a birth rate of 58 and a death rate of 21 for East Pakistan, with a birth rate of 55 and a death rate of 22 for West Pakistan[12].There is reason to believe that the birth rate estimated by the PGE for total Pakistan is a reasonably close approximation of the actual birth rate but that the estimated death rate is too low (and consequently, that the indicated rate of growth is too high)[1].

All rates shown in the paper are per 1,000 population.

1 There is some evidence to indicate that in the developing nations of Africa and Asia, deaths are often less completely registered or accounted for than are births. This situation is unlike that found in the developed Western countries where the registration of deaths is generally at least as complete as the registration of births; see, [12, pp. 12-13] and footnote 2 below.

Other estimates of vital rates in Pakistan have been prepared by analyzing the 1951 and 1961 Census age distributions in terms of stable age techniques[2]. These estimates will be discussed and evaluated in a later section of the paper.

The new estimates prepared for this paper are based on the proportionate age distributions available from the 1962 PGE surveys[3]. These distributions were considered to be more accurate than the age distributions from either the 1951 or 1961 Census[4]. The analysis of the PGE distributions assumes that the populations of East and West Pakistan are essentially closed populations[5], that fertility in both areas has remained constant, and that in both areas mortality has been declining in recent years—*i.e.,* the populations of East and West Pakistan are quasi-stable.

Application of the stable population model requires, or assumes, constant age schedules of fertility and mortality whereas quasi-stability refers to populations experiencing constant fertility and changing mortality. Since fertility is the major determinant of the age distribution of a (closed) population, populations subject to quasi-stable conditions often have been assumed, for purposes of analysis, to be stable. This assumption was believed to have an inconsequential effect on estimates generated in this manner. However, recent work has shown

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2　In addition to published material referred to in [2; 1, pp. 25-49; 8, pp. 279-305], the writers have had the benefit of unpublished research available at the Office of Population Research, Princeton University. Mr. Wiqar Hussain Zaidi, a graduate student at Princeton University during the 1962-1963 academic year, analyzed in detail the age distributions of the 1951 and 1961 Pakistan censuses. Zaidi's analysis revealed major errors in the two censuses, especially in the 1951 age distribution for West Pakistan. This analysis indicated the lack of reliability in vital rates estimated from the census age distributions through stable age techniques.

In another (unpublished) project, Mr. Masihur Rahman Khan attempted to estimate the birth rate in Pakistan by applying stable age techniques to the 1962 PGE female age distribution and female age specific mortality rates. Khan estimated, after adjusting for quasi-stability, a female birth rate of 45; increasing the PGE age-specific mortality rates by 50 per cent resulted in an estimate of 49. The results appear to be too low and indicate the underestimation of mortality in PGE.

3　These age distributions, in turn, are based on a subsample of the total PGE sample, the subsample covering the rural areas of East and West Pakistan. Since both sections are predominantly rural, these proportionate age distributions presumably are hardly different from the proportionate age distributions for total East and total West Pakistan. For present purposes, these distributions have been taken to represent the total populations of the two sections.

4　The use of the PGE age distributions should not be taken to mean that they are completely accurate or without error. An examination of these age distributions and the present analysis both indicate certain deficiencies, primarily at age 0-4 and 10-24. As explained below, the process of estimation (of the birth rate) described in this paper not only reveals these deficiencies but also reduces or eliminates their effect; *see* pp. 68-69. Even with their shortcomings, the PGE distributions are undoubtedly superior to the census distributions; *see* Appendix A for a discussion of the latter.

5　This assumption undoubtedly overstates the situation in that between 1951 and 1961 there was probably some out-migration from East Pakistan and in sufficient magnitude to affect the present estimates. There is, however, no firm evidence as to the amount of such movement. For the way in which the present estimates would be affected by migration, *see* below p. 69.

that application of the stable model to populations that are in fact quasi-stable can introduce a substantial degree of error in the measure being estimated. [4, pp. 175-193; 6]. The bias introduced is especially pronounced in those instances where mortality has undergone a precipitous decline as has been the case in some of the currently developing nations.

Where mortality has been declining, application of the stable population model tends to underestimate the current true birth rate (which in turn is below the current intrinsic birth rate). The underestimation of the birth rate results from the fact that the quasi-stable (*i.e.*, declining mortality) population has smaller proportions at the young ages than would the stable population with the same current (but previously constant) level of mortality. Smaller proportions at the young ages imply, *ceteris paribus*, a lower estimate of the birth rate. Therefore, assuming the quasi-stable populations to have been stable and estimating the birth rate from the smaller proportions (at the young ages) than the population would have had, had it actually been stable, would result in underestimation of the current birth rate.

The estimation process itself requires two known or assumed parameters; given these two measures, it is possible to estimate other parameters of the population. The procedure requires finding (by interpolation if necessary) a stable age distribution (in a set of previously prepared stable age distributions) having the same values for the two known parameters[6]. The indicated birth rate for the stable age distribution provides a "first approximation" of the birth rate being estimated. With some knowledge or estimate of the decline in mortality, including the length of time over which it has occurred, an adjustment for the effect of the bias can be introduced to provide the final estimate of the current true birth rate.

The birth rates estimated in this manner for Pakistan were prepared by using, as the two known parameters, the (1951-1961) intercensal annual rates of growth (for East and West Pakistan, by sex) and the 1962 PGE age distributions. More specifically, the rate of growth was used in conjunction with the cumulative proportion under 5, and 10, etc. up to the proportion under 30, to provide a series of estimates for each sub-population[7]. Each series was then adjusted for the effect of declining mortality on the estimates by assuming that life expectancy at birth

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6   The Office of Population Research at Princeton University has prepared four families of model life tables ("West", "East", "North", and "South") reflecting four different age patterns of mortality, and corresponding stable age distributions for various rates of growth. This study has relied on the "West" series which is based on the mortality experience of all of Western Europe *plus* Australia, Canada, New Zealand, the United States, Japan and Taiwan. This material will be published in the near future; *see* [5].

7   For the rationale behind the use of the cumulative proportions under several succeeding ages, *see* below and (especially) [5, p. 178].
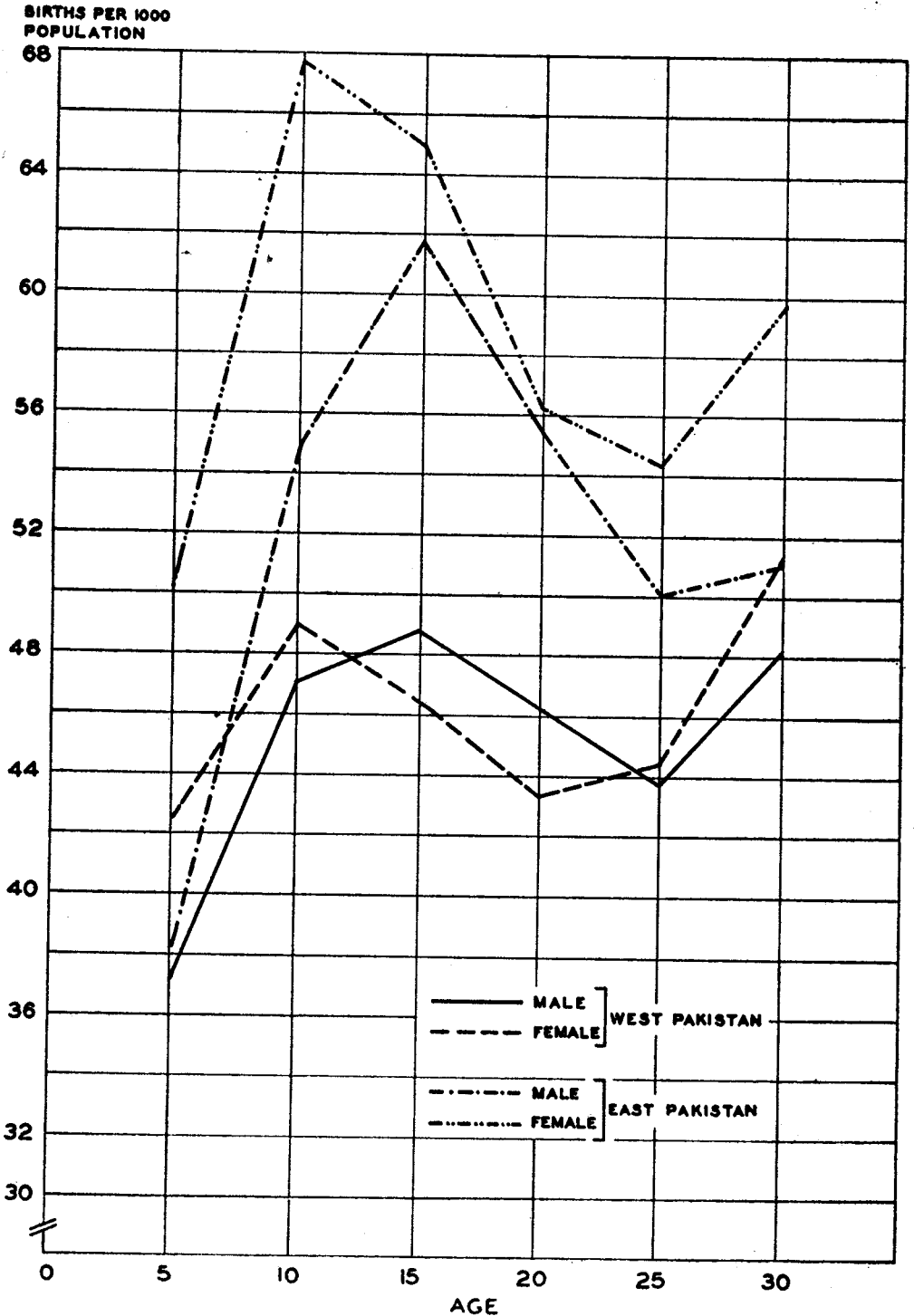
BIRTHS PER 1000
POPULATION

Figure 1. Birth Rates estimated from Cumulative Proportions under Each Age in 1962.
PGE Age Distributions, for East and West Pakistan by Sex

(e_0^o) has been increasing by one year per year for twenty years[8]. The adjusted series, shown in Figure 1, indicate a birth rate for East Pakistan females between 68 and 58, and for East Pakistan males between 62 and 54. The estimates for West Pakistan do not indicate similar ranges. Specific rates reflected by these series are given in Table I[9].

At this point a short digression might help the reader to understand the rationale behind the use of cumulative proportions under several succeeding ages in an analysis based on stable age techniques. An appreciation of this point will assist the reader in making the transition from the series of estimates in Figure 1 to the estimates of Table I.

Estimating the birth rate of a population by stable age techniques does not require or depend on using the cumulative proportions under succeeding ages. An estimate of the birth rate could be derived from the population under any one age, *e.g.*, the proportion under 10 (and, of course, one other independent parameter). In fact, if a (stable) age distribution was complete and accurate, then the birth rate estimated from the proportion under any age would agree precisely with estimates derived by using other cumulative proportions of the age distribution. However, age distributions are seldom accurate. Where the age distribution is suspected, basing an estimate of the birth rate on the cumulative proportion under only one age precludes the possibility of internally evaluating the estimate. On the other hand, using the cumulative proportions under several succeeding ages provides a series of estimates of the birth rate which *a*) allows for some evaluation of the relative accuracy of the age distribution (and, therefore, of the derived estimates) and *b*) indicates the level at which "stabilization" of the estimates of the birth rate can be expected to occur.

In the present context, major reliance, in arriving at the ranges cited above and the (point) estimates shown in Table I, has been placed on the estimates derived from the cumulative proportions under age 10 and age 30. Reliance on these two proportions results from *a*) the pattern of errors typically encountered in the age distributions of underdeveloped nations; *b*) the pattern of errors encountered in the 1951 and 1961 Pakistan Census age distributions as well as age distributions for Muslims in India prior to Partition; and *c*) the pattern of estimates shown in Figure 1, which are derived from the PGE age distributions.

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8 The adjustment factors were derived from material presented in [6, Appendix Table A-1].

9 These specific figures are given for purposes of comparison and simplification of presentation; they should not be considered to be precise estimates of the true rates, but as "best estimates" from the indicated ranges implied by the series shown in Figure 1. Nor should these specific figures be thought of as averages of the six estimates shown in Figure 1 for each subpopulation.

Age distributions for underdeveloped areas, and especially for Pakistan, typically indicate relative undercounts of children 0-4 and of young adults 10-19 or 10-24. If, in the present case of Pakistan, we assume that the deficiencies at ages 0-4 are due to age mis-statement and that all of the mis-reported persons incorrectly reported themselves as being 5-9, then the cumulative proportion under age 10 is correct. The correct estimate of the birth rate in this instance would be obtained from the cumulative proportion under 10. (It should be obvious that averaging the estimates based on the proportions under 5 and the cumulative proportion under 10 would result in an erroneous estimate of the birth rate). In fact, however, the population under 10 is probably inflated by the inclusion of persons 10 years old and over[10], so that the estimate based on the cumulative proportion under 10 is too high. At the same time, estimates based on the cumulative proportions under 15, under 20, and possibly under 25 would be too low because of over- and understatement of age. By the time the cumulative proportion under age 30 is reached, the effect of age mis-statement on this proportion is negligible. In addition, using the proportion under 30 reduces the effect of errors in coverage[11]. Thus, the estimates given in Table I should be considered the "best estimates" implied by the patterns of estimates shown in Figure 1.

Some reservations concerning these estimates must be mentioned. If mortality has in fact been declining, then the 1951-1961 annual rate of growth provides an average rate of growth over the decade, a rate which is lower than the instantaneous rate of growth as of the end of the decade. If this instantaneous rate of growth had been used the estimated birth rates would be slightly lower[12].

The second reservation is of greater importance in terms of the difference in the estimated birth rates of the two sections of the country. Although the writers do not have evidence to substantiate this position, it is quite likely that East Pakistan experienced some net out-migration between 1951 and 1961, with the bulk of the migrants moving to Bengal in India. Adjusting for out-migration from East Pakistan would have the effect of increasing the intercensal rate of

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10 This inflation, caused by the understatement of age on the part of persons 10 years old and over, is especially pronounced in the 1961 Census (apparently as the result of the inclusion in the census of questions on labour force status); the same phenomenon, however, almost consistently appears in Pakistan—or the "equivalent"—age distributions; *see* Appendix A.

11 For a clear and succinct exposition of the points elaborated on in the present "short digression", the reader is referred to [5, especially p. 178].

12 However, if (as seems the case) the relative level of enumeration in 1961 was greater than in 1951, then the indicated intercensal rate of growth is too high. A lower growth rate would produce higher birth rates. To the degree that these two "errors" are compensating, the rates used may provide more accurate results than mechanically estimated instantaneous rates would have provided.

growth and thereby reducing the estimate of the birth rate. Thus, the result of taking out-migration from East Pakistan into account would be to alter the present estimates of the East Pakistan birth rate so as to be closer to the sectional estimate provided by *P.G.E. Interim Report No. 5*[12]. Similarly, a consideration of a positive net migration into West Pakistan during the inter-censal period would have the effect of increasing our estimate of birth rate for West Pakistan and thus reducing the gap of our present estimates between the two provinces (*see* Table I).

As a third reservation, mention may be made of our assumption concerning decline in mortality in Pakistan. The magnitude of adjustment in the estimated birth rate of a quasi-stable population depends on the duration and rapidity of the decline in mortality [6, especially Table A-1; 4, pp. 182—186]. In our study we assumed that life expectancy at birth has been increasing by one year per year for twenty years. Instead, had we assumed that life expectancy at birth had been increasing for the last ten years or less, all our estimates of birth rates for the whole country, province and the sexes would have been slightly lower.

TABLE I

ESTIMATES OF THE BIRTH RATE IN EAST AND WEST PAKISTAN BY SEX: 1962

	PGE[a] Both Sexes	Present estimates		
		Both[b] Sexes	Male	Female
East Pakistan	58.0	61.0	58.0	64.0
West Pakistan	55.0	48.0	48.0	49.0
Total Pakistan	**56.0**	**55.0[c]**	**53.0[c]**	**57.0[c]**

a) The rate for total Pakistan is from *P.G.E. Interim Report No. 4* [11] whereas the rates for East and West Pakistan are from *P.G.E. Interim Report No. 5* [12].

b) Computed from the formula $\dfrac{(1+u)\,(b_m\ b_f)}{ub_f + b_m}$

where b_m = male birth rate

b_f = female birth rate

u = sex ratio at birth, which was assumed to be 1.05

c) Computed from the rates for East and West Pakistan, using as weights the proportion of population in each section in the 1961 Census.
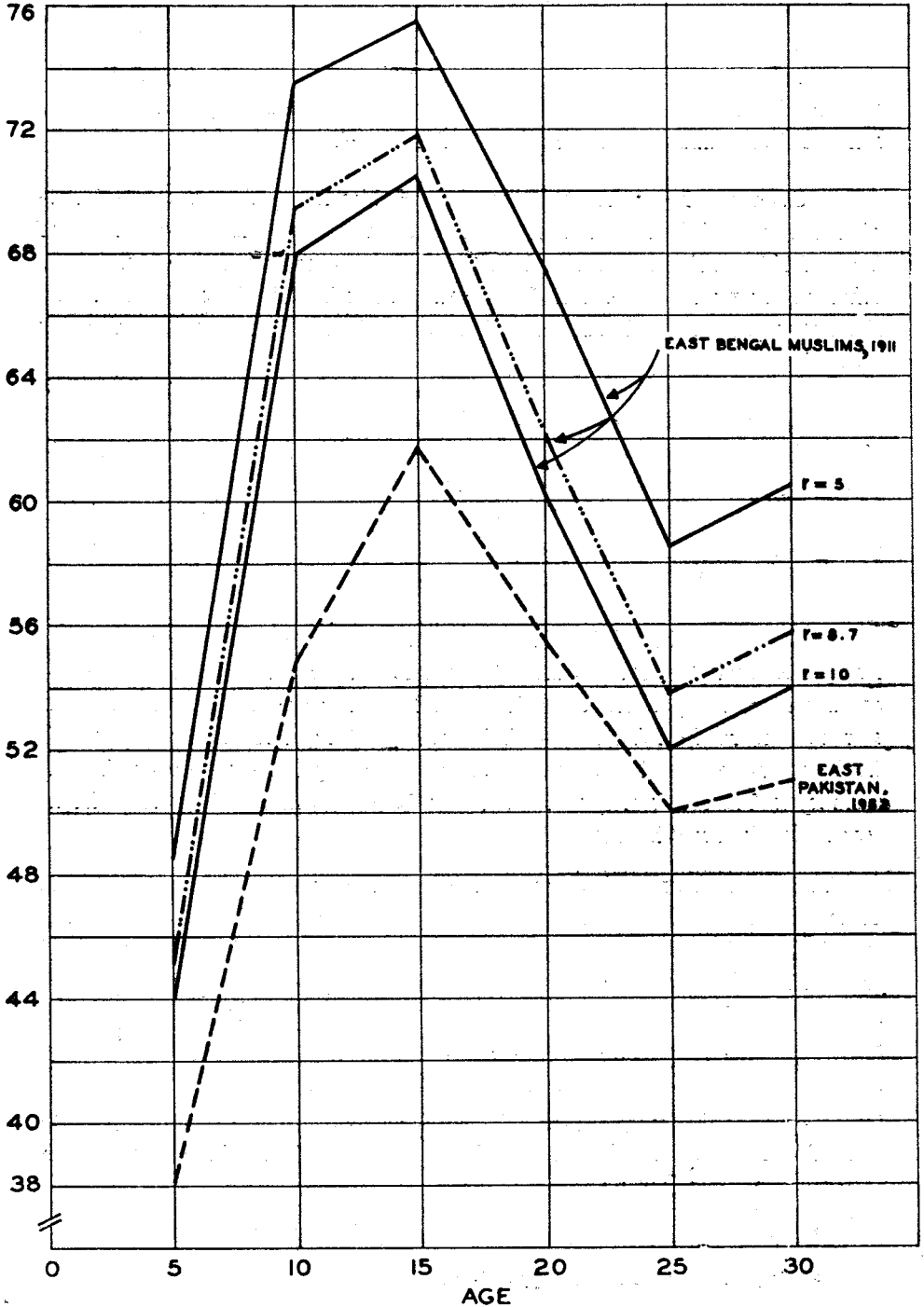
Figure 2a. Male Birth Rates Estimated from Cumulative Proportions under Each Age,
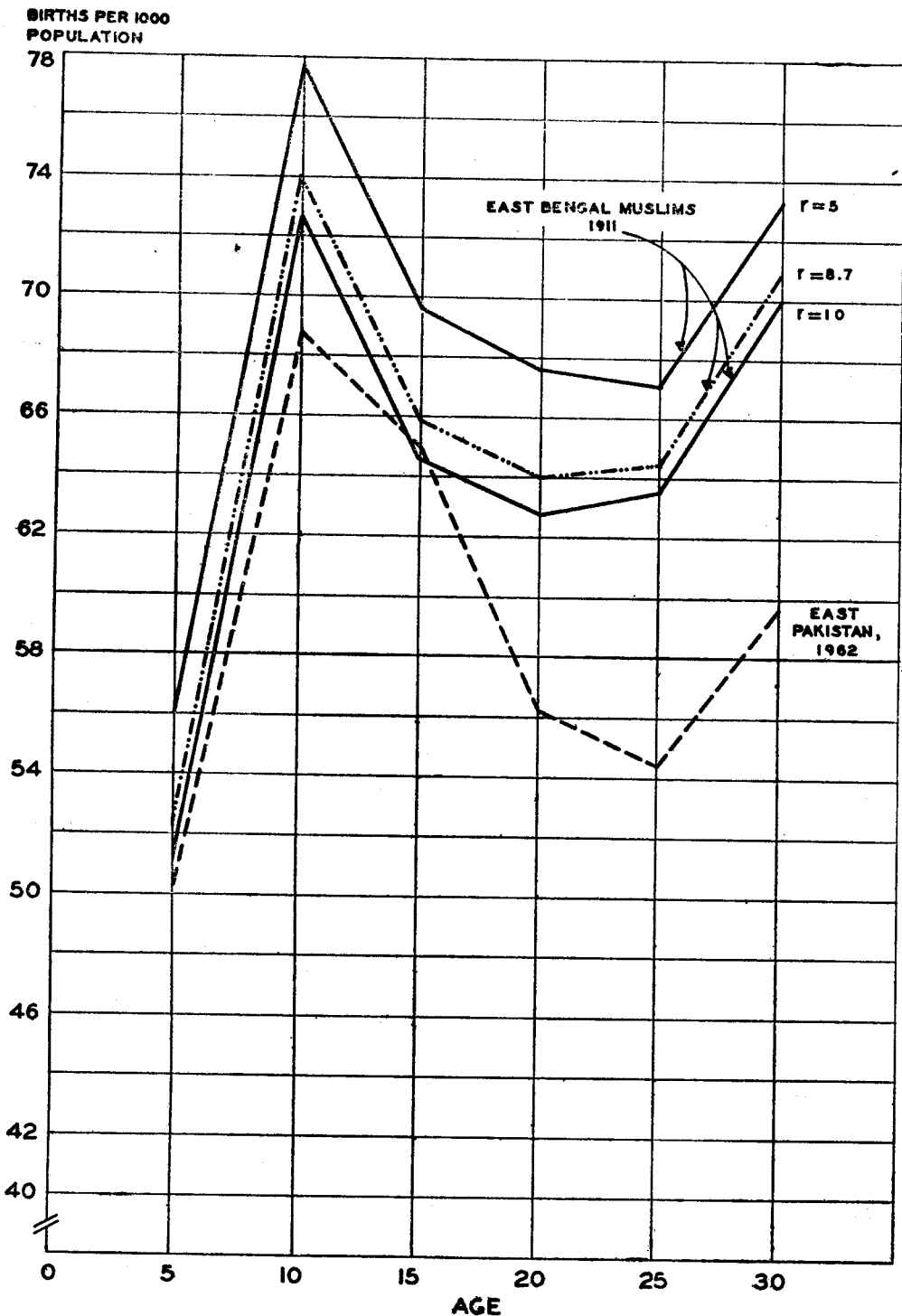East Bengal Muslims, 1911 and East Pakistan, 1962

Figure 2b. Female Birth Rates Estimated from Cumulative Proportions under Each Age, East Bengal Muslims, 1911 and East Pakistan, 1962
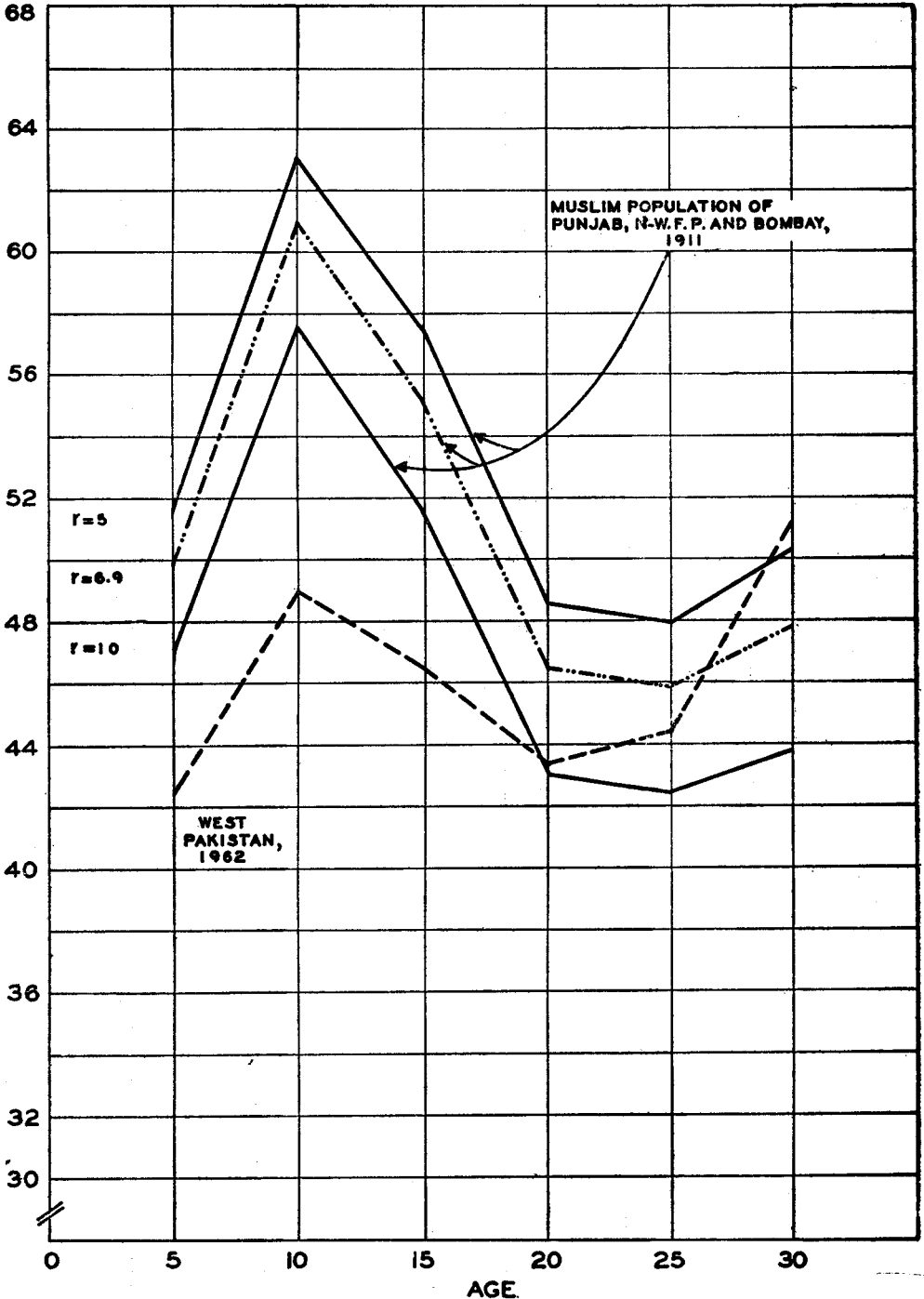
BIRTHS PER 1000
POPULATION

Figure 2c. Male Birth Rates Estimated from Cumulative Proportions under Each Age.
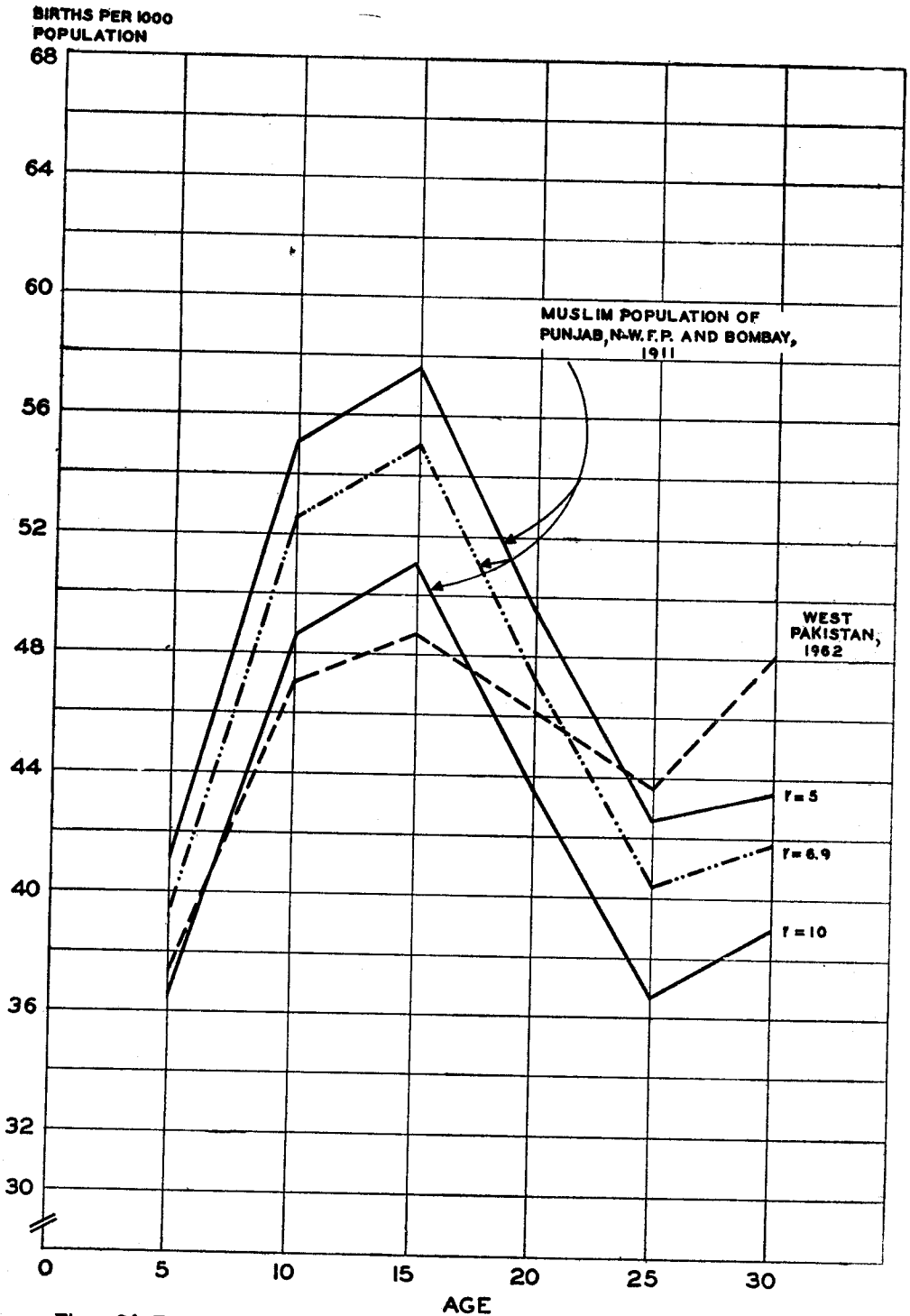Combined Muslim Population of Punjab, N-W.F.P. and Bombay 1911 and West Pakistan 1962.

Figure 2d. Female Birth Rates Estimated from Cumulative Proportions under Each Age.
Combined Muslim Population of Punjab, N-W.F.P. and Bombay 1911 and West Pakistan 1962.

Figure 3a. Gross Reproduction Rates Estimated from Cumulative Proportions under Each Age, East Bengal Muslims 1911 and East Pakistan 1962

Figure 3b. Gross Reproduction Rates Estimated from Cumulative Proportions under Each Age.
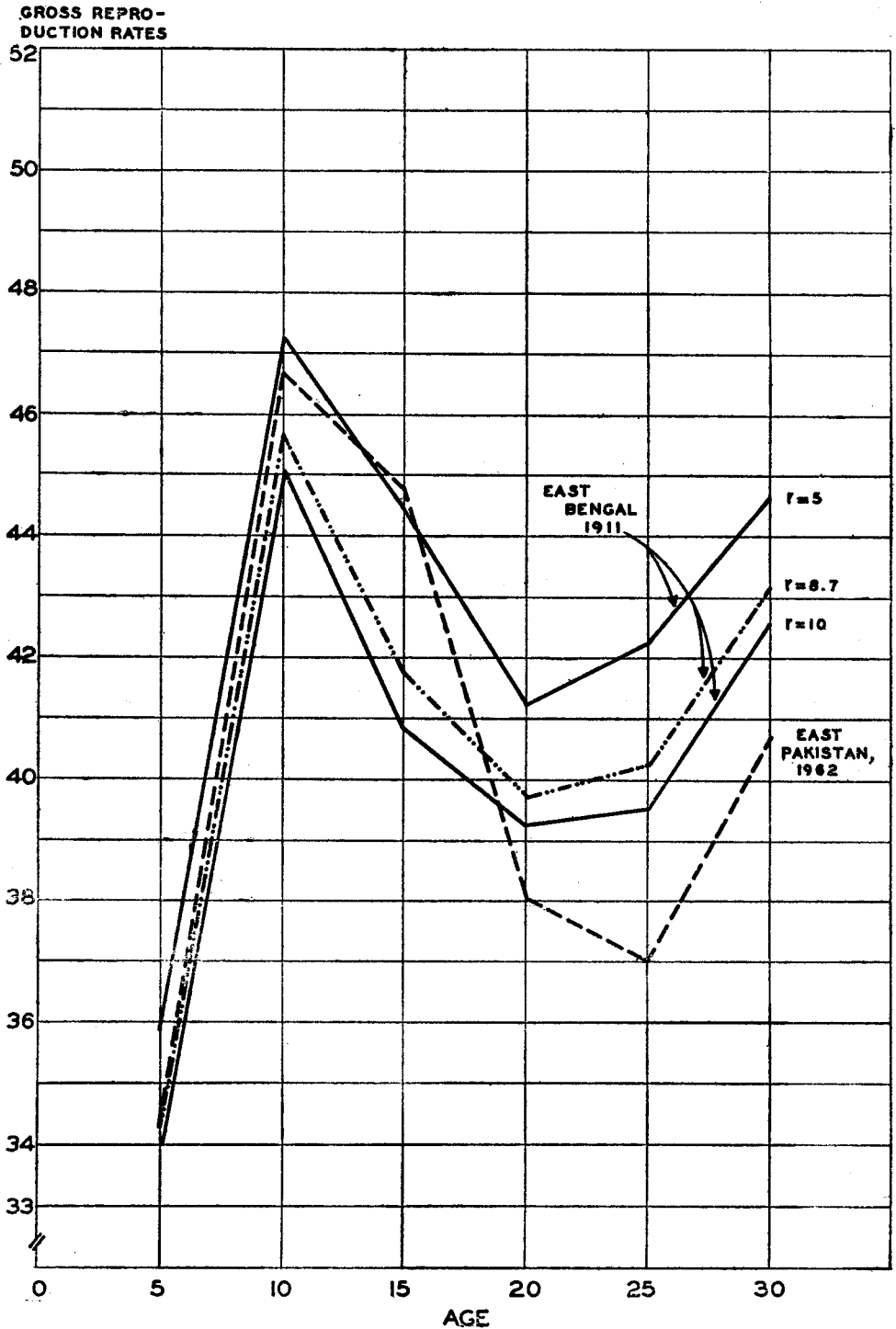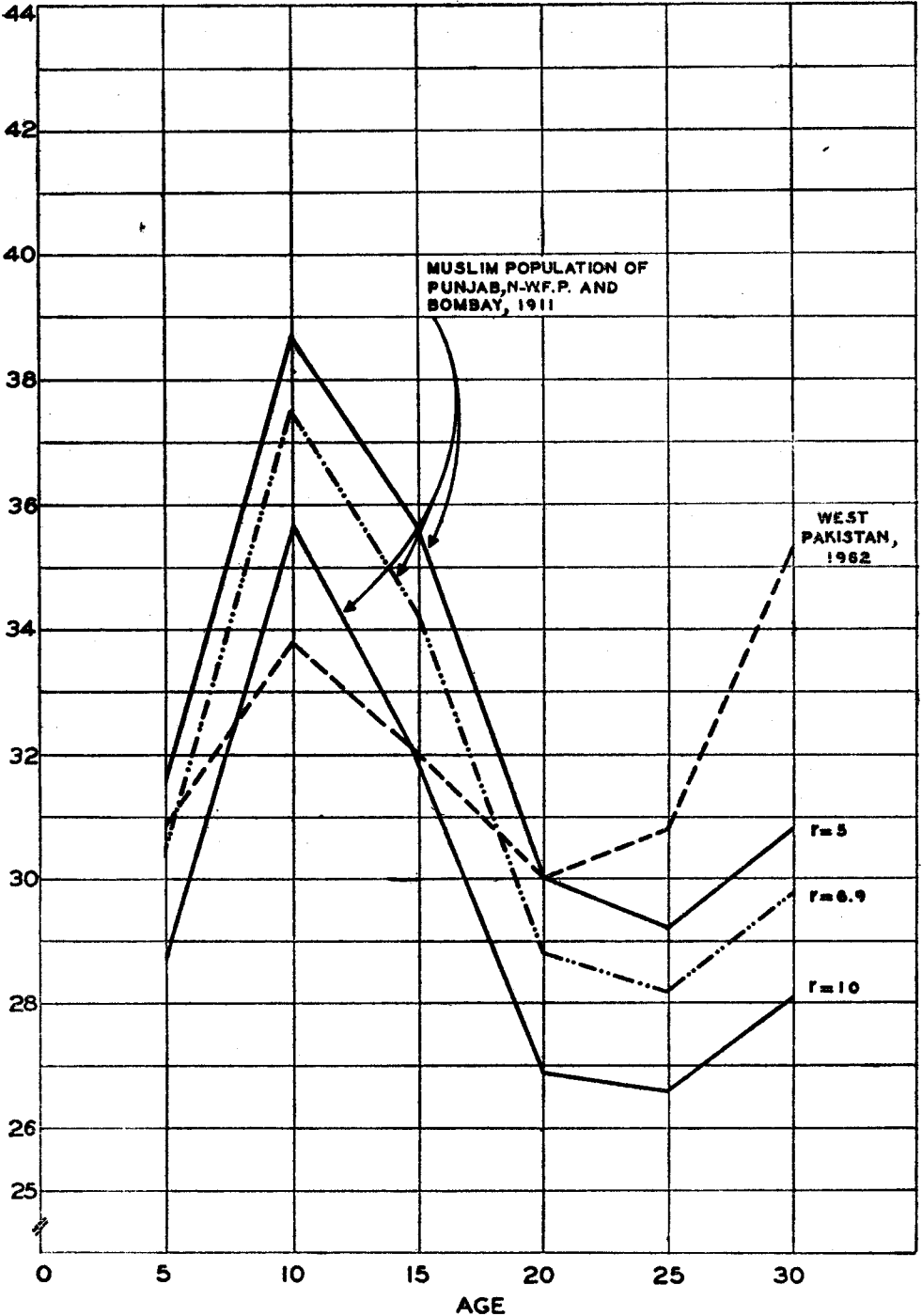Combined Muslim Population of Punjab, N-W.F.P. and Bombay 1911 and West Pakistan 1962

changes, with constant fertility, is to reduce the birth rate. This argument leads to the hypothesis that the birth rates in East and West Pakistan prior to the decline in mortality should have been higher than the current birth rates even though fertility has been, or has been assumed to be, constant.

This hypothesis was tested by estimating the birth rate for Muslims in India as of 1911, using the age distributions of the 1911 Census and annual rates of growth between 5 and 10 per thousand[16]. The results of this test support the hypothesis of higher birth rates for East and West Pakistan in 1911 (approximately 70 for East Pakistan and 58 for West Pakistan) than in 1962 (Figures 2a-2d). It is interesting to note that even in 1911 East Pakistan had a higher birth rate than West Pakistan.

Lastly, an attempt was made to determine whether fertility has in fact remained constant over time by comparing the gross reproduction rates (GRR) estimated by stable age techniques for the 1911 age distributions with those estimated from the 1962 PGE age distributions (after adjusting the latter for the bias introduced by declining mortality).

Although the results are not in perfect agreement, they are close enough to confirm the hypothesis or assumption of constant fertility (Figures 3a and 3b)[17]. On the basis of these estimates, East Pakistan appears to have a GRR of around 4.3 and West Pakistan of approximately 3.4. Not only does fertility appear to have remained constant but this additional evidence also shows higher fertility in East than in West Pakistan[18].

Ahmed estimated 1951 birth rates of 58.7 for East Pakistan and 62.4 for West Pakistan. These estimates were based on the assumption of constant fertility and declining mortality and were prepared by applying stable age techniques

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16   The 1911 Census was used because: *a)* it predated any continued decline in mortality; *b)* it contained unsmoothed age data; and *c)* because of the lack in the 1901-1911 intercensal period of excessive but temporary "disturbing" factors such as wars and unusually severe epidemics and famines which would have affected the age distributions. The Muslim population for East Bengal in 1911 was assumed to be comparable to the current population of East Pakistan. The population of West Pakistan was compared to two different populations—Indian Muslims *minus* East Bengal Muslims and the combined Muslim population of the Punjab, North-West Frontier Provinces and Bombay. Since these two populations provide very similar estimates, results are shown only for the latter. Ahmed has estimated the 1901-1911 annual rate of growth as 8.3 for East Pakistan Muslims and 6.9 for West Pakistan Muslims [1, p. 29].

17   Adjusting for the effect of migration would have the result of bringing the 1962 estimates for East Pakistan closer in line with the 1911 estimates.

18   These GRR's were computed on the assumption of a mean child-bearing age of 27 years. Using a mean child-bearing age of 29 years would raise the GRR's but it would not affect any of the comparative conclusions cited above.

to the 1951 Census age distributions for East Pakistan and total Pakistan; rates for West Pakistan were then estimated indirectly from the estimates for total Pakistan and East Pakistan.

These estimates are somewhat lower than they should be because of the bias introduced by Ahmed in assuming a stable age distribution when in fact the population is quasi-stable. Estimates for 1962 consistent with Ahmed's estimates for 1951 (or Ahmed's 1951 estimates adjusted for quasi-stability) would be lower, since the true birth rate declines because of the effect of falling mortality on the age distribution.

These two points imply that Ahmed's estimate for East Pakistan is too low, probably by an amount even greater than can be accounted for in failing to adjust for quasi-stability. At the same time his estimate for West Pakistan is undoubtedly too high (and would be even higher if adjusted for quasi-stability). Not only is it higher than his estimate for East Pakistan but the difference between the (unadjusted) 1951 West Pakistan estimate and the 1962 estimate is too large to be accounted for by the decline in mortality over the eleven-year period. Ahmed's estimate for West Pakistan is even greater than our estimate for the comparable population in 1911[19]. The somewhat too-low estimate for East Pakistan in 1951 and the unusually high estimate for West Pakistan in 1951 appear to be the result of the poor census age distributions, especially for West Pakistan.

Krotki, in his estimates, assumes constant mortality and rising fertility after 1947. He bases this assumption on a comparison of the 1951 and 1961 Census age distributions, accepting at face value the two sets of age distributions and drawing the obvious conclusion that they reflect increasing fertility. He then attempts to adjust the 1961 age distribution (up to age 25) for errors in coverage and using these adjusted age distribution estimates, by stable age techniques, a birth rate of 58 for East Pakistan and 51 for West Pakistan (as of 1961).

These estimates, although slightly different from the present estimates, are consistent with them considering the range of uncertainty implicit in all of the various sets of estimates. It appears, however, that Krotki's estimates are "right" but for the wrong reasons—*i.e.*, his acceptance as accurate defects of the 1951 and 1961 Censuses and assuming constant mortality with rising fertility. The

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[19] *See*, p. 78 above.

adjustments he introduced to the 1961 age distributions had the effect of negating these assumptions (and any bias that would have been introduced by employing stable age techniques on a population with assumed rising fertility) with the result of generating estimates that appear to be correct.

The present analysis, using stable and quasi-stable techniques, indicates that East Pakistan is currently experiencing high fertility, that it has been experiencing this same high level of fertility over the past 50 or 60 years (and perhaps longer) and that fertility in West Pakistan over this same period of time has been somewhat lower. These results could be spurious, resulting from persistent distortions in the age distributions used in the analysis. However, it should be remembered that the results are based on age distributions separated by 50 years of time and obtained by somewhat different methods—a census on the one hand and a sample survey on the other. It seems unlikely that the kinds of errors necessary to generate similar levels of fertility over time and dissimilar levels between East and West Pakistan would be present in age distributions as widely separated in time and method as these.

The various estimates of the birth rate in Pakistan, including the present one with its several reservations, indicate some uncertainty in the rates for the two sections of the country, with the estimates for East Pakistan varying from the mid to the high 50's or low 60's and the estimates for West Pakistan ranging from the high 40's to the mid 50's. Given the quality of the currently available data, it might not be unreasonable to suggest that this is as close as demographers can come, at the present time, to estimating the "true" birth rate(s).

It may, however, be mentioned that the use of r, the rate of growth of a population, in conjection with age distribution results in a somewhat wider margin of error in estimating birth rate than when estimated from age distribution and some known mortality measure [5, pp. 179-180]. Another attempt in estimating birth rates of Pakistan may be made at a later stage when more reliable mortality data from PGE would be available.

The present analysis cannot provide an independent estimate of the death rate (or of the growth rate). Instead, the death rate is obtained as the difference between the estimated birth rate and the *assumed* rate of growth. In the current situation, if the estimated birth rates for East and West Pakistan are accepted and if the present rate of growth for East Pakistan is in the mid-20's and for West Pakistan in the high 20's then the death rate for East Pakistan would be somewhere around 35 and for West Pakistan around 20. But a consideration of the reservations mentioned earlier (p. 69) would indicate that these death rates, obtained as a residual, would have an effect of reducing the gap of the

death rates between the two provinces, the death rate figure for West Pakistan having a downward bias while that for East Pakistan having an upward bias.

In effect then, the estimate of the death rate is dependent on the growth rate used in the analysis. However, errors in the latter would lead to even greater errors in the death rate. For example, adjusting the East Pakistan data for out-migration between 1951 and 1961 would result in lowering the present estimate of the birth rate, and a natural rate of increase that was somewhat higher than the indicated intercensal annual rate of growth. The consequence of these changes would be to reduce the estimate of the death rate in East Pakistan, by an amount even greater than the change in the growth rate.

The evidence available on the growth rate from the intercensal increase and the analysis of the PGE age-specific mortality rates[20] indicate, at least for East Pakistan, that the PGE estimates of the death rate are probably too low. However, the uncertainties inherent in the intercensal growth rate preclude any possibility of conclusively demonstrating in this analysis a downward bias in the PGE estimates of the death rate.

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[20] *See*, footnote 2 above.

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13. United Nations, *Future Population Estimates by Sex and Age. Report IV. The Population of Asia and the Far East, 1950-1980*. Population Studies No. 31. (New York: Department of Economic and Social Affairs, 1959).

Appendix A

The 1951 Census showed approximately equal proportions in the first three five-year age groups, suggesting to some observers a decline in fertility over the ten years period preceding the census. This view was strengthened by publication of the 1961 Census which showed very high proportions in the 0-4 and 5-9 age groups (indicating a return between 1951 and 1961 to the high fertility that had prevailed prior to 1941) with small decreasing proportions in the age groups 10-14, 15-19 and 20-24. The decline in fertility was attributed to the 1943 Bengal famine and the effects of World War II and the partition of Indo-Pakistan subcontinent; with the end of strife, fertility presumably rose [5, p. 181; 8, p. 302].

This appendix will attempt to argue an alternative position: that the small proportions at 0-9 in 1951 and 10-19 in 1961, and the large proportions at 0-9 in 1961 are the result of errors in reporting and coverage and that these errors (along with others) make the age-sex distributions of the 1951 and 1961 Censuses unusable for purposes of estimating vital rates by stable age techniques. Implicit in this position is the contention that fertility remained constant over the 1941-1961 interval (and prior to 1941), as was indicated in the text of this paper.

A comparison of the age-sex distributions in 1951 for East and West Pakistan helps to dispel the views of decreasing fertility between 1941 and 1951 and the accuracy of the reported census figures. The distributions for East Pakistan show smaller proportions at 10-14 than at the younger age groups, especially in the case of females. The distributions for West Pakistan give slightly smaller proportions at 5-9 than at 0-4 and very large proportions at 10-14 (Table A-I). Not only are these distributions not wholly consistant with the hypothesis of a decline in the birth rate, but it is impossible to imagine short-range fertility patterns that could produce these results.

The peak at 10-14 in West Pakistan in 1951 does not show up at 20-24 in 1961 and is clearly the result of some form of error in the age distribution for 1951 (and not an indication of a decline in the birth rate prior to the census). It has been suggested that the relative overreporting of the 10-14's in 1951 results from enumerators reporting persons 12 and over as being under 12 to avoid having to ask additional questions on labour force status [9, pp. 377-405; 7, p. 56]. The 10-14 age group presumably was inflated by the inclusion of persons 15 years and over. While some of the overreporting of the 10-14's may be the result of age mis-statement on the part of the enumerators, it appears that much of it is due to some other form of error.
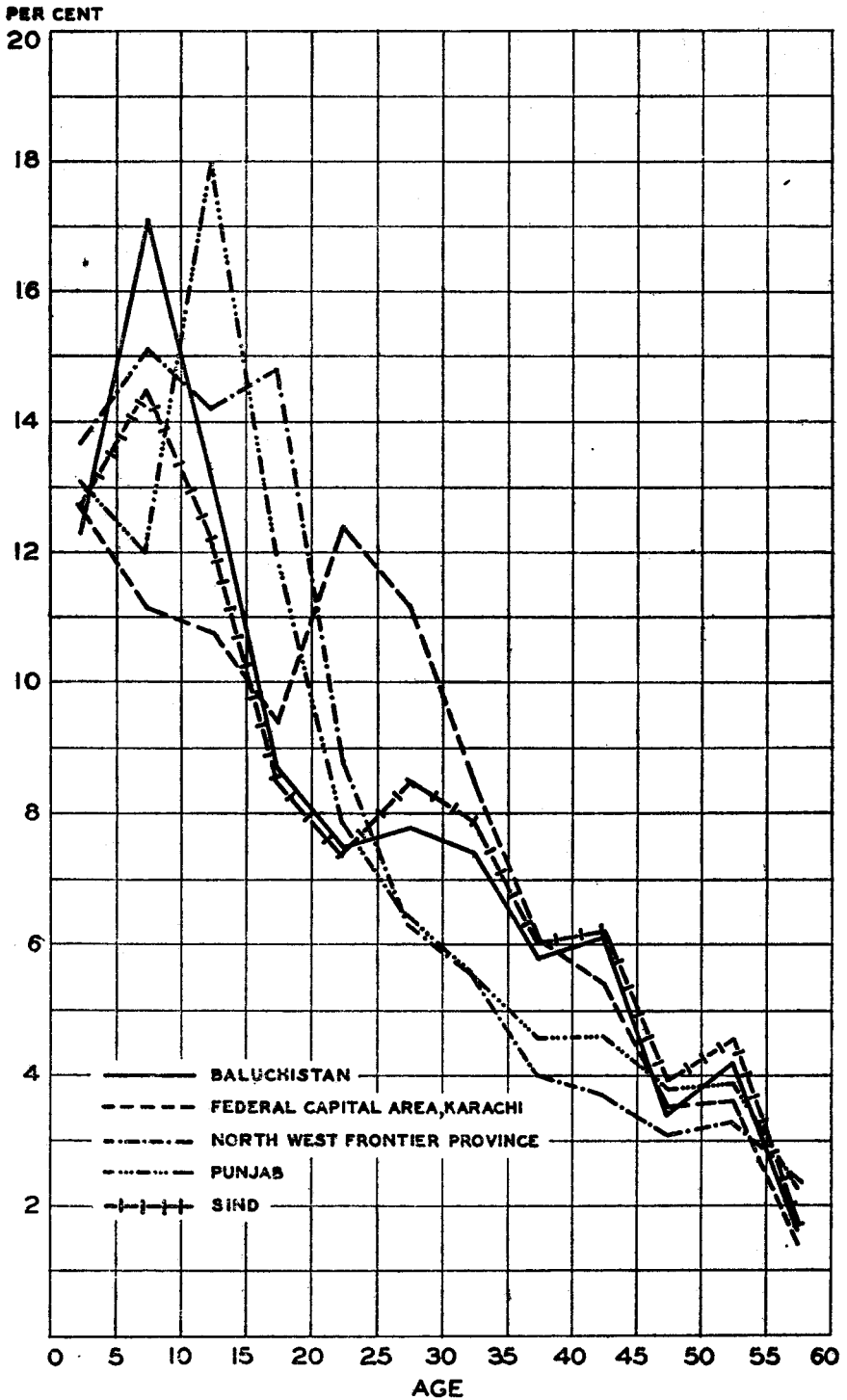
PER CENT

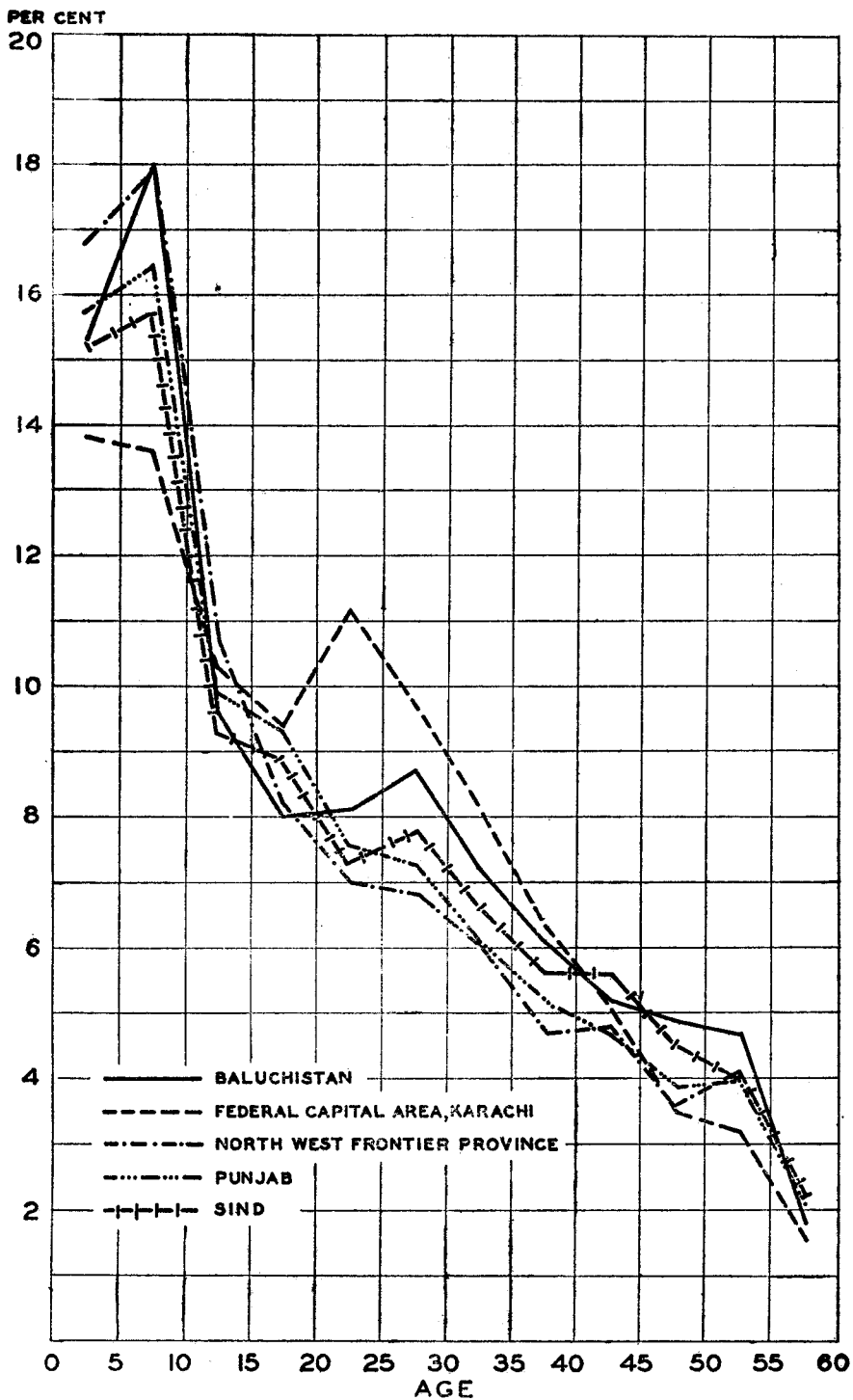Figure A-1. Male Age Distributions for Regions of West Pakistan, 1951

Figure A-2. Male Age Distributions for Regions of West Pakistan, 1961
(Based on 1951 Boundaries)

TABLE A-1

PER CENT DISTRIBUTION OF EAST AND WEST PAKISTAN BY SEX: 1951 AND 1961

Age group	1951				1961			
	East Pakisan		West Pakistan		East Pakistan		West Pakistan	
	Male	Female	Male	Female	Male	Female	Male	Female
All ages	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0-4	13.9	15.4	13.0	14.6	17.4	19.1	15.6	17.3
5-9	14.5	15.3	12.9	13.4	18.5	19.0	16.3	16.5
10-14	13.5	11.7	16.2	16.5	9.9	8.3	9.9	9.4
15-19	9.4	10.6	11.5	12.7	7.3	8.1	9.0	8.8
20-24	7.8	8.8	8.1	8.1	6.9	8.1	7.7	7.9
25-29	7.7	8.4	7.0	6.0	7.6	2.8	7.5	8.0

First, if the 15-19's were erroneously reported as 10-14, the former age group should be quite small; the age distribution does not bear out this contention. In fact, the proportion in the age group 15-19 is greater in West Pakistan than in East Pakistan although the over-reporting at 10-14 appears to be much greater in West Pakistan than in East Pakistan (Table A-I). Secondly, if the 15-19's were under-reported in 1951, the expectation would be for the 1951-1961 Census survival ratios to be unusually high. This expectation is not fulfilled—the survival ratios for East Pakistan appear to be approximately correct (*i.e.*, do not indicate any relative undercounting) whereas the ratios for West Pakistan are not only lower than anticipated but are even lower than the ratios for East Pakistan (Table A-2).

Lastly, a comparison of the age distributions for the regions comprising West Pakistan show that a peak at 10-14 is restricted to the former Punjab and within the former Punjab mainly to former Bahawalpur State and Lahore and Multan Divisions (Figure A-1)[1]. These regional and sub-regional comparisons also reveal a high degree of inconsistency among the various regions of West Pakistan, each region exhibiting its own idiosyncracies which are generally to be found in the sub-units of that region. The 1961 distributions show a much higher degree of similarity with one another (as do the sub-units of each region), and to that extent they are unlike the 1951 distributions or what would be expected on the basis of the 1951 distributions (Figure A-2)[2].

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1   Since the patterns for the two sexes are similar, figures are shown only for the males.
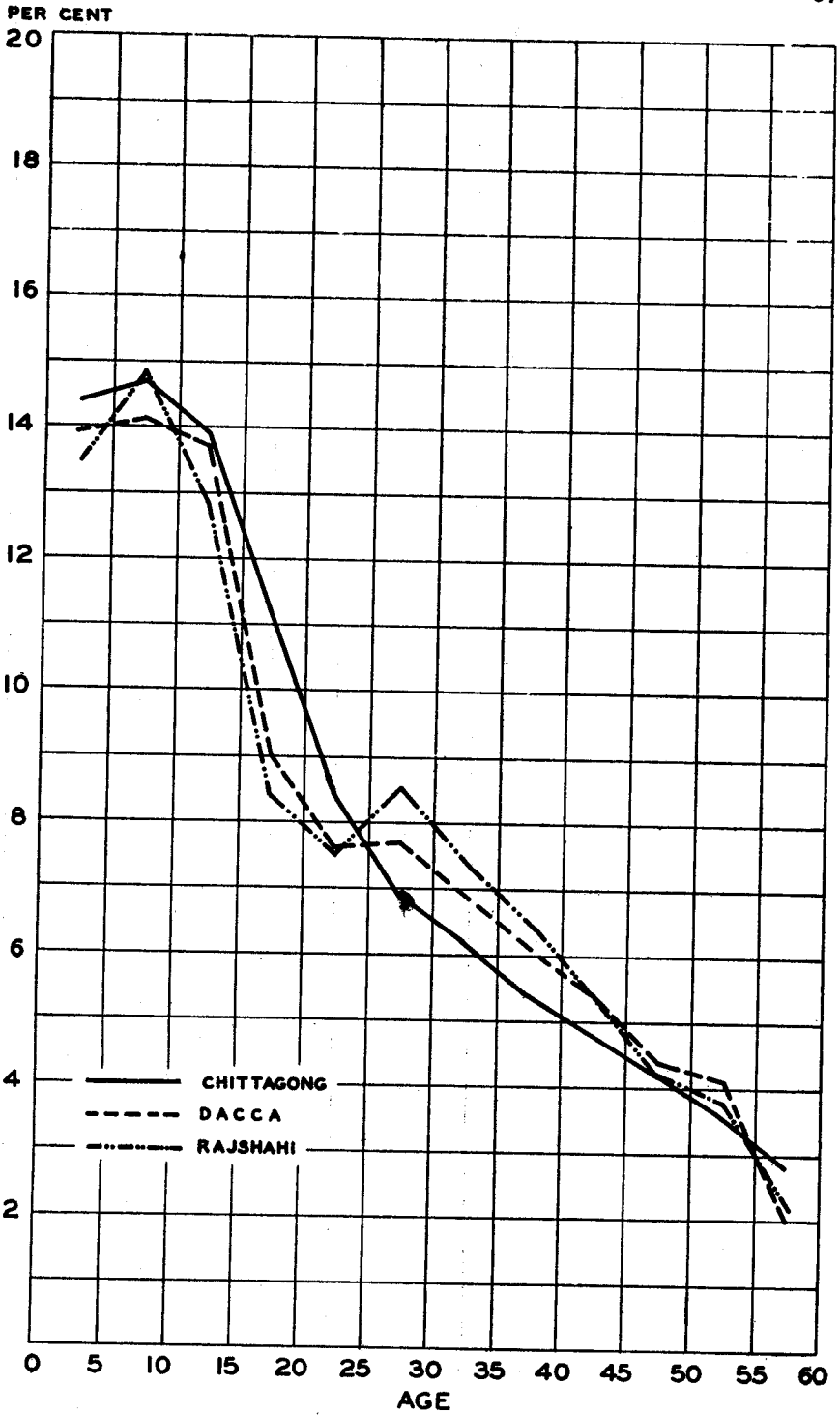2   The 1961 distributions refer to the regions as they were defined in 1951.

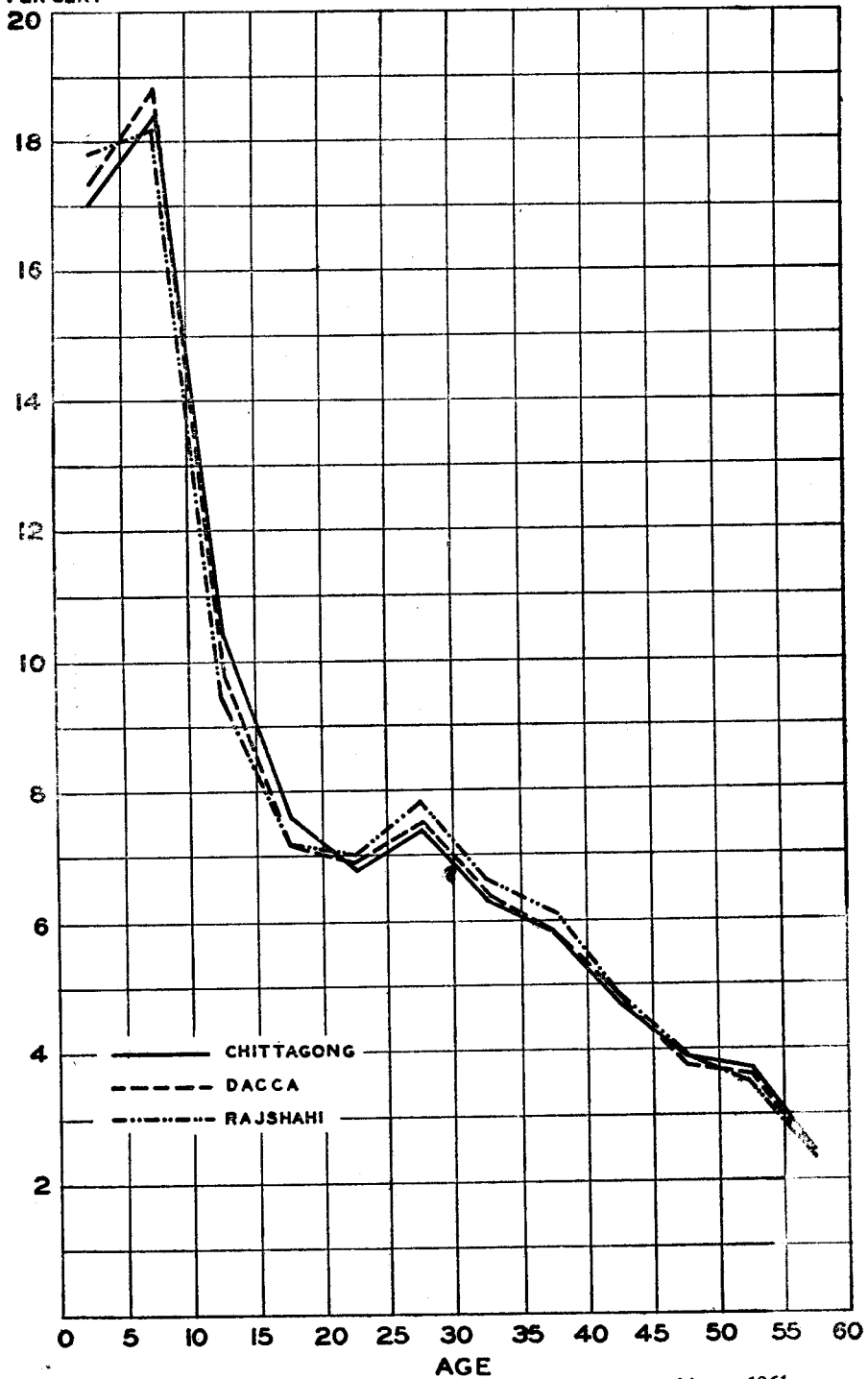Figure A-3. Male Age Distributions for Regions of East Pakistan, 1951

Figure A-4. Male Age Distributions for Regions of East Pakistan, 1961
(Based on 1951 Boundaries)

TABLE A-2

CENSUS SURVIVAL RATIOS OF EAST AND WEST PAKISTAN BY SEX: 1951-1961

Age group	East Pakistan		West Pakistan	
	Male	Female	Male	Female
0-4 to 10-14	.8581	.6628	.9619	.8200
5-9 to 15-19	.6048	.6474	.8887	.8401
10-14 to 20-24	.6174	.8498	.6032	.6112
15-19 to 25-29	.9704	.9449	.8227	.8012
20-24 to 30-34	.9886	.8766	.9818	1.0339
25-29 to 35-39	.9179	.7511	.9684	1.1139
30-34 to 40-44	.8335	.8241	1.0280	1.1514
35-39 to 45-49	.7663	.7288	1.0270	1.1032
40-44 to 50-54	.8265	.8446	1.0223	1.0437
45-49 to 55-59	.6518	.6727	.7132	.7392

The age distributions for the regions and sub-regions of East Pakistan show a high degree of similarity with each other in both 1951 and 1961 (Figures A-3 and A-4). The only exception (at both dates) occurred among the districts comprising Chittagong Division; in this instance, the age distributions for the various districts showed similar patterns, only at higher and lower levels, with the result that the distribution for the entire division is very close to the distributions for the other divisions.

The 1951-1961 Census survival ratios provide additional evidence of the relative inaccuracy of the census counts. The low ratios for those 0-4 and 5-9 in 1951 indicate that these age groups were overcounted relative to those 10-14 and 15-19 or conversely, that the 10-19's in 1961 were undercounted relative to those 0-9 in 1951. Since it is highly unlikely that the small size of the 0-9 age group in 1951 reflects an overcount, the low ratios probably result from the under-counting of those 10-19 in 1961. The somewhat higher ratios for West Pakistan (in conjunction with the shape of the age distributions) indicate that the counts of those 0-9 in West Pakistan in 1951 were less complete than the counts at these ages in East Pakistan.

These comparisons reveal the unreliability of the 1951 age distributions for West Pakistan; they also suggest that the peak at 10-14 in 1951 (found primarily in three divisions of the former Punjab in West Pakistan) is not the result of an
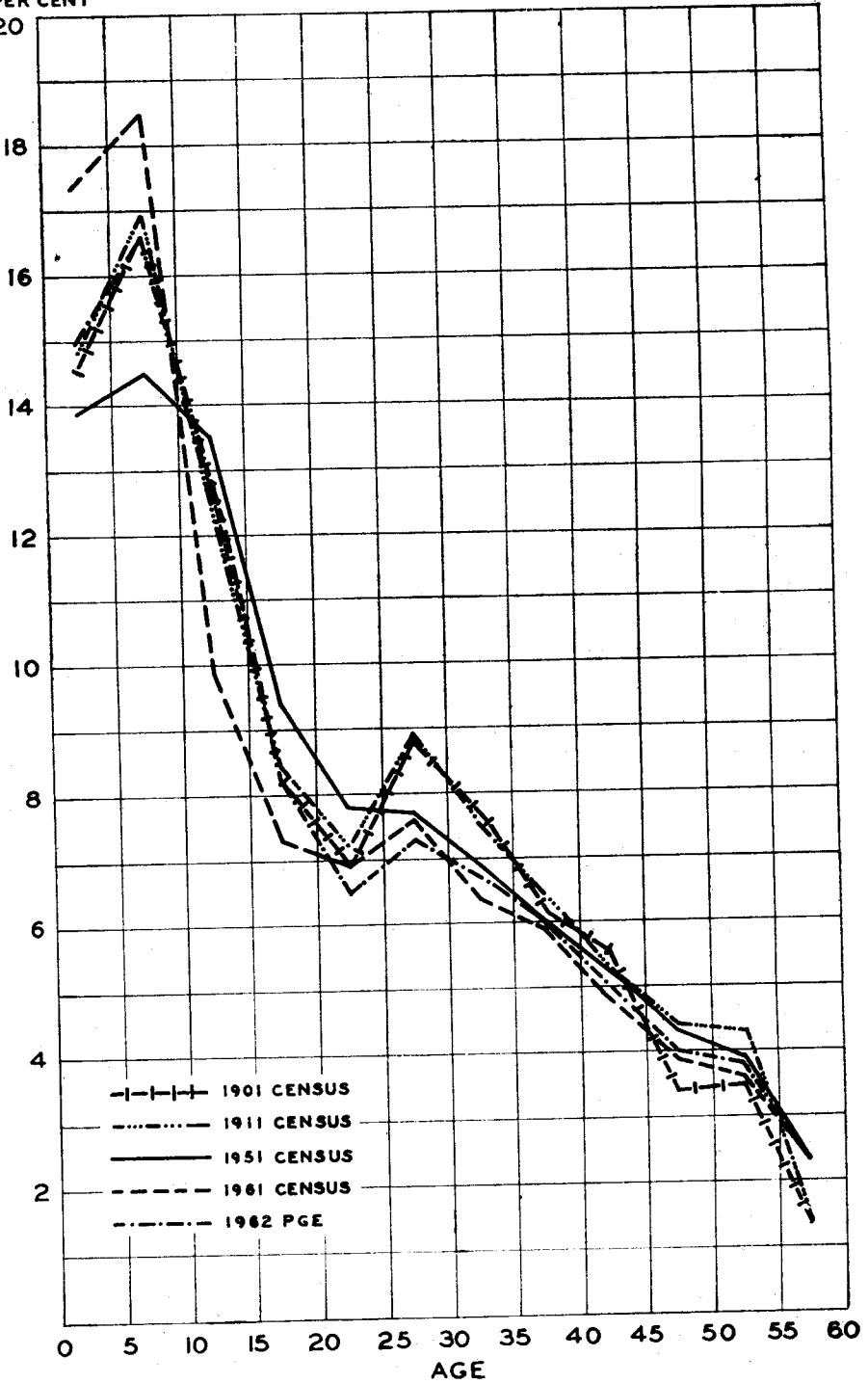
Figure A-5. Age Distributions for East Bengal Muslim Males, 1901, and 1911, and East Pakistan Males 1951, 1961 and 1962
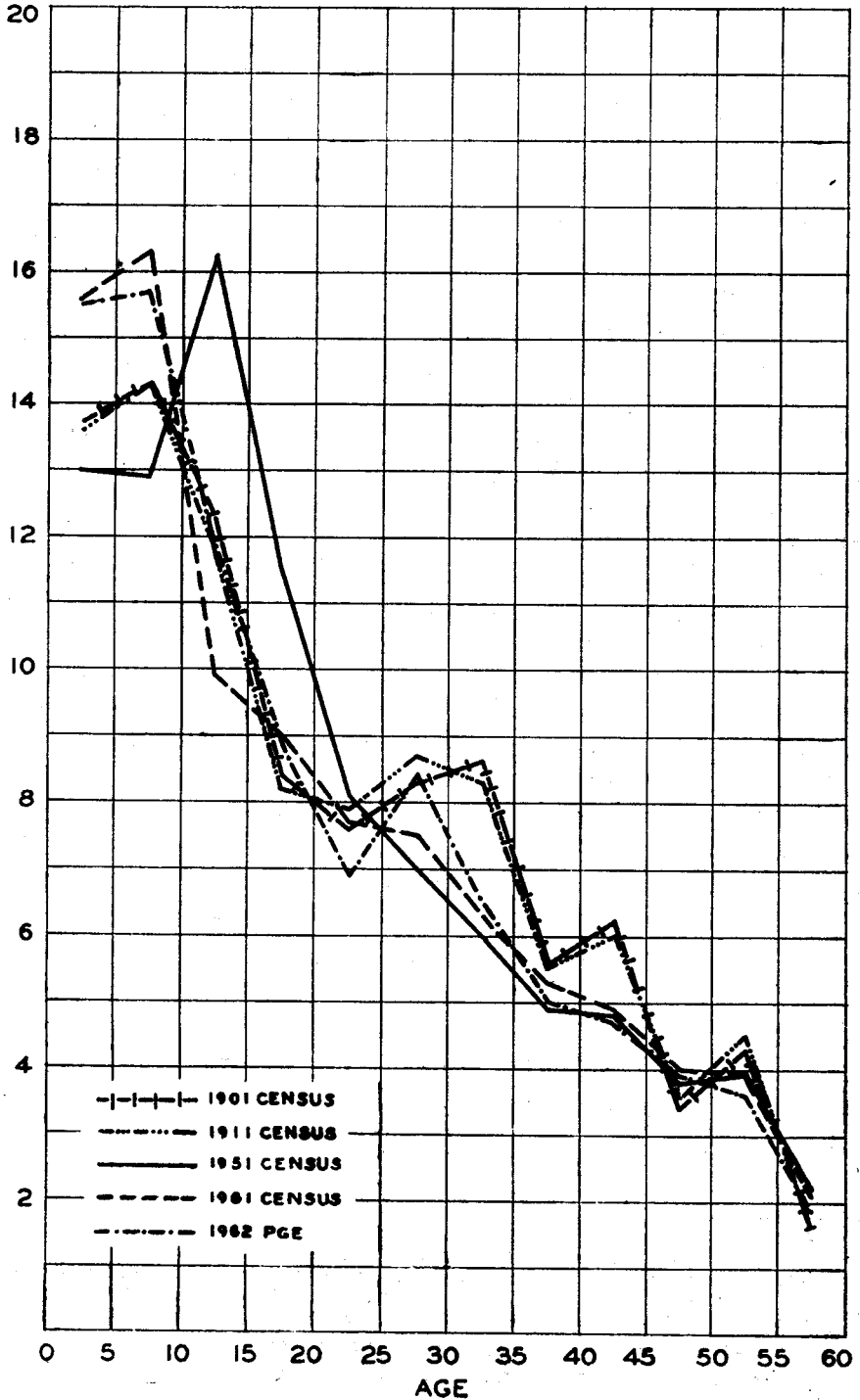
Figure A-6. Age Distributions for Combined Muslim Male Population of Punjab, N-W.F.P. and Bombay, 1901 and 1911, and West Pakistan Males, 1951, 1961 and 1962.

undercount of those 15-19 (in 1951) but rather of some other source of error. Two other inferences can be drawn which suggest the inadequacies of the 1951 and 1961 distributions for East Pakistan as well as West Pakistan. First, the large proportions at 0-9 in 1961 are probably the result of misreporting at these ages persons who should have been enumerated as being 10-19[3], instead of indicating a falling birth rate in the 1940's and a rising birth rate in the 1950's. Secondly, the small proportions at ages 0-9 in 1951 are probably the result of the relative undercounting of this group rather than the result of a falling birth rate[4].

One other set of comparisons indicates the defects of the census age distributions and the relative superiority of the PGE distributions. The 1891, 1901, and 1911 age distributions, for the populations at these dates comparable to East and West Pakistan[5], reveal a high degree of similarity over time, indicating a stable rate of growth. The 1951 age distributions differ from these earlier ones mainly by the smaller proportions at the young ages. If the 1951 distributions were accurate, the lower proportions at ages 0-9 would reflect a considerably lower birth rate than had prevailed from 1891 to 1911. However, as the previous sections of the appendix have attempted to show, the deficits at the early ages in 1951 are a reflection of undercounts rather than a low birth rate. The 1961 age distributions also differ from the earlier ones but in the opposite direction from the 1951 age distributions, *i.e.*, the 1961 distributions show much larger proportions at the young ages than do the earlier distributions. Since the estimated birth rate for 1911 was extremely high, and since it is impossible to imagine conditions that would lead to a higher birth rate in 1961 than in 1911, the large proportions at the young ages in 1961 undoubtedly reflect an error. Unlike the 1951 and 1961 Census age distributions, the PGE distributions are very similar to the distributions for the earlier censuses (Figures A-5 and A-6).

Comparing the cumulative age distributions leads to the same conclusions. The cumulative 1961 Census age distributions show higher proportions than the cumulative PGE age distributions up to age 25; above age 25, the two distributions are approximately equal. The differences below age 25 and the convergence from there on indicates the overcounting in the 1961 Census of the young ages (0-9) at the expense of those 10-19 or 10-24. The 1951 Census cumulative age

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    3 · The 1961 Census included questions on labour force status which were to be asked of persons 10 years and over; to avoid having to ask these additional questions, enumerators presumably classified persons 10-19 as being under 10; *see* [9, p. 395; 7, p. 56]. The evidence pertaining to the effect of these additional questions on labour force status is more consistent and greater for the 1961 Census than for the 1951 Census.

    4   For additional evidence relating to these inferences, *see* below.

    5   *See*, footnote 16 in the main text for the populations referred to here.

distributions have smaller proportions below age 20 in the case of East Pakistan and below age 10 in the case of West Pakistan. After these ages, the 1951 distributions are consistently greater than the PGE distributions. The differences are especially noticeable for West Pakistan. These differences suggest not only the undercounting of the young ages in the 1951 Census but also the excessively large counts above age 10.

(*Editor's note:* A further discussion of the applicability of stable and quasi-stable population models to the estimation of Pakistan's growth rate by members of the PIDE'S demographic staff will appear in a forthcoming issue of this *Review.*)