Examining the Sex Ratio in Pakistan

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Introduction

The use of the ratio of a country's female population to its male population (the sex ratio) as a measure of its level of sex-based discrimination really began when Amartya Sen first investigated the sex ratio in Kynch and Sen (1983). Interest in the sex ratio picked up when Sen coined the phrase "missing women" in Sen (1990). In this paper, Sen used sex ratios in countries[i] particularly affected by sex-based discrimination to calculate the number of women who would be alive in these countries today in the absence of such discrimination. He calculated that 107 million more women would be alive today, if not for sex-based discrimination in terms of excess female mortality. This figure was revised downward during the nineties (in Coale 1991 to 60 million and Klasen 1994 to 89 million), but the most recent research on the subject (Klasen and Wink 2002) brings the number back up to 101 million by including previously unexamined countries[ii]. In any case, the magnitude of even the lowest of these estimates demonstrates the considerable implications of an unusually low sex ratio[iii]. Emphasizing this point, Klasen and Wink write that the figure of 101 million "exceeds the death toll of both World Wars combined ... [and] the currently ongoing AIDS pandemic."

This paper narrows the scope of the investigation of the sex ratio to one country: Pakistan. Sen's assessment of Pakistan as having the largest percentage of missing women has remained robust to recent research, although the actual value of the percentage has decreased from 9.1% to 7.8%. The number of missing women in Pakistan given by Klasen and Wink is 4.9 million. As of the most recent census (1998), Pakistan's overall sex ratio was 925 females per 1000 males.

As the first investigation of the sex ratio in Pakistan specifically, this paper divides its attention between two main tasks. First, the paper seeks to provide a descriptive account of the sex ratio in Pakistan. This involves an investigation of geographical variation in sex ratios across districts. Similar data from India is provided for comparison purposes. Also, data from the 1961, 1972, 1981, and 1998 censuses allow us to roughly examine trends in the sex ratio through time. Second, the paper provides regression analysis of determinants of variation in sex ratios. This analysis is intended to be comparable to similar studies done of India (for example, Kishor 1993 and Murthi et al 1995), which form the bulk of country-specific analyses of sex ratios.

The main finding of this paper casts doubt on the utility of these studies' approach in the Pakistani context. Many of the studies of India focus on sex ratios or sex-biased mortality in the 0 to 5 or 6 age range. However, in this paper, one finds that there is actually very little variation in the sex ratio for this age and that the variation that exists is not consistent with trends at later ages. Thus, investigation of sex bias for later age groups seems to be the direction to follow. Also, rural sex ratios tend to be higher than urban; a fact that is largely explained by sex-biased migration explains the variation.

Finally, from regression analysis for later age groups, we find a number of surprising results. Unlike in the Indian context, male education increases sex ratios while female education decreases them. Also, the percentage of Muslims in an area decreases sex ratios, which is surprising, given that Pakistan's population is over 95% Muslim. Finally, one finds that exogamy has a positive effect on sex ratios. Exogamy is marriage outside of the area of one's birth and, in the Indian case, it is thought to be associated with anti-female cultural bias. The number of differences vis-à-vis the Indian case suggest that further research is needed to understand the Pakistani case in its own right. This is especially important, given the severity of the effects of anti-female bias in India, as demonstrated by its 4.9 million missing women.

The paper is organized as follows. Section I details the main findings from the previous literature on sex ratios. Section II provides cross-sectional and time-series descriptions of the sex ratio in Pakistan. Section III presents the results of regression analysis of the causes of variation in the sex ratio within Pakistan, beginning with a description of the model and data and continuing with a presentation of the results. Section IV concludes.

Section I: Literature Review

Previous studies of the sex ratio can be readily separated into two groups. The first follow directly in Sen's footsteps, attempting to arrive at a satisfactory count of the number of missing women in the world. The second are country-specific studies of the determinants of variation in the child sex ratio (generally ages 0 to 5 or 0 to 6) or in other, more direct measures of sex-based discrimination, such as differential mortality rates (again, generally in childhood). Many of these focus on India, which provides high-quality data that is readily available for a very large of number of observations. This is practical for our purposes, given the cultural and administrative similarities between the two countries.

Missing Women

The literature on missing women is useful insofar as it provides us with the means to make comparisons between Pakistan's sex ratio and trends at the global level. Furthermore, identifying the number of missing women in a given area can be a useful measure of the implications of sex-based discrimination in that area. One may not be interested that an area has an unusually high sex ratio if that area has hardly any people in it.

Coale (1991) provided the first critique of Sen's estimate. Sen's original calculation is based on the number of additional women in the population if areas experiencing sex-based discrimination were to have sex ratios identical to those found in Sub-Saharan Africa, which Sen assumed to be discrimination-free. However, these populations tend to have higher sex ratios at birth than is common in the rest of the world, providing an inflated estimate. Coale replaced Sen's "expected" sex ratio at birth with one based on the sex ratio at birth in high-income countries and used Coale, Demeny, and Vaughan's (1983) Model Life Tables[iv] to calculate the expected sex ratio for various age groups. He then applied this methodology to the countries in Sen's analysis to determine a revised (and diminished) figure.

Klasen (1994) further revised this figure, arguing against Coale's assumption of a single sex ratio at birth. Klasen showed that sex ratios at birth tend to decrease with improvements in general health conditions, since males tend to suffer disproportionately from miscarriages, spontaneous abortions, and stillbirths. Thus, the expected sex ratio at birth will be higher in high-mortality regions, such as Pakistan. This raises the number of missing women from these areas. Klasen also revises Coale's choice of comparison group within the Model Life Tables.

Finally, Klasen and Wink (2002) revises the methodology of Klasen (1994) with new data. To determine each country's predicted sex ratio at birth, Klasen and Wink run a regression of sex ratios at birth from around the world as given in the UN Demographic Yearbooks (omitting the problematic Sub-Saharan African data) on life expectancy. The estimates prove to coincide almost perfectly with the stated sex ratios at birth for countries with low levels of sex-based discrimination (Sri Lanka, for example). However, they differ significantly from those of Pakistan and India.

The estimates (.9594 for Pakistan and .9626 for India) are likely to be a more accurate estimate of what the sex ratio "should be" in these cases, since official figures may be skewed by sex-biased underreporting and sex-selective abortion. The greater dependability of Klasen and Wink's predicted sex ratio at birth is underscored by the fact that Pakistan's official sex ratio at birth, as given by the sex ratio for individuals under the age of one, changed from 1.0134 in 1981 to 0.9530 in 1998. This is a far greater fluctuation than one would expect from the modest increase in life expectancy from 55 to 62 over the same period and casts doubt on the official statistics (World Bank 2004, Feeney and Alam 2003).

Country-Specific Studies

As mentioned above, India-based empirical studies of the determinants of low sex ratios or excess female mortality tend to concentrate on early childhood, in the age range of 0 to 5 or 0 to 6. Concentrating on the child sex ratio simplifies the analysis of determinants of sex-biased discrimination, as one need not be concerned with sex-specific migration of children. Children might migrate with their parents, but one would not tend to believe that family migration would affect male and female children differentially. One would think that either all children or no children migrate. Similarly, in investigating the child sex ratio, one does not need to consider behaviors in adulthood that may lead mortality rates to differ significantly by sex.

Furthermore, it can be argued that the child sex ratio provides a more accurate barometer of sex-based discrimination, since differential mortality among the sexes is likely to be a function of choice on the part of parents rather than choice on the part of the individual. Discrimination through parental choice can come in the form of allocation of nutrition or medical treatment that differs by sex as well as in the more naked forms of sex-selective abortion or infanticide[v].

However, the choice to set the upper bound of the analysis at 5 or 6 is certainly debatable. Dependency clearly goes on for more than six years. There may be an implicit assumption that, by the age of 6, most discrimination-based differential mortality has already occurred, since it is assumed that parental choice is explicit. That is, that differential mortality is a result largely of sex-selective abortion or infanticide. However, there has been some objection to the idea that sex-biased mortality ends at the age of 6. Agnihotri (2000) shows, using the 1981 Indian Census, that the sex ratio for 5- to 9-year-olds are considerably lower than for 0- to 4-year olds (.976 and .942, respectively). Sen (1987) uses data from the 1981 Indian Census to show that age-specific mortality rates remain significantly higher for females until they reach their mid-thirties. Klasen (1998), using genealogy data from village clusters in 17th to 19th century Germany, suggests that excess female mortality in adulthood cannot solely be attributed to an increase in female mortality during the child-bearing years due to the dangers of child-birth. We will see that the Pakistani evidence tends to support these studies.

Nonetheless, it is worth discussing the results of studies of sex-based discrimination in childhood. These have concentrated on the effects of four main explanatory variables: female labor force participation, female education, poverty, and fertility. The effects of female labor force participation have been the most consistent through studies. For example, Rosensweig and Schultz (1982), Murthi, et al. (1995), and Kishor (1993) all find a positive effect on the sex ratio from increased female labor force participation. The explanation here is simple. In areas where females are participating in the labor force, they are more economically valuable than in areas where they are not. Thus, parents have less reason to prefer sons to daughters so treatment between the sexes should be more equitable.

Poverty is generally thought to be positively associated with the sex ratio (Dasgupta 1993, Murthi, et al. 1995, Basu 1993), but there have been results that see the two variables as negatively correlated (Agarwal 1986). The theory here hinges on the fact that a decrease in poverty could see one of two effects. First, the improved opportunities that accompany a decrease in poverty (in health care, for example) make discrimination unnecessary as families do not have to choose only one or a few of their children to privilege (to treat, to follow the example of health care), increasing the sex ratio. In the second effect, these improved opportunities accrue only to the male children, decreasing the sex ratio.

Female education, too, sees a divergence in results. There is a consensus that education (both female and male) is associated with lower child mortality. As with poverty, it is a question of which decrease is larger: that of female mortality or that of male mortality. Kishor (1993) finds that increasing male education decreases male mortality by a greater amount than female mortality, leading to a decrease in the sex ratio. As for female education, Bourne and Walker (1991), Murthi, et al. (1995), and Kishor (1993) all estimate a positive effect on the sex ratio from increased female education. The explanation given by Bourne and Walker is that increased education for women results in increased feelings of autonomy on the part of women. Increased autonomy of thought might lead women to think more critically about the role of other women in society, including their own daughters, whom they would be more likely to treat equally. The assertion of a change in preferences due to education is certainly contestable, so one is not too surprised that Basu (1992) estimates a negative relationship between education and sex ratio.

He notes that the effect operates in different ways between North and South India, with education being associated with lower sex ratios in the North and higher sex ratios in the South. There are significant cultural differences in the treatment of women between North and South India, including greater discrimination against women in the North, which translates to lower sex ratios (see Figure 5). Basu concludes, "the hold of culture is strong and cannot be released with simple literacy and basic education. The relevant elements of this culture are the traditional inhibitions which often make it difficult to have a girl examined, especially by a male doctor, and the conservative female life-style which limits the economic worth of women." Simple education cannot erase the cultural differences between North and South India.

Section II: Descriptive statistics

Cross-section analysis: National and Provincial level

We begin our descriptive analysis with an examination of variation across age cohorts. Immediately, we see that the assumption that the majority of sex-biased mortality takes place before the age of 6 is called into question. Table 1 shows that the overall sex ratio (females to males) is lower than the child sex ratio (ages 0 to 6). It is important to remember that the child sex ratio and overall sex ratio are measured at the same time. Thus, we cannot draw conclusions on what the sex ratio of the 0 to 6 cohort will be in the future. One cannot then reject the assumption that sex-biased mortality takes place in the 0 to 6 age group before examining one of these cohorts through time, which we do later in our analysis. Also, a lower overall sex ratio could be caused by behavior rather than discrimination, a point that will be explored further on. Note, however, that the child sex ratio of 0.9450 is lower than the predicted sex ratio at birth of .9594 (sex ratio at age 0, roughly equivalent to sex ratio at birth is .9530 – very close to the predicted ratio), but perhaps not by as much as one would expect. This again suggests not all sex-biased mortality takes place between the ages of 0 and 6.

TABLE 1: Child versus overall sex ratio

	Child Sex Ratio (0-6)	Overall Sex Ratio
All Pakistan	0.9450	0.9216

Meanwhile, Table 2 shows that this difference is not driven by a large difference in one region, but, rather, that it shows up in all provinces except the Northwest Frontier Province (NWFP). Another interesting observation from Table 2 is that there is surprisingly little variation in the child sex ratio across provinces. All provinces are clustered around the range from .94 to .95. This is in contrast to the overall sex ratio, which shows a great deal of variation across the provinces. As we will do throughout this paper, we omit Federally Administered Tribal Areas (FATA) and Northern Areas due to lack of data.

TABLE 2: Juvenile versus overall sex ratio: by province

Province	Child Sex Ratio (0-6)	Overall Sex Ratio
NWFP	0.9397	0.9522
Punjab	0.9479	0.9326
Sindh	0.9408	0.8910
Balochistan	0.9479	0.8725
Islamabad	0.9505	0.8544

Another surprise is the difference in sex ratios between urban and rural areas. Generally, one would think that urban areas would be more progressive than rural areas. This is reflected in the literature, as one usually finds that urbanization has a slight positive effect on child sex ratios at the district level (Kishor 1993 Murthi et al 1995). However, Table 3 shows the unintuitive result that the overall sex ratio is actually lower in urban areas than it is in rural areas. Again, this phenomenon is not constrained to one province. Table 4 shows that this is true across all provinces, excepting Sindh.

TABLE 3: Overall sex ratio: urban versus rural

	Urban Sex Ratio	Rural Sex Ratio
All Pakistan	0.8917	0.9369

TABLE 4: Overall sex ratio: urban versus rural by province

Province	Urban Sex Ratio	Rural Sex Ratio
NWFP	0.8898	0.9207
Punjab	0.9213	0.9353
Sindh	0.9361	0.9258
Balochistan	0.8693	0.9159
Islamabad	0.8203	0.9234

One should not be too quick to disregard intuition and the conclusions of previous studies, however. The difference between these conclusions and the results presented here is that we are examining the overall sex ratio, rather than the child sex ratio. Table 5 shows what happens when one considers differences in the juvenile sex ratio as well as the overall sex ratio between urban and rural areas.

Table 5 shows that urban and rural sex ratios are very similar at early ages, just as they are across provinces. Again, the lack of variation in the child sex ratio suggests that sex bias may not end there. The divergence between urban and rural sex ratios only comes in when one considers the population as a whole. Table 6 shows that this is again a widespread trend. In all provinces, the difference between juvenile and overall sex ratios is greater in urban areas.

TABLE 5: Juvenile versus overall sex ratio: urban and rural

	Child Sex Ratio (0-6)	Overall Sex Ratio
All Pakistan: Urban	0.9488	0.8917
All Pakistan: Rural	0.9434	0.9369

TABLE 6: Juvenile versus overall sex ratio: urban and rural by province

	Urban			Rural		
Province	**Juvenile Sex Ratio (0-6)**	**Overall Sex Ratio**	**Difference**	**Juvenile Sex Ratio (0-6)**	**Overall Sex Ratio**	**Difference**
NWFP	0.9384	0.8838	0.0546	0.9512	0.9400	0.0113
Punjab	0.9508	0.9069	0.0439	0.9588	0.9468	0.0120
Sindh	0.9505	0.8774	0.0731	0.9588	0.9339	0.0249
Balochistan	0.9291	0.8468	0.0823	0.9903	0.9532	0.0371
Islamabad	0.9507	0.8203	0.1304	0.9524	0.9502	0.0022

One possible explanation for the divergence in the overall has males migrating to urban areas in adulthood, depressing the urban sex ratio. These males would migrate without their families, sending remittances back to relatives in rural areas. Table 7 explores this hypothesis. Interestingly enough, one finds not only that migration to urban areas is male-dominated, but also that migration to rural areas is female-dominated.

The difference lies in the reasons for migration. 38.3% of male migrants in all of Pakistan cited business or employment as the reasons for their migration. In comparison, only 2.7% of women did. Employment is an important driver of rural to urban migration, explaining the male-dominated inflow into urban areas. For women, the biggest reason given for migration was marriage (33.7% of female migrants). By contrast, only 1.1% of male migrants gave marriage as a reason. Marriage-driven migration would have little reason to differ between rural and urban areas, so it makes sense that, in the absence of male incentives to migrate to rural areas, females would dominate migration into rural areas. "Moved with household head" was a major reason for both males and females, but is associated with migration of entire households (ostensibly including a male head, spouse, and children), so should not affect the sex ratio of immigrants. Migrants are defined as persons for whom the district in which they currently reside is different from the district of their birth. This includes persons who have migrated to another district within the same province, but not persons who have migrated within a district. Immigrants are persons coming into a district different from that of their birth.

TABLE 7: Sex ratio for migrants: urban and rural

	Sex Ratio (immigrants)
All Pakistan: Urban	0.8373
All Pakistan: Rural	1.2194

Table 8 shows the results by province. One now sees that Punjab is responsible for the conclusion that rural immigrants are predominantly female. In Punjab, the immigrant sex ratio is above the overall sex ratio in both urban and rural areas, but drastically so in rural areas. The fact that Punjab has so many more female migrants is a result of Punjab's having by far the greatest level of exogamy of all that provinces, excluding Islamabad. Female migrants giving marriage as the reason for their migration make up 4.14% of the population of Punjab. The province with the next greatest percentage is Sindh, with 1.62%.

For the rest of the provinces, one sees that immigrants have lower sex ratios than the total population in both urban and rural areas, although the difference is greater in urban areas. Figures 1 and 2, showing the relationship between the percentage of immigrants in the urban and rural parts of a district, confirm this idea. In urban areas, shown in Figure 1, the greater the percentage of immigrants, the lower the sex ratio (coefficient of -.2456, significant at the 1% level). The relationship is insignificant in rural areas as shown in Figure 2. Note that migrants form a much smaller percentage of the population in rural areas. Nonetheless, there is no real trend for these small percentages.

TABLE 8: Sex ratio for immigrants: urban and rural by province

	Urban		Rural	
Province	**Sex Ratio (immigrants)**	**Overall Sex Ratio**	**Sex Ratio (immigrants)**	**Overall Sex Ratio**
NWFP	0.6765	0.8838	0.9362	0.9400
Punjab	0.9625	0.9069	1.3182	0.9468
Sindh	0.7370	0.8774	0.8927	0.9339
Balochistan	0.6053	0.8468	0.6094	0.9532
Islamabad	0.7503	0.8203	0.8608	0.9502

FIGURE 1: Relationship between proportion of migrants in urban areas and overall sex ratio (by district)

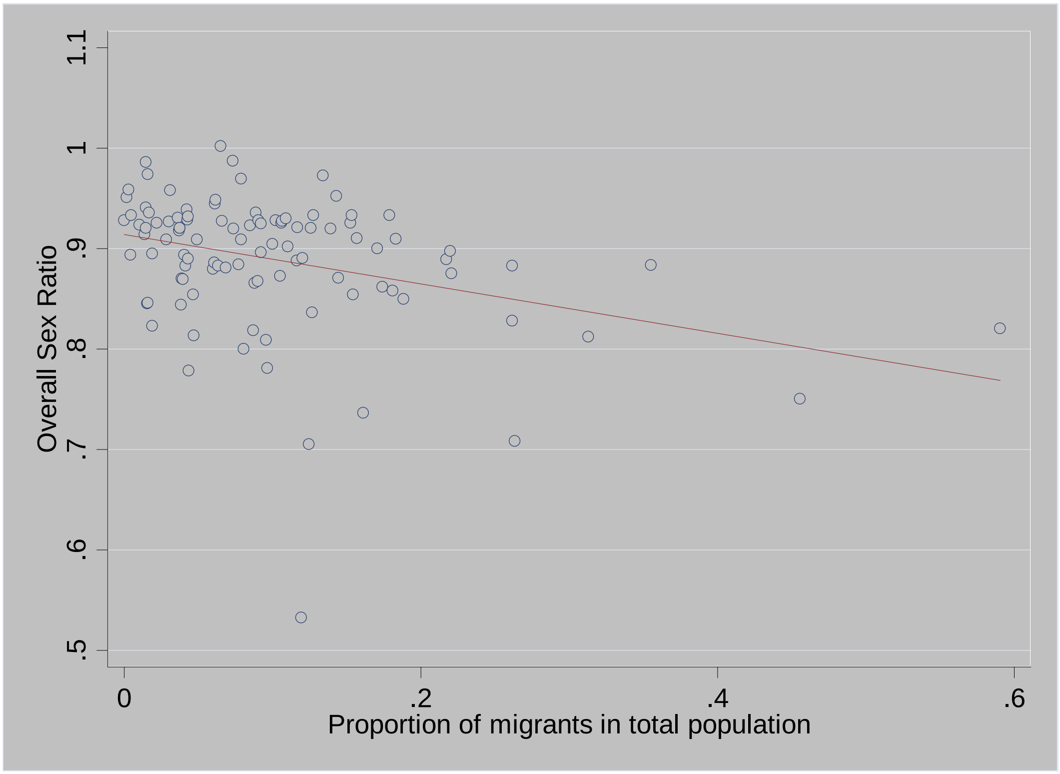
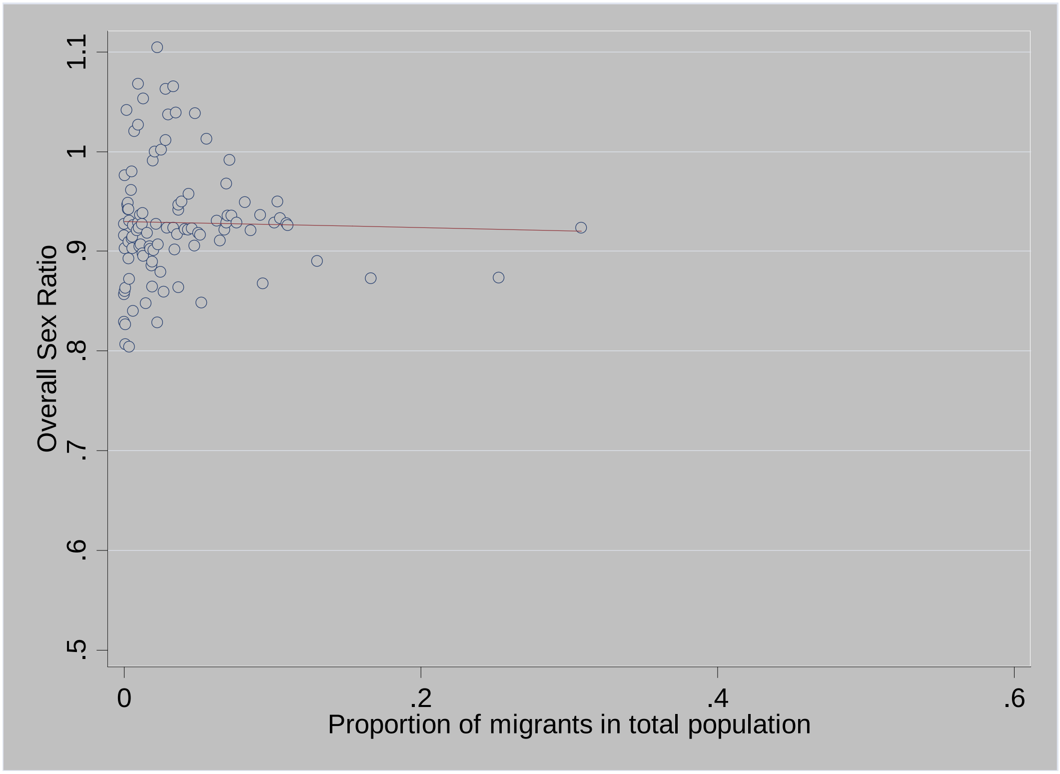


FIGURE 2: Relationship between proportion of migrants in rural areas and overall sex ratio (by district)



Examining the cohorts that seem to be of pre-migration age, we are able to get some idea of the trends in post-0 to 6 differential morality. Table 9 shows the sex ratio for the first three 5-year age groups in urban and rural areas. In both areas, we see the sex ratio drop as we advance in age cohorts, suggesting that the age of differential mortality continues considerably beyond age 6 (the usual cross-section caveat applies). Furthermore, this effect seems to be greatly amplified in rural areas, confirming our earlier intuition that rural areas may be less progressive than urban areas.

First, one could suggest that, for the 0 to 4 age group in 1998, sex bias has been reduced or now operates in a different way. This is possible, but may be overoptimistic. More likely, I think, is that sex bias now operates at later ages. The current 0 to 4 cohort may not have been suffering from sex bias in 1998, but, I would suggest, has probably experienced a decrease in its sex ratio since then.

TABLE 9: Sex ratio by age groups: urban versus rural

	Sex Ratio (0-4)	Sex Ratio (5-9)	Sex Ratio (10-14)
All Pakistan: Urban	0.9567	0.9337	0.9163
All Pakistan: Rural	0.9593	0.9035	0.8592

Cross-section analysis: District level

Figures 3 and 4 set up the district-level analysis section of the paper. Figure 7 shows a map of the population density of Pakistani districts while Figure 8 shows their respective levels of urbanization. Important points to bear in mind through the rest of this section are, first, that all of Balochistan is very thinly populated, even in its urban areas. As a result, we may not want to consider results from this province too heavily, since they have little impact on a national level. Sindh is also sparsely-populated with the exception of Karachi.

FIGURE 3: Population density (per km^2) by district

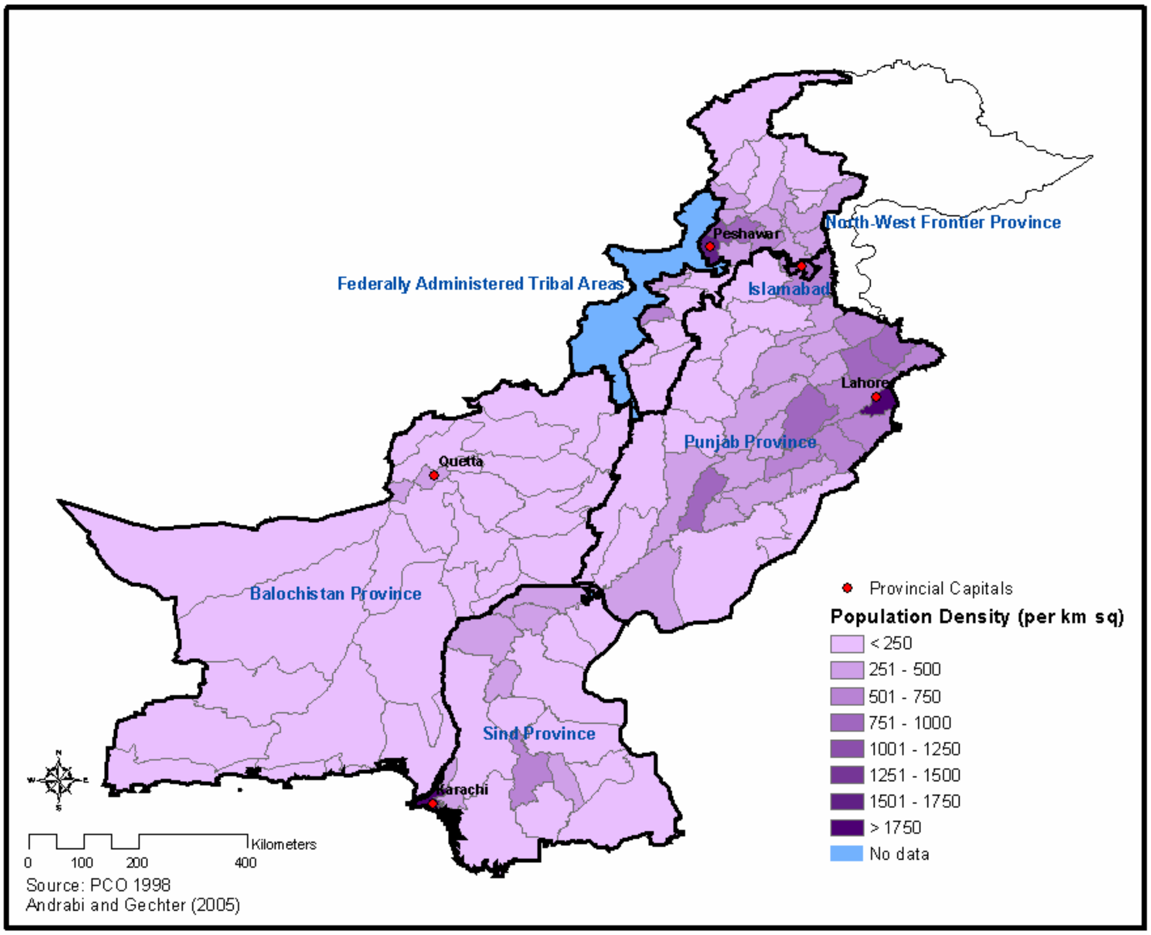
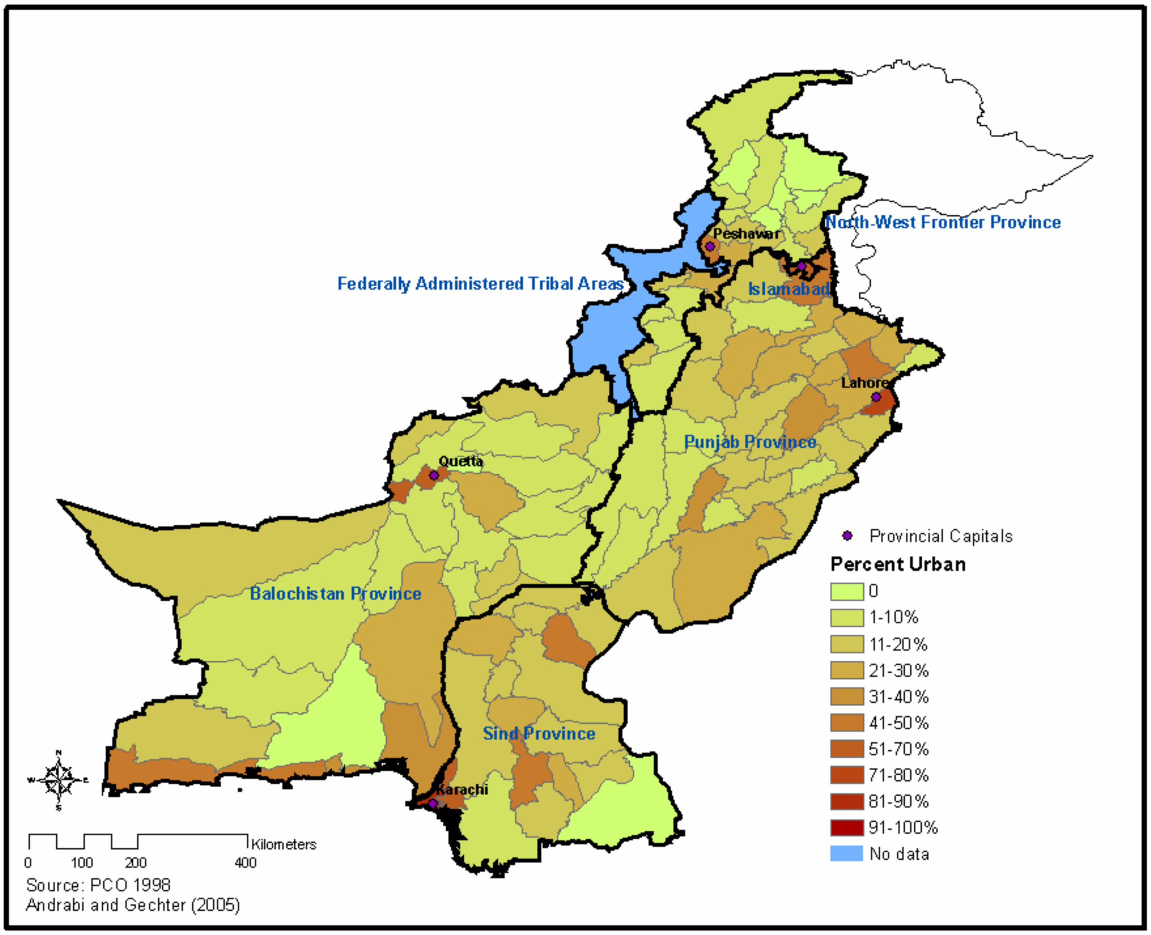


FIGURE 4: Percent Urban by district



Moving into the meat of the district-level analysis, Figure 5 confirms our observation from Table 2 in the context of districts. There is relatively little variation in the child sex ratio across districts. Punjab, in particular shows no variation across the whole province given the specified intervals. Recall that Balochistan, with the most variation, is also the most thinly-populated. The majority of the districts are in the tan area, which also includes Klasen and Wink’s predicted sex ratio of .9594. Those areas exhibiting high variance from the mean have low population density and low total population, as can be verified by examining Figure 3. These results are robust to decreasing the size of intervals to half standard deviations.

FIGURE 5: Child sex ratio (0-6) by district standard deviations

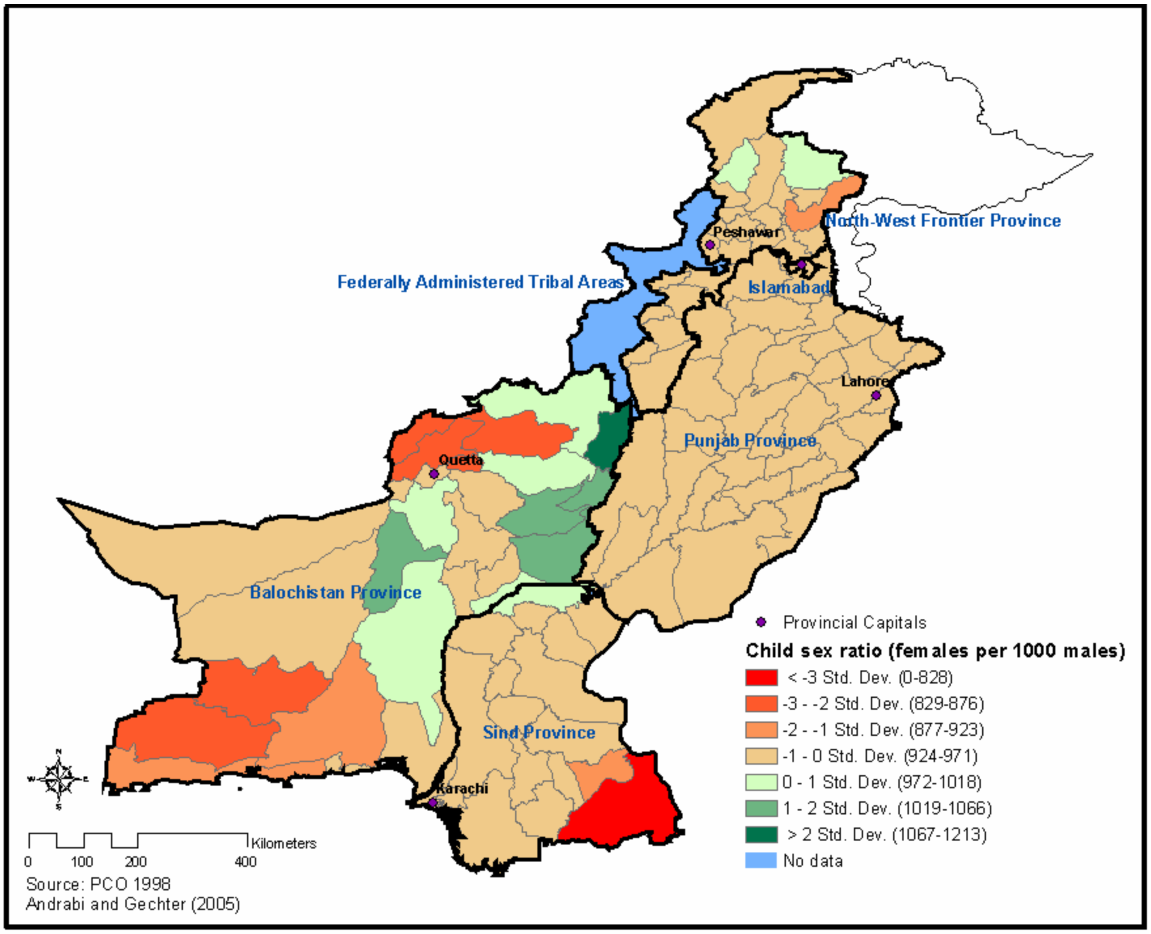


Figure 6, showing the overall sex ratio by district, tells a different story. The map uses the same intervals for comparability, but the results are drastically different. There is now substantial variation across districts, even within provinces. As one would expect from Tables 1 and 2, the sex ratios are also generally lower. One interesting point is that, in Northern Balochistan, the areas where sex ratios were above the district mean for the child sex ratio are now far below the mean. Also interesting is the presence of a region in northern Pakistan, encompassing Punjab and NWFP where sex ratios are above the child mean. These are largely rural areas (see Figure 4) who could be feeding their male population to the large cities of Islamabad and Lahore in the same region. Unfortunately, emigration data are not available by district, so one cannot test this idea.

FIGURE 6: Overall sex ratio

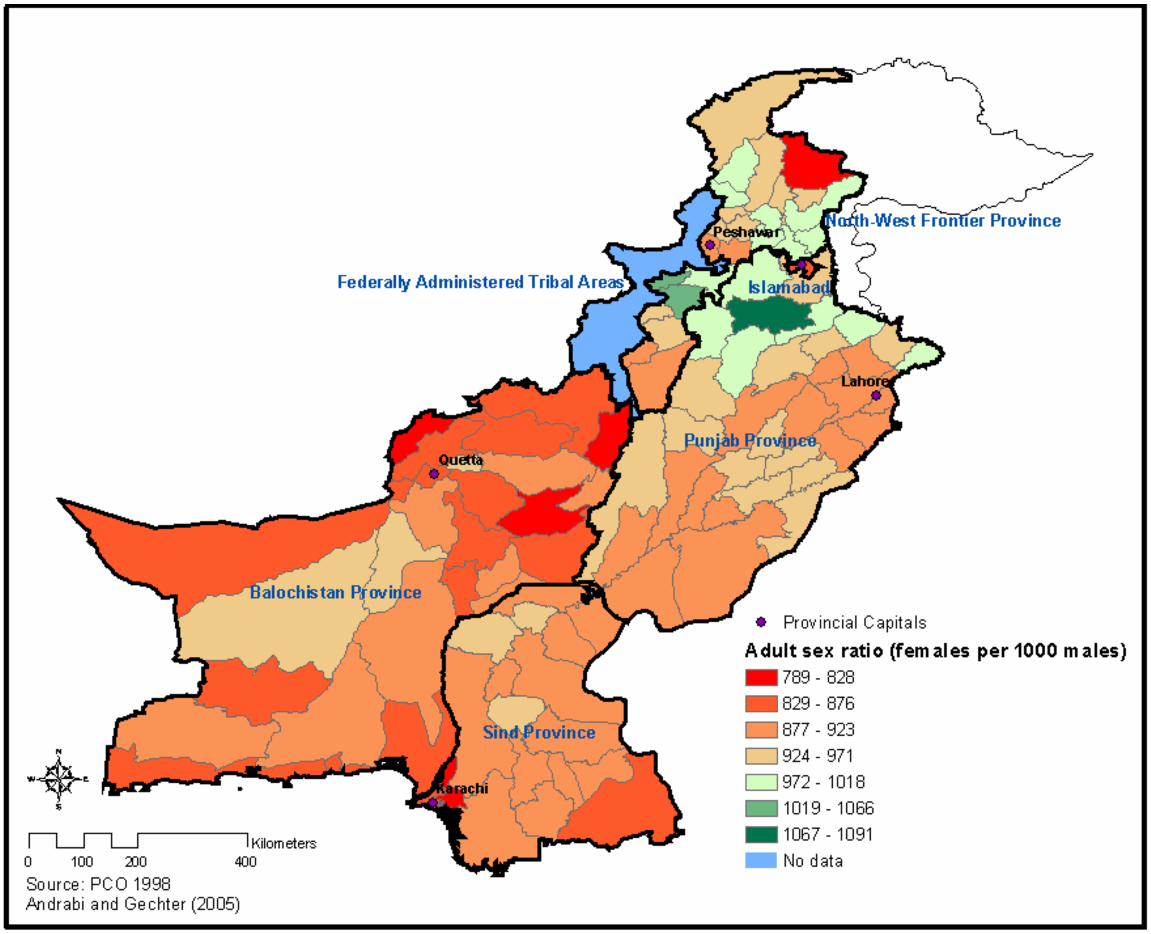


Figure 7 shows the child sex ratio in India and Pakistan with the intervals given by standard deviations of Pakistani district data for comparability. This gives us our first opportunity to compare India and Pakistan. The Indian data used here comes from the 2001 census. The map is intriguing.

The overall variation in the 0 to 6 sex ratio across districts appears similar between the two countries with a standard deviation of .0477 for Pakistan versus 0.0490 for India. However, weighting each observation by 0 to 6 population, to control for the fact that high-variance districts in Pakistan tend to be low-population, eliminates this result. Now India shows considerably more variance, with an only slightly diminished standard deviation of .0442 as compared to Pakistan's highly-diminished figure of .0283. Figure 7 confirms this as the districts in India that show high variance (on the low end) are clustered around the highly-populated northwestern states of Haryana and Indian Punjab. This suggests that analysis of the sex bias in early childhood may not be misplaced in India, since there appear to be substantial and varied effects for that age group.

The geographical discontinuity in sex ratio trend between Indian and Pakistani Punjab is surprising and intriguing, especially given that these two areas were unified under British rule, suggesting some similarity in administrative fixed effects. Indian Punjab displays very low 0 to 6 sex ratios while neighboring Pakistani Punjab's districts all have sex ratios in the range that encompasses the expected sex ratio at birth. Indeed, the border represents geographical discontinuity to a far greater degree than one would expect. Like Punjab, Haryana, and, to a less extent, Rajasthan display drastically lower sex ratios than neighboring areas in Pakistan.

FIGURE 7: India and Pakistan child sex ratio (0-6) by Pakistani district standard deviations

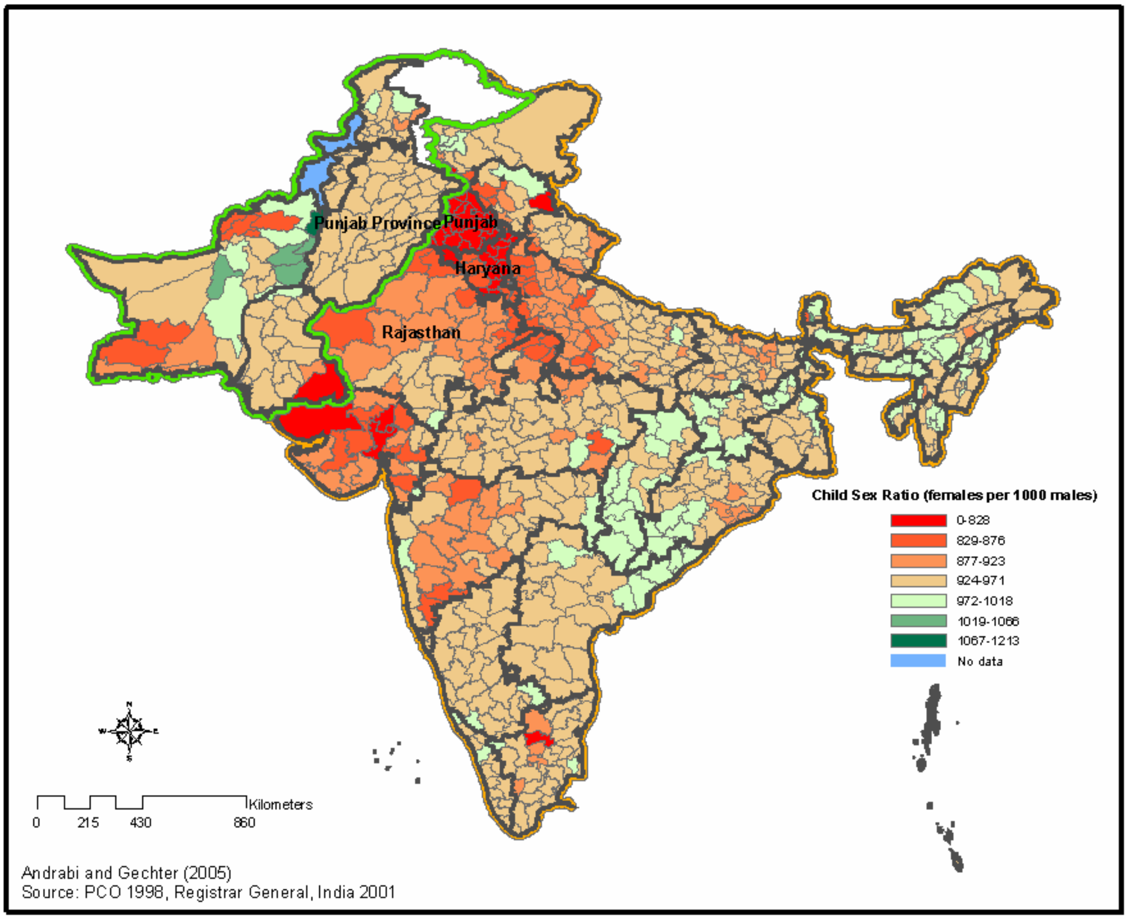
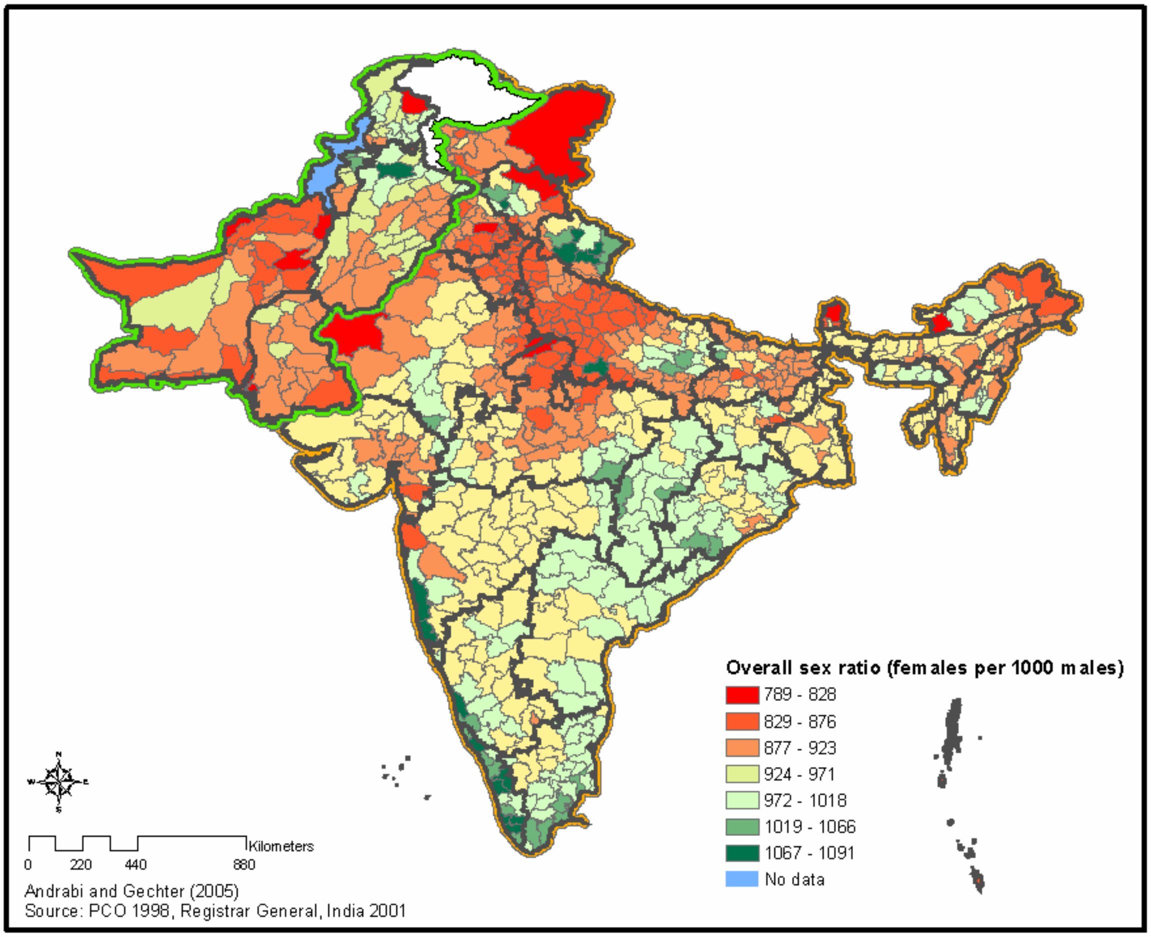


Figure 8, showing the overall sex ratio for both countries, demonstrates that this "border effect" is transitory. Overall sex ratios appear to be roughly continuous across the border, without the kind of geographical discontinuity that one observed in the map of child sex ratios. As sex ratios in Pakistani Punjab worsen, sex ratios in Indian Punjab, Haryana, and Rajasthan improve. Given that males are prone to higher mortality in youth, adolescence, and old age, this is the trend that one would expect. The Pakistani trend of relatively little sex bias in early childhood and worsening overall sex ratios is surprising. Again, this validates the study of early childhood sex bias in the Indian case.

FIGURE 8: India and Pakistan overall sex ratio



The final two district-level maps, Figures 8 and 9, show the number of missing women in each district according to Sen's simple calculation based on the sub-Saharan African sex ratio (updated for the most recent sex ratio for that region) and Klasen and Wink's most recent calculation. The results are unsurprising. The number of missing women map looks very similar to the population density map (Figure 3). Since the number of missing women is found by multiplying the expected female-to-male sex ratio by the number of males in the district, more populated areas should have higher numbers of missing women. Sen's calculation, based on a population that tends to have higher sex ratios than average, tends to overstate the number of missing women, and this is borne out in the maps. Sen's calculation estimates more missing women for each district than Klasen and Wink's. Calculations at the provincial level are shown in Table 10 and give the same result. "Percentage missing" is calculated by taking the number of missing women in a district and dividing it by the total number of women in the district.

It is again interesting to note the grouping of districts with "negative missing women" in the northwestern part of the country. A district's having negative missing women means that the number of women in this district is greater than would be predicted by the expected sex ratio. Again, this could be a factor of male migration to the large cities in this region.

TABLE 10: Missing women by province (Sen and Klasen and Wink calculations)

Province	Missing Women (Sen calculation)		Missing Women (Klasen and Wink calculation)	
	Number	**Percent Missing**	**Number**	**Percent Missing**
NWFP	552,383	6.4%	406,960	4.7%
Punjab	3,062,671	8.6%	2,453,161	6.9%
Sindh	1,964,558	13.7%	1,706,996	11.9%
Balochistan	492,712	16.1%	436,608	14.3%
Islamabad	68,888	18.6%	61,940	16.7%

FIGURE 12: Missing women by district (Sen calculation)

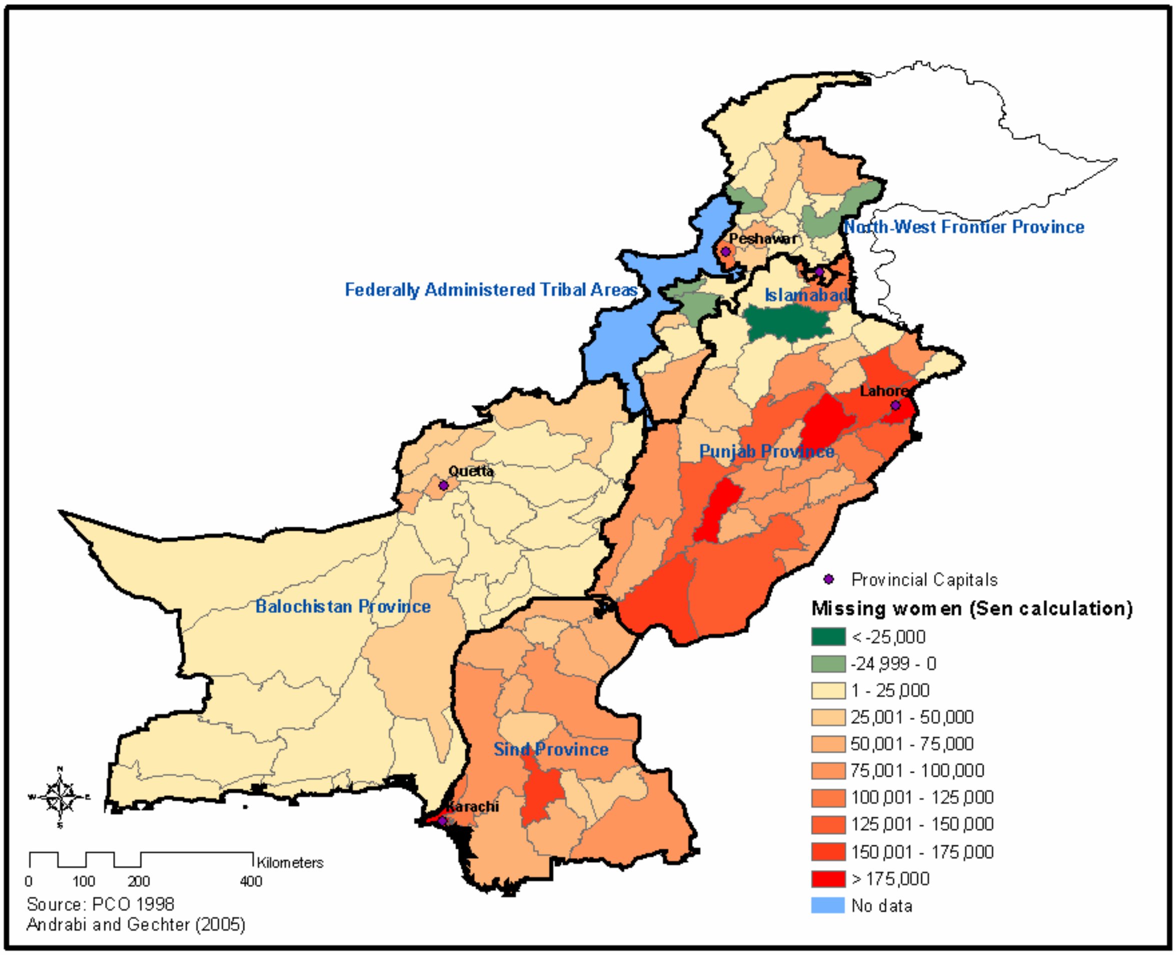
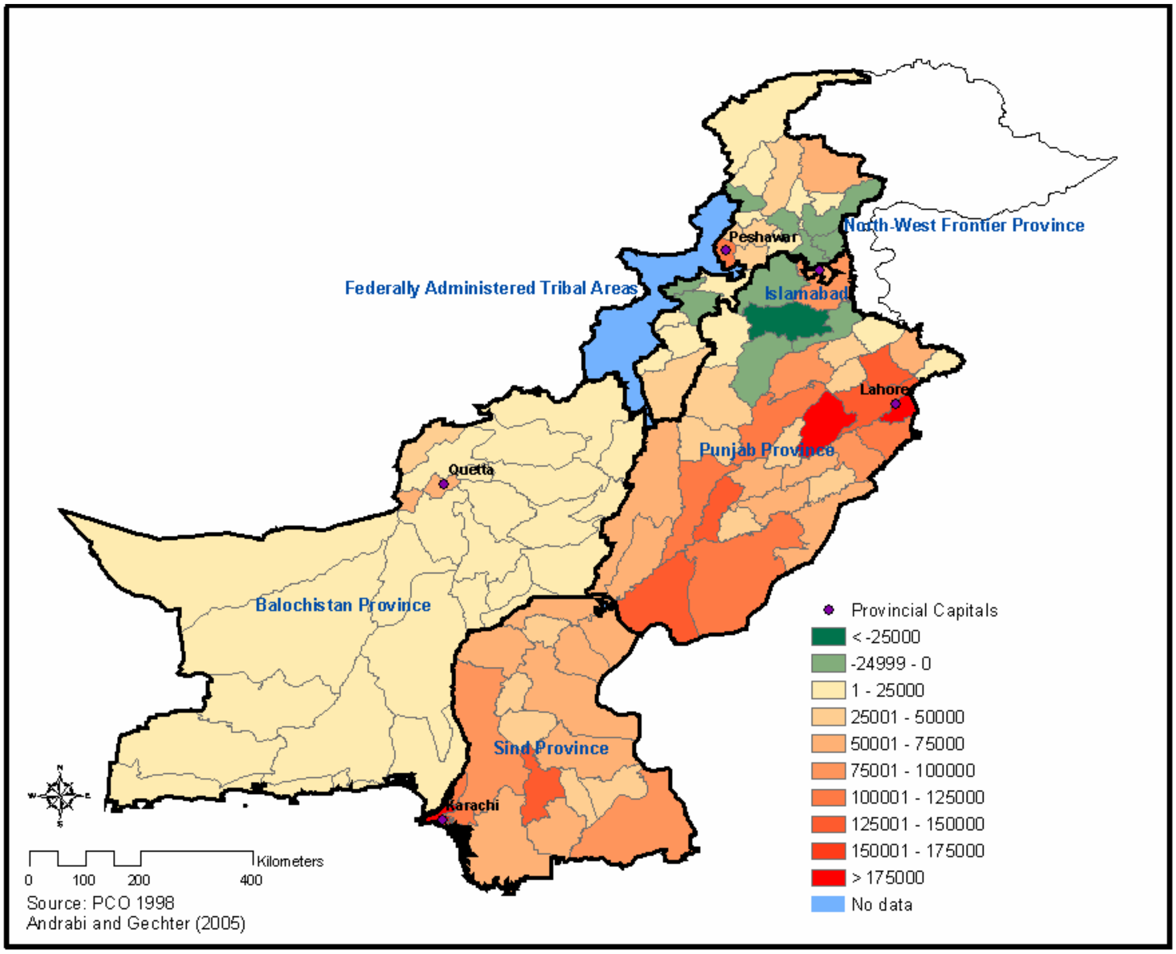


FIGURE 13: Missing women by district (Klasen and Wink calculation)



Time Series Analysis

Turning now to time-series analysis of the sex ratio in Pakistan, Table 11 shows the juvenile sex ratio and overall sex ratio across different census years. The juvenile (early childhood) age group is now considered as those children between the ages of 0 and 4, since one must now compare with data that are not directly drawn from the census organization. While the overall sex ratio seems to show a steady increase across census years, suggesting diminished sex-biased mortality, the child sex ratio does not trend as well. From a level slightly below the predicted sex ratio at birth in 1961, the juvenile sex ratio jumps up beyond the predicted level in 1972 and increases even further in 1981. This increase beyond the level of the predicted sex ratio at birth either signifies a data problem (as suggested before) or an increased mortality of males between 0 and 4 years, which is predicted by the demographic literature (Klasen and Wink 2002).

For this to take place, however, there would need to be an end to sex-biased mortality in this age group, which is unlikely. Furthermore, the sex ratio for children aged less than one year is 1.0134, even higher than the juvenile sex ratio. By 1998, the juvenile sex ratio has returned to a level closer to the predicted ratio at birth. Feeney and Alam (2003) identify this data problem and specify it as follows:

> [1] The 1961 and the 1998 censuses enumerated the population with approximately equal accuracy.
> [2] The 1972 and the 1981 censuses also enumerated the population with approximately equal accuracy.
> [3] The accuracy of enumeration in 1961 and 1998 differed from the accuracy of enumeration in 1972 and 1981 by approximately 10 percent with the 1961 and 1998 censuses indicating a smaller population and the 1972 and 1981 censuses a larger population.

Thus, the data from 1972 and 1981, to some extent, defy comparability with the data from 1998.

TABLE 11: Juvenile versus overall sex ratio by census year

	Juvenile Sex Ratio (0-4)	Overall Sex Ratio
1961 Census	0.9566	0.8633
1972 Census	0.9921	0.8705
1981 Census	1.0279	0.9042
1998 Census	0.9586	0.9216

Source: 1961, 1972 Feeney and Alam (2003)

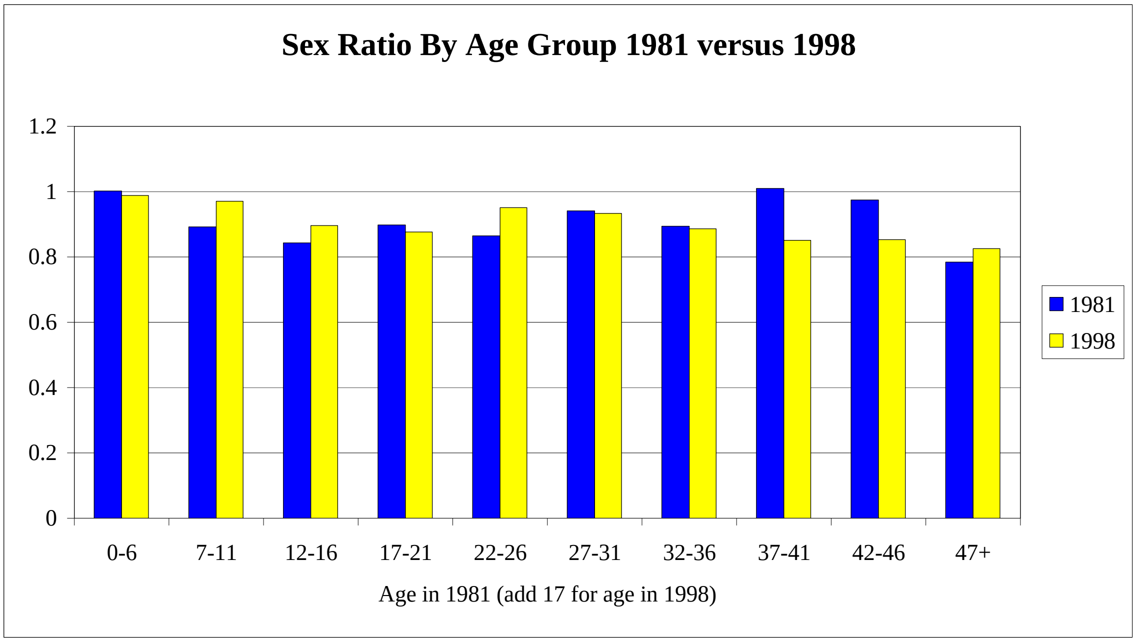
Despite the data problems, we now attempt to determine what happened to 1981 cohorts in 1998. This can finally tell one something about the ages at which differential mortality applies. Figure 13, shows the sex ratio for a given cohort in both 1981 and 1998. These particular cohorts were chosen to include years of "clustering." That is, once people advance beyond a certain age, they no longer keep track and round to the nearest "round number," be that 5, 10, 15, or 20, and so on. Without accounting for this, cohorts can seem to have increased in population from 1981 to 1998, which should not be possible. With the chosen intervals, this does not occur.

One sees a slight decline in the sex ratio for the 0 to 6 age group, suggesting differential mortality. However, it is not clear whether this would have happened while the cohort was aged 0 to 6 or after. For example, this could be driven by sex-biased mortality among the cohort of 2-year-olds in 1981, but this sex bias could have ended by the time they were 6. Also, had there been a data problem in 1981, one would expect a more precipitous drop in the sex ratio for this cohort from 1981 to 1998, so the mystery remains. If, on the other hand, the data problem is not one of accuracy but, rather, one of comparability between 1981 and 1998, as Feeney and Alam would suggest, then one would not expect a decline in the sex ratio, since the accuracy of the sex ratio depends only on the accuracy of male and female populations relative to one another within the same year.

Most of the cohorts from 17 to 46 show signs of differential mortality, again casting doubt on the idea that differential mortality only takes place between the ages of 0 and 6. Of particular interest is 37 to 46 age group. There is here a precipitous drop in the sex ratio for a cohort (the quite old by 1998) where one would expect to see an increase in the sex ratio, given the biological trend toward higher male mortality in old age. After the age of 37, it is likely that the majority of childbearing is at an end, so there is no good biological reason to expect a sex bias in mortality. However, Sen (1987) suggests one possible explanation. It is possible that, by this age, men and women enter a second period of dependency where they are living in the households of children and their spouses. These decision-makers are now free to enact their sex biases on the now-dependent cohort.

The exceptions to the rule of a diminishing sex ratio from 1981 to 1998 are the 22 to 26 age group and the 47 and up age group. One would expect this of the 47 and up group, since males tend to live less long than females and this cohort would be quite old by 1998. The 22 to 26 age group remains a mystery, showing, along with the 7 to 16 cohort, a very large increase in the sex ratio.

FIGURE 13: Sex ratio for 1981 cohorts in 1981 and 1998



One possible explanation for this is sex-biased migration out of the country. We know that there was significant migration during this period, with Pakistan sending an average of roughly 120,000 people abroad each year from 1986 to 2002 (ILO 2004). We also know that men tend to emigrate from South Asia in greater numbers than women. For example, Kuwait (the fourth largest receiver of Pakistani migrants) reported a migrant sex ratio of .62 in the 1991 United Nations Demographic Yearbook (United Nations 1991 in Klasen and Wink 2002). Applied to the entire average migrant population, this sex ratio translates to some 73,000 male and 45,000 female migrants per year. Assuming that all migration from 1986 to 2001 came from individuals in the 7-16 cohort that concerns us, migration would account for 52% of the decline in the number of males and 56% of that in the number of females in this cohort from 1981 to 2001. The fact that these percentages are similar means that, according this admittedly rough calculation, migration does little to eliminate the male bias in population decrease for this cohort from 1981 to 1998. Before the calculation, 1.9 males left the cohort for each female. After, the figure was 1.74. So, the increase in the sex ratio for this cohort remains a mystery and merits further exploration.

Section III: Regression Analysis

Model:

Based on the previous literature, one would tend to believe that the female-to-male sex ratio is a function of the following:

1. Female economic valuation. This goes hand-in-hand with female labor force participation.
2. Development level. This can refer to:
    a. Economic development. This translates to personal incomes and wealth.
    b. Human development. This is generally taken to mean development in terms of health and education (Ray 1998). We will consider education separately because of its hypothesized effect on preferences, so human development here refers to improvements in health.
3. Education, male and female. Since education is thought to act on the sex ratio by changing preferences, it is the number of educated persons of each sex that matters here, not some measure of educational provision such as total number of schools in a given area.
4. Cultural factors. As noted in Basu (1992), relevant cultural factors differ across regions, with certain regions displaying different levels of *cultural* (as opposed to economic) valuation of women.
5. Urbanization, based on the divergent sex ratios that we have seen for rural and urban areas in Section II.

Clearly, these five categories and sub-categories are not completely discrete. Within the category of Development, economic and human development are clearly associated, since personal wealth can be used to buy health improvements. However, as shown in Sen (1983), for example, this correlation is far from perfect and the level of public administration of health improvements makes a big difference in outcomes. Furthermore, female labor force participation tends to decrease as economic development increases, perhaps as a result of cultural factors which view female work outside the house as onerous (Basu 1992). If this were true, however, changes in income would explain away all variation due to female labor force participation, which it does not. Female labor force participation can vary regionally for reasons other than economic development. For example, areas in India where rice cultivation is more widespread tend to employ more females. This has been shown to exert an impact on sex-based discrimination (Kishor 1993). Nor are education and cultural factors entirely disparate, as education is thought to exert a dampening effect on those cultural factors that tend to lead to sex-based discrimination.

Finally, urbanization is part economic development and part cultural factor. Urbanization tends to accompany economic development. At the same time, urbanization is thought to have a dampening effect on the traditional values fostered by insular rural villages. With urbanization, cultural norms shift in response to the realities of the new environment.

Still, we believe that each of these categories has a sufficiently distinct effect on the sex ratio to specify the model below:

(1) $$S = f(L, D^e, D^h, E^m, E^f, C, U)$$

That is, the female-to-male sex ratio is a function of female labor force participation (L), economic development (D^e), human development (D^h), male and female education (E^m and E^f, respectively), cultural factors (C), and urbanization (U).

Data:

In this analysis, each observation is one district. Data on each district come from the 1998 Pakistan census and are compiled by the Pakistan Census Organization. We can expect the biased underreporting that is typical of this kind of data. This includes under-enumeration of transient or impermanently-housed populations and under-enumeration of women, as argued in Klasen and Wink (2002) with reference to the sex ratio at birth. However, census data has the advantage of coming close to completeness and of providing many potential explanatory variables. The census provides full data on 106 districts.

Turning now to the specification of variables, S is given by the district sex ratio. Ideally, L would be given by the percentage of employed females in a district. However, the credibility of census data on this subject is highly questionable. Aforementioned cultural biases against female labor force participation may lead to its underreporting, as exemplified by Chakwal district's reporting only 1.7% of its female population as working. 93.5% were reported as engaged in domestic work. The categories could be at issue here, since many might categorize (or might want to categorize) a woman working in subsistence agriculture as engaged in domestic work. Ultimately, these data appear unusable and one must, unfortunately, discard the variable. The equation now reads as:

(2) $$S = f(D^e, D^h, E^m, E^f, C, U)$$

Economic development is easier to specify. As our proxy for development, we use the percentage of households in a district that are classified as "permanent" (as opposed to "semi-permanent" or "non-permanent"). One chooses this proxy, as opposed to others, since it would not appear to correlate with government efforts. The percentage of households with access to potable water or electricity, also considered as wealth proxies, do have this problem, since the government is generally responsible for such infrastructural developments. The only government agency involved in the building of housing, the Pakistan Housing Authority, has only been responsible for the construction of 4,500 house structures; a number dwarfed by the country-wide total of 18,870,820 (Pakistan Housing Authority 2005).

Human development is given by the percentage of children aged 0 to 9 who have been vaccinated. These data must be viewed with some caution for two reasons. First, the question on the census form reads roughly as "was _____ injected?" "Injected" does not imply any kind of standard bundle of vaccinations that constitute immunization. What is meant by "injected" could vary from region to region or even from respondent to respondent. However, in defense of using the percentage of vaccinated children aged 0 to 9 as the measure of human development, an answer of "no" may mean more than an answer of "yes" on this question. An answer of "no" means the same thing, regardless of the regional definition of "yes." Thus, the percentage of "no" answers really forms the basis of this proxy for human development.

Turning to the second concern with the immunization data, the total number of children in the "vaccinated," "not vaccinated," and "not known" categories for a given age does not translate to the total number of children of that age, as reported in other census tables. However, the total number of children aged 0 to 9 for whom immunization data are collected is equal to the number of children 0 to 9 in other census tables. The differences are relatively small, so one probably needs to worry less about the difference than one does about the implications of the existence of such a difference. Its existence casts some doubt on the dependability of the immunization data itself.

One possible explanation for the difference is that immunization questions are on the long form rather than the standard questionnaire. Respondents have to answer the age of the relevant child on each form. Asked about all children aged 0 to 9 on the long form, parents get the number of children correct, but, asked to specify the age of each of these children, they are not sure. This could lead to a discrepancy in answers between the short and long form, but would make the number of children aged 0 to 9 the same between the two. However, the assumption that parents make no mistakes in identifying which children are under the age of 10 may not be a good one. In this case, the census organization itself may ensure that this total is identical to corresponding totals in other tables. The conclusion remains: results from the immunization data must be treated with some care.

Male education is given by share of literate males aged 10 and over in the total male population of the same age. Female education is similarly specified. Once again, one runs into the idea that differential education may be co-determined with the sex ratio, but, given the potential preference-changing attributes of education, one must consider the possibility of its being a social cause. The overall literacy rate provides another indicator of a region's level of human development.

Cultural factors are proxied by the level of exogamy present in a given district. Female exogamy is highly prevalent in North India and relatively absent in the South. It is both a cause and an indicator of an anti-female bias in North India. As a cause, it takes women out of the social network that they know and immerses them in the unfamiliar surroundings of their husband’s family. This is clearly a disempowering change. As an indicator, the simple fact that migration is required of women suggests an anti-female bias (Kishor 1993). In Pakistan, as in South India, exogamy is the exception rather than the norm. Thus, testing the effect of an increase in exogamy on the sex ratio allows one to determine whether exogamy is, in itself, a good proxy for cultural bias or whether it is simply a proxy for the cultural differences between North and South India.

I measure the level of exogamy in a district by the percentage all females in a district who migrated there because of marriage. In the presence of cultural factors contributing to an anti-female bias, one would expect that districts who “send” large numbers of women to marry in other districts should also “receive” a large number of women. If exogamy is the cultural practice in a set of districts, one would not have any reason to believe that some of these districts would be “senders” and others “receivers.”

Religion, considered to encompass a number of cultural factors, is also included in the model. Since Pakistan, an Islamic republic, contains very few religious minorities, one lumps all of these together and use the percentage of the population that is Muslim as our proxy for religion. The fact that minorities are rare could be a problem, since their presence in a district might not be enough to exert a cultural effect on the district, but might be associated with some other variable that then drives the direction of the effect. To clarify, exogamy is denoted *X* and religion *R*, giving us a final model:

(3) $$S = f(D^e, D^h, E^m, E^f, X, R, U)$$

Like Murthi et al. (1995), I believe that the form of the regression must be linear. Since all the dependent variables except average household size are percentage-based already, one would not think that it is a change in the percentage, rather than a percentage change in the percentage that will cause a change in the sex ratio. To explain this more concretely, an increase in the percentage of female literacy from 1% to 2% constitutes a change of 1% in a linear formulation, but a change of 100% percent in a logarithmic formulation. I believe that a change in female literacy from 1% to 2% should have the same effect as a change from 30% to 31%. As a result, I prefer the linear formulation. Thus, one obtains the regression equation:

(4) $$S_i = \beta_0 + \beta_1 D_i^e + \beta_2 D_i^h + \beta_3 E_i^m + \beta_4 E_i^f + \beta_5 X_i + \beta_6 R_i + \beta_7 U_i + \varepsilon_i$$

We can split the ε term into a term of fixed unobservable district characteristics (the sex bias that is not observed in the explanatory variables) and a "true" error term. Compressing the values of our observable characteristics into on vector *X*, we obtain:

(5) $$S_i = \alpha_0 + \alpha_1 X_i + \theta_i + u_i$$

where θ is a vector of unobservable characteristics. The determinants of the sex ratio from 0 to 4 and the determinants of the sex ratio from 5 to 9 can then be expressed as in equations (6) and (7), respectively.

(6) $$S_{0-4i} = \alpha_0 + \alpha_1 X_i + \theta_i + u_i$$

(7) $$S_{5-9i} = \beta_0 + \beta_1 X_i + \theta_i + \varepsilon_i$$

Subtracting equation (7) from equation (6) yields equation (8):

(8) $$S_{0-4i} - S_{5-9i} = \alpha_0 + \alpha_1 X_i + \theta_i + u_i - (\beta_0 + \beta_1 X_i + \theta_i + \varepsilon_i)$$

The θs, being fixed, cancel, yielding equation (9):

(9) $$S_{0-4i} - S_{5-9i} = (\alpha_0 - \beta_0) + (\alpha_1 - \beta_1) X_i + (u_i - \varepsilon_i)$$

This can be simplified to equation (10):

(10) $$S_{0-4i} - S_{5-9i} = \delta_0 + \delta_1 X_i + \mathrm{E}_i$$

This, finally, leads us to the final regression equation:

(11) $$S_{0-4i} - S_{5-9i} = \delta_0 + \delta_1 D_i^e + \delta_2 D_i^h + \delta_3 E_i^m + \delta_4 E_i^f + \delta_5 X_i + \delta_6 R_i + \delta_7 U_i + \mathrm{E}_i$$

In this final model, $S_{0-4i} - S_{5-9i}$ can be seen as "differential mortality" between the 0 to 4 cohort and the 5 to 9 cohort. It is the difference between the sex ratio for the 0 to 4 cohort and the sex ratio of the 5 to 9 cohort. This difference is given by the change in the sex ratio caused by the number of women who go "missing" based on our expectations of the number of women that "should" be there. This expectation comes from the 0 to 4 age group. A larger difference, then, is normatively worse, since it implies that more women have gone missing. Summary statistics for all variables are given in Table 13. Table 14 gives correlation coefficients between the explanatory variables.

TABLE 13: Summary Statistics

Variable	Mean	Standard Deviation	Min	Max
Dependent Variable				
Sex ratio (age 0-6)	0.9471	0.0477	0.7359	1.2126
Sex ratio (age 5-14)	0.8873	0.0769	0.6433	1.0000
Explanatory Variables				
Economic Development				
% Households permanent housing	43.18%	29.41%	1.30%	97.61%
% of population urban	23.90%	21.38%	0.00%	100.00%
Human Development				
% of population 0-9 vaccinated	64.56%	14.47%	22.72%	86.20%
Education				
% Males Literate	47.33%	16.27%	14.34%	81.19%
% Females Literate	22.69%	15.92%	2.95%	73.92%
Cultural Factors				
% Exogamy	1.71%	2.04%	0.00%	7.34%
% Muslim	96.76%	7.29%	51.27%	99.82%

TABLE 14: Correlation Coefficients

	(1) D^e	(2) D^h	(3) E^m	(4) E^f	(4) *X*	(6) *R*	(7) *U*
(1) D^e= % Permanent housing	1	--	--	--	--	--	--
(2) D^h= *% Vaccinated*	0.5859	1	--	--	--	--	--
(3) E^m= Male literacy	0.7227	0.7788	1	--	--	--	--
(4) E^f = Female literacy	0.7259	0.6093	0.8615	1	--	--	--
(5) *X*= *% Exogamy*	0.5565	0.5606	0.5565	0.6835	1	--	--
(6) *R* = % Muslim	0.1051	0.0313	0.0463	-0.0193	-0.0368	1	--
(7) *U*=% Urban	0.4808	0.2965	0.5372	0.7659	0.4382	-0.079	1

Results

In the first regression, we build from equation (4) and use the child sex ratio (0 to 6) as the dependent variable to replicate the analysis of studies of India. For comparability, we use the percentage of children aged 0 to 6 who are immunized for the human development dummy. Table 15 shows the results. Given the evidence, presented in Section II, that there is relatively little sex bias in mortality at early ages, it is not surprising that none of our variables emerge as significant and that our R^2 value is low. Simply, there is not much variation in the child sex ratio in Pakistan and the areas with the most variation are those that are likely to be the most idiosyncratic, due to their small populations. Using the set of variables that is generally thought to explain variation in the sex ratio actually explains very little of the variation in the child sex ratio.

TABLE 15: OLS Regression Results (Age 0-6)

% Households permanent housing	0.053
	(1.96)
% Population 0-6 vaccinated	-0.084
	(1.67)
% Males Literate	-0.137
	(1.89)
% Females Literate	0.033
	(.45)
% Exogamy	0.067
	(.28)
% Muslim	0.194
	(1.47)
% Urban	0.015
	(.44)
Punjab dummy	0.012
	(1.36)
Sindh dummy	0.01
	(.8)
Balochistan dummy	0.002
	(.1)
Islamabad dummy	0.019
	(1.54)
Constant	0.837
	(6.12)**
Observations	106
R-squared	0.25

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Now we begin building to the model of equation (11), adding variables to see the marginal effect of adding one variable on the others. For this analysis, we split districts into their rural and urban components and assign a value of one to the urban component. This raises the total number of observations to 204. We begin by looking only at the effects of the urban dummy and the provincial dummies. The results are given in Table 16. Recall that a positive coefficient means a positive effect on "differential mortality" and a negative effect on the sex ratio. Positive coefficients are thus normatively "bad."

Already, one sees an improvement in explanatory power over the early childhood model. The R^2 value jumps up to .3354, urbanization is shown to exert a negative and significant effect and Sindh and Balochistan to exert positive and significant effects. Adding the economic development proxy in (2) does little for explanatory power, emerging as insignificant, but reduces the power of the urbanization, Sindh and Balochistan effects. Part of the negative effect of urbanization, then, is attributable to greater wealth in urban areas and part of the positive effects of the Sindh and Balochistan dummies are attributable to poverty in those areas.

Adding the human development proxy in (3) adds another significant variable, with a negative effect. This brings the urbanization dummy to the brink of statistical significance and makes the Sindh dummy insignificant. The Balochistan dummy is slightly affected. A significant part of the urbanization effect, then, is attributable to the positive relationship between urbanization and human development. Similarly, part of Sindh's negative effect seems to stem from the lack of human development in Sindh.

Male education is brought in in (4) with a negative and significant effect. It reduces the human development proxy to insignificance. Urbanization and Balochistan lose more significance and Islamabad becomes significant. Controlling for differences in education, it seems, Islamabad has a significant fixed effect. Economic development also becomes significant. It seems that the human development effect was a product of collinearity with education.

Unlike in the Indian case, adding female education in (5) does not have a significant effect. Furthermore, in another difference, male literacy has a negative (normatively "good") effect, while female literacy has a positive (normatively "bad") effect. This casts doubt on the hypothesis that female education is preference-changing in the Pakistani context and that male education decreases male child mortality by a greater amount than it decreases female child mortality.

Finally, adding the cultural factors in (6) returns Sindh to significance and yields some interesting results. Exogamy has a negative effect, which confirms our earlier prediction that, in the Indian case, it may simply have been a proxy for North-South India cultural differences. In the Pakistani case, it may simply be a proxy for nontraditional values. More progressive families might be willing to abandon the tradition of marrying their daughters in an area close to where they live. Very surprisingly for a country that is over 95% Muslim, the percentage of Muslims in a district has a significant and positive effect on "differential mortality." The result is mostly driven by a number of districts in Sindh with a large Hindu population, but the fact that it remains significant despite so many controls is surprising and notable.

TABLE 16: OLS Regression Results (Differential Mortality)

Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)
Urban dummy	-0.037	-0.034	-0.025	0.023	0.02	0.026
	(3.73)**	(2.43)*	(1.99)*	(1.25)	(1.01)	(1.31)
Punjab dummy	-0.004	-0.003	-0.005	0.002	-0.003	0.013
	(0.45)	(0.35)	(0.61)	(0.22)	(0.29)	(1.02)
Sindh dummy	0.032	0.031	0.022	0.022	0.017	0.041
	(2.81)**	(2.63)**	(1.8)	(1.9)	(1.17)	(2.80)**
Balochistan dummy	0.108	0.104	0.089	0.064	0.059	0.058
	(5.70)**	(4.34)**	(4.12)**	(3.43)**	(2.61)**	(2.59)*
Islamabad dummy	-0.013	-0.009	-0.006	0.041	0.034	0.053
	(0.67)	(0.47)	(0.47)	(2.41)*	(1.73)	(2.42)*
% Households permanent housing		-0.011	0.004	0.059	0.05	0.05
		(0.4)	(0.14)	(1.9)	(1.38)	(1.34)
% Population 0-9 vaccinated			-1.579	-0.367	-0.34	-0.185
			(2.81)**	(0.64)	(0.6)	(0.33)
% Males Literate				-0.322	-0.355	-0.383
				(3.52)**	(3.20)**	(3.35)**
% Females Literate					0.052	0.071
					(0.61)	(0.82)
% Exogamy						-0.388
						(1.97)
% Muslim						0.196
						(3.94)**
Constant	0.048	0.054	0.135	0.191	0.203	0.009
	(4.94)**	(3.62)**	(4.22)**	(5.48)**	(4.50)**	(0.14)
Observations	204	204	204	204	204	204
R-squared	0.34	0.34	0.38	0.48	0.48	0.51

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Section IV: Conclusions and Extensions

In the contemporary Pakistani context, there is little to be learned from examining variation in sex ratios in early childhood. The evidence presented here points to the conclusion that there is little variation in the child sex ratio and that this variation cannot be explained through the means traditionally used to account for sex bias with regard to the sex ratio or to mortality. Instead, it seems to be in later childhood that this effect is really visible. Thus, we encourage further research into sex bias to follow this line.

We also find that urban sex ratios tend to be lower than rural sex ratios. Sex differences in migration explain this. Finally, from our own analysis of post-early-childhood sex bias, we learn that male education has a positive effect on sex ratio while female literacy has a small negative effect. This finding contradicts earlier studies of the Indian case, which found that male education has a negative effect while female education has a positive effect. Education, then, seems to operate differently on preferences in the Pakistani Case. We also find that the percentage of Muslims in an area has a negative effect, which is a very surprising finding in an Islamic country and that exogamy has a positive effect, perhaps as a proxy for non-traditionalism, in contrast with India. In conclusion, sex ratios in Pakistan have shown themselves to operate in very different ways from the more thoroughly-studied Indian case. In light of the recent estimate of 4.9 million missing women in Pakistan, we believe that significant future research attention should be paid to understanding the idiosyncrasies of the Pakistani case.

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[i] China (548.7 million women alive, 9.1% missing), India (406.3, 10.2 %), Pakistan (40, 13.1%), Bangladesh (42.2, 8.9%), Nepal (7.3, 7.47%), West Asia, including Turkey and Syria, (55, 8.5%), and Egypt (23.5, 7.16%). Sen obtains the percent missing by dividing the number of missing women by the number of living women.

[ii] Taiwan, South Korea, Afghanistan, Iran, Algeria, Tunisia, Sub-Saharan Africa.

[iii] The sex ratio can also be unusually high, but usually only within social classes rather than total populations. Edlund (1999) cites Chinese census data from 1990 as pointing to abnormally *high* female-to-male sex ratios at low levels of education for mothers. I will generally refer to imbalanced sex ratios as "low" because this is the norm, but it is important to bear in mind that this is not necessarily so.

[iv] 240 life tables, largely from Europe, dating from the mid-19th century to the mid-20th.

[v] It can be argued that differential mortality among the old is similarly unrelated to individual choice (Sen 1987). However, the fact that choice-related differential mortality has already taken place by the time individuals reach old age may make their sex ratio a less-than-useful analytical tool.