

# **Mother's Employment and Infant and Child Mortality in India**

Sunita Kishor and Sulabha Parasuraman

National Family Health Survey Subject Reports  
Number 8 • April 1998

International Institute for Population Sciences  
Mumbai, India

Macro International Inc.  
Calverton, Maryland, U.S.A.

India's National Family Health Survey (NFHS) was conducted in 1992-93 under the auspices of the Ministry of Health and Family Welfare. The survey provides national and state-level estimates of fertility, infant and child mortality, family planning practice, maternal and child health care, and the utilization of services available to mothers and children. The International Institute for Population Sciences, Mumbai, coordinated the project in cooperation with 18 population research centres throughout India, the East-West Center Program on Population in Honolulu, Hawaii, and Macro International in Calverton, Maryland. The United States Agency for International Development provided funding for the project.

ISSN 1026-4736

This publication may be reproduced for educational purposes.

*Correspondence addresses:*

International Institute for Population Sciences  
Govandi Station Road, Deonar, Mumbai - 400 088, India  
Fax: 91-22-556-32-57 • E-mail: [iips.nfhs@access.net.in](mailto:iips.nfhs@access.net.in)

Publications

Demographic and Health Surveys  
Macro International Inc.

11785 Beltsville Drive, Suite 300  
Calverton, MD 20705-3119, U.S.A.

Fax: 301-572-0999 • E-mail: [reports@macroint.com](mailto:reports@macroint.com)

# Mother's Employment and Infant and Child Mortality in India

*'...The higher mortality of children if mothers work reflects the fact that employment for women is in addition to their traditionally ascribed roles. They alone must fulfill all of these obligations. Similar negative effects on child mortality would surely be evident if fathers had the sole responsibility for the care of infants while having to fulfill their obligations as earners. Unless gender roles and gender relations are renegotiated, children will continue to lose' (page 42–43).*

**Abstract.** *Despite its many advantages, the employment of women in economic activity in India has been associated with increased mortality for infants and young children. Simultaneously, narrower gender differentials in child mortality among employed women have been noted. This report examines whether these conclusions are upheld at the level of the typical Indian mother.*

*Using data from the 1992–93 National Family Health Survey, the effect on child survival of mother's employment status is evaluated for all children. Separate analyses of male and female survival evaluate the gender-differentiated impact of mother's employment. The effect of employment is also evaluated separately by whether employment is at home, outside the home without cash earnings, or outside the home with cash earnings.*

*The bivariate comparison of infant- ( ${}_1q_0$ ) and child-mortality ( ${}_4q_1$ ) rates for the period 0–4 years before the survey according to mothers' employment status reveals that mothers who are employed have a 10 percent higher infant-mortality rate and a 36 percent higher child-mortality rate than mothers who are not employed. Male mortality increases more than female mortality if mothers work.*

*These results are largely upheld in the multivariate analysis of births that took place 0 to 4 years before the survey. Logistic regressions are run separately for survival from 0 to 11 months and from 12 to 47 months. Controlling for relevant biodemographic, socioeconomic, and individual background characteristics, the odds of dying at ages 12–47 months are significantly higher when mothers are employed; the odds of dying at ages 0–11 months are higher only if the mother is employed at home or outside the home for cash. The odds of dying do not differ by mother's employment status for female infants, but are 12 percent higher for males if the mother is employed than if she is not. During childhood, the odds of dying increase for male and female children if the mother works. For boys the increase is greatest if the mother works outside the home for cash and for girls if the mother works at home.*

*Thus, employment of women outside the home for cash, perhaps the most empowering form of employment, does not lower the risk of mortality for girls and increases the risk for boys. Further, employment of mothers in urban areas has more detrimental effects on infant and child survival than employment in rural areas. Also, employment of mothers has its most negative effect on survival at ages 12–47 months of daughters at higher birth orders with same-sex siblings, a group that is considered most at-risk. The report concludes that mother's employment is associated with higher infant and child mortality. Gender differentials narrow with mother's employment largely because of higher increases in male than in female mortality. There is little evidence to suggest that survival of girls is enhanced when mothers work. These conclusions do not imply that mother's employment should be discouraged; instead, they emphasize the need for viable child-care alternatives for women who work and for a renegotiation of gender roles and gender relations.*

---

***Sunita Kishor and Sulabha Parasuraman***

*Sunita Kishor is the Gender Specialist at Macro International, Calverton, Maryland. Sulabha Parasuraman is a Reader at the International Institute of Population Sciences, Mumbai, India.*

---

Employment of women in economic activity has several beneficial effects for women and their families, not the least of which is the associated increased access to and control of income. Research in India, however, suggests that women's employment may have at least one disadvantage: the survival of young children appears to be negatively affected if women work (Basu and Basu 1991; Kishor 1992). The same research suggests that *gender differentials* in child mortality, which in the Indian context largely imply excess female mortality, are reduced when women work.

Past research into the association between women's employment and child mortality has largely used the 1981 census data and has been more comprehensive at the district level than at the household or woman level. Specifically, at the district level, higher rates of women's labour-force participation have been found to be associated with higher rates of child mortality net of several cultural and economic factors (Kishor 1992, 1993; for no relationship see Murthi, Guio, and Drèze 1995). At the microlevel also, working women are found to have higher child-mortality rates (Basu and Basu 1991), but this largely bivariate association awaits empirical analysis that adequately accounts for the influence on child mortality of factors whose effects may be spuriously captured in bivariate analyses by mother's employment.

Similarly, several studies, again based largely on the 1981 census, have found macrolevel evidence of an association between lower gender differences in child mortality and higher rates of female labour-force participation at the district level (Kishor 1993; Murthi, Guio, and Drèze 1995; Rosenzweig and Schultz 1982). In India, gender differentials in child mortality favouring the survival of male children are well documented, and the underlying mechanisms and causes have been extensively studied (Arnold, Choe, and Roy in press; Bardhan 1974; Kishor 1993; Miller 1981; Sopher 1980). Explanations of the observed excess female mortality during the years when, on biological grounds, male mortality can be expected to exceed female mortality (Waldron 1983, 1987) rest essentially on the undervaluation of females compared with males within the Indian economic and cultural ethos. While the cultural undervaluation of females is explained largely in terms of the prevalent kinship systems that practise patrilocal exogamy and give exclusivity to males in social, political, and economic cooperation and in the fulfillment of religious obligations and the intergenerational transfer of fixed assets (Dyson and Moore 1983; Kishor 1993), explanations of the economic undervaluation of females rest largely on the low levels of women's participation in income-generating activities, that is, their low rates of labour-force participation (Rosenzweig and Schultz 1982; Schultz 1990). In this context, it is not surprising that gender differentials in child mortality are found to be consistently lower the higher women's labour-force participation.

In contrast, the causal mechanisms by which a woman's employment affects the relative survival of her male and female children is an empirical question that has

received only limited attention. Research by Basu and Basu (1991) suggests that even at the microlevel, women's employment is associated with narrower gender differences in mortality. However, it has yet to be determined whether lower gender differences in mortality prevail if women are employed *net of all relevant confounding individual, demographic, and contextual factors*. Further, there remains the need to go behind the effect of women's employment on the composite index of gender differences in mortality and examine the *gender-differentiated* impact of women's employment on child mortality. Such an examination would reveal whether any reduction in gender differentials is due to a greater impact of women's employment on male mortality or on female mortality.

A detailed examination of the relative impact of a mother's employment status on the survival of her children in India has had to wait for the availability of appropriate data. Unlike macrolevel research in this area, based largely on state- or district-level women's labour-force participation rates, child-mortality estimates, and information on regional characteristics generally available from censuses or other sources of published data, a microlevel examination needs data that link the characteristics of each child with the characteristics of its mother, including the latter's employment status. The 1992–93 National Family Health Survey of India provides not only complete birth histories for women but information on their socioeconomic status and other relevant background characteristics. Using these nationally representative data, this report examines in detail the effect of women's employment on the survival of all their children as well as the relative survival of their male and female children.

In the sections that follow, the nature of the data and the definitions of women's employment used in the analysis are discussed first. Then there is a brief discussion of the mechanisms that might underlie the expected negative association of women's employment with gender differences in mortality and its hypothesized positive association with child mortality. Next, nationally representative mortality rates, according to mother's employment status, are presented. Mortality is evaluated for two time periods: during the first year of life and during the next four years of life. This bivariate analysis is followed first by a discussion of the variables and methods to be used for a multivariate evaluation of the influence of mother's employment on infant and child mortality, overall and by sex of child, and then by an examination of the empirical findings. Finally, conclusions are presented.

## **DATA**

The 1992–93 National Family Health Survey interviewed 89,777 ever-married women age 13–49 in 88,562 households across 24 states and one Union Territory (Delhi) between April 1992 and September 1993 (International Institute for Population Stud-

ies (IIPS) 1995). A core standardized questionnaire, combined with state-specific questions, was used to collect information on individual characteristics (age, education, employment status, caste, etc.), household background characteristics (household assets, water and toilet facilities, etc.), and birth histories of eligible women, among other things. The birth histories of women permit the estimation of infant and child-mortality rates; they also allow an examination of the influence of individual characteristics of women, including women's employment status, on the probability of survival of their children net of factors specific to the birth such as birth order or the birth interval.

Two questions were used to elicit the employment status of women. All eligible women were first asked 'Aside from your housework, are you currently working?' Women who said 'no' were asked 'As you know some women take up jobs for which they are paid in cash or kind. Others sell things, have a small business, or work on the family farm or in the family business. Are you currently doing any of these things?' Women who answered 'no' to both questions were counted as not employed; women who answered 'yes' to either the first or the second question were then asked details about the work they did including their occupation, where the work was done, and whether they earned cash for it or not. These data provide information on women's employment status and if they work, the type of work they do. In light of both conceptual and empirical considerations, employment of women is categorized into three types: employment at home, employment outside the home but without cash earnings, and employment outside the home for cash. As will be argued later, from a women's-status perspective, the last category of employment should be most empowering. The very small number of cases in the category 'employment at home' prevents its disaggregation by whether cash is earned or not.

Some caveats about the data need to be noted. The data on employment are based on self-reported employment, which generally underestimates the true extent of women's employment. Thus the relationships found in this report are really between employment that *women themselves perceive as employment* and mortality of children. Also, while the employment data refer to current employment of women, the demographic events of interest—births and deaths—could have occurred any time in the past. To minimize the effect of the nonconcurrency of a mother's employment and the death of any of her children, the multivariate analysis is restricted to births and deaths occurring no more than 47 months before the date of interview. The effective sample then reduces to 39,977 mothers with 48,876 eligible births with complete information in the four years before the survey.

The use of the child-mortality experience of mothers in the most recent period in combination with reports of their current employment status raises, but does not resolve, the issue of the direction of causality between child mortality and mother's employment. This report assumes that the relevant direction of causality is from

mother's employment to infant and child mortality. However, causality could be the reverse if women whose children die are more likely to be in the labour force than those whose children survive. Since a part of any association found between mother's employment and child survival status may be due to this reverse causality, perhaps the more relevant question is: Which is the dominant direction of causality? Given the cross-sectional nature of the data, it is not possible to answer this question directly. An indirect answer will, however, be sought in the conclusions section at the end of this report.

Since, the effects of mother's employment on the mortality of children can be expected to be different (as discussed below) during infancy and after the first year of life, the analysis is conducted separately for mortality in the period 0–11 months (infant mortality) and child mortality. In keeping with the need to minimize the nonconcurrence of a mother's employment and the timing of her births, child mortality in the multivariate analysis refers to the mortality of children born between one and four years (12 to 47 months) before the survey. For bivariate comparisons, however, in keeping with standard demographic practice, child mortality is measured by  ${}_4q_1$  (mortality between 12 and 59 months) for all-India comparisons and by  ${}_5q_0$  (mortality between 0 and 59 months) for state-level comparisons. Although clearly the more relevant rate, very large sampling errors around some state-level, sex-specific estimates of  ${}_4q_1$  necessitate the substitution of  ${}_5q_0$ .

## **THE INFLUENCE OF MOTHER'S EMPLOYMENT ON INFANT AND CHILD MORTALITY: CONTEXT AND MECHANISMS**

There are reasons to expect women's participation in the labour force to have beneficial as well as detrimental effects on child survival. Some beneficial effects of women's labour-force participation will derive as a positive income effect of the earnings of mothers enhanced by the likelihood that a higher proportion of these earnings, compared with earnings of males, will be directed toward child-welfare needs (Kumar 1977; Mencher 1988). In addition, women's employment may translate into greater control over the expending of resources, increased exposure and access to relevant information about childbearing and childrearing practices, and an enhanced ability to manipulate and engage the world outside the home to better meet the nutritive, medical, and survival needs of infants. However, these hypothesized benefits of women's employment are likely to depend critically on the type of employment in which women are engaged. For example, income effects are most likely to ensue when women earn cash, and employment is most likely to lead to increased engagement with the wider world when women's work takes them outside the home.

Counterbalancing these effects is the reduced availability of time and a consequent likelihood of increased inability of working women to provide personal and timely care for their children. To the extent that this is true, any negative consequences for the health and welfare of children are likely to be exacerbated by the lack of appropriate alternative child care (Basu and Basu 1991) and the necessity among poor rural women to spend time fetching water and firewood (Desai and Jain 1994). This will be particularly true for work identified as the most likely candidate for empowering women—wage work that takes women outside the home. More direct effects on the nutrition of children and shortened breastfeeding among mothers who work also have been noted in different contexts (Leslie 1989; Popkin and Doan 1990).

Despite the potential benefits of mother's employment, there is reason to believe that the net effect of mother's employment will be to lower child survival. Bivariate analysis of 1981 census data reveals that rural Indian working women have a 14 percent higher child-mortality rate than nonworking women; the percentage difference ranges from 27 to 68 percent across the four largest southern states and from 4 to 18 percent across the five largest northern states (Basu and Basu 1991).

It is expected that the macrolevel effect of women's labour-force participation on gender differences in mortality will be reproduced at the microlevel, i.e., gender differentials in mortality will be lower among women who work. However, if child mortality is, in general, higher among women who work than among women who do not, then lower gender differentials can result among women who work only if male mortality rises with mother's employment while female mortality also rises but by not as much, or remains unchanged, or falls.

A common explanation of the narrowing of gender differentials stems from the idea that women who work will not undervalue their female children at all, or at least not as much, as those who do not work. This explanation is labeled 'the women's-status explanation'. When women work, they belie the normative belief that they do not contribute economically to the material welfare of their households. Being employed should change women's perceptions of their own worth and the worth of their daughters even when no perceived changes in the relative cultural worth of sons and daughters occur. Indeed, a district-level analysis of 1981 Indian census data found that women's labour-force participation made the largest difference to the relative survival of female children precisely in those districts where exogamy (the practice of out-marrying girls) was practised (Kishor 1993). Based on these results, Kishor concluded that the greater relative survival of female children could not be a consequence of natal families expecting to benefit from the economic contributions of women. Instead, she suggested that the relative improvement in the survival of female children must result from the changed subjective perceptions of working mothers with regard to the value of their own abilities and those of their female children. Also, extrapolating Cain's (1980, 1982) argument with respect to fertility, another

explanation could be that women who work are less likely to depend on sons alone to meet their current and future economic needs and are thus less likely to favour their sons while undervaluing their daughters. Net of all other effects, the experience of being employed may also change women's gender preferences by exposing them, quite independently of their level of education, to new ideas, authority structures, and social networks (Dixon-Mueller 1993). Such exposure may allow women to break with traditional normative beliefs and promote gender equality.

However, critical to this argument is the nature of women's work. Dixon-Mueller identifies the types of employment least likely to transform gender relations (and hence, least likely to alter gender preferences in the Indian context) as 'those that do not confront patriarchal family relations of production and reproduction'. Examples include unpaid work in family fields or other family enterprises and self-employment in enterprises with low return or dependence on men for capital, materials, or marketing. Indeed, many would argue that work for most women in the Indian context is far from empowering, concentrated as it is in low-paying, low-productivity occupations, often requiring hard labour, and not necessarily ensuring control over income earned (Bardhan 1985; Ware 1981). Clearly, some elements necessary to making the transition from women's employment to higher status and autonomy are that women should be working for cash that they control and that their employment should provide exposure to the world outside the home. There are no NFHS data to measure the amount of control women exercise over their earnings. However, in this report, a distinction is made between working for cash and not working for cash, combined with a distinction between working at home and away from home.

The women's-status explanation for the narrowing of gender differentials in mortality of children when women work is but one hypothesis. An alternative hypothesis could be that gender differentials are narrower among women who work because these women have less time to discriminate or provide preferential treatment.<sup>1</sup> Without preferential treatment for males, male mortality rates are more likely to approximate female mortality rates or even rise above them. Looked at another way, it may be that boys lose out more than girls when their mothers work because resources, including mothers' time, tend to be concentrated on boys. The amount of time that mothers spend on child care—ranging from holding children to breastfeeding, preparing meals, and feeding children—is an important factor in the health and survival of children (Miller 1981). Note that, although not considered here, there could be situations in which working mothers may discriminate against girls more than nonworking mothers. For example, working women may learn through their own market experiences that male biases in the labour market make sons a more reliable old-age resource than daughters. They may, as a result, devote more of their limited time and resources to sons than unemployed mothers do.

It is not possible to draw any definitive conclusion about the relevance of alternative explanations for the narrowing of gender differentials without examining intermediate variables such as patterns of feeding and health care by sex of child, issues not addressed in this report. Nonetheless, the gender-differentiated effect of different types of employment can provide some guidance on the relevance of the women's-status explanation. For example, more credence can be given to the women's-status explanation if women's employment for cash outside the home, the type of work most related to higher women's status, differentially benefits girls more than boys.

The type of work that women engage in will be an important mediating factor, not only for the relationship between women's labour-force participation and gender differences in child mortality but also for the overall relationship between employment and child mortality per se. The latter positive association, resting as it does critically on women's lack of time and the removal of the child from the immediate care of the mother, is likely to be stronger for employment that takes women away from home. Also, if such employment is not for cash, the potential for beneficial income effects will be considerably reduced.

In addition to type of employment, several factors will mediate the potential effects of mother's employment on the relative survival of their daughters. Among these are the overall levels of female employment. If women who participate in the labour force are ostracized or if such participation is atypical, changes in self-worth associated with labour-force participation may fail to ensue. In India, 67 percent of currently married women in reproductive ages are not employed, 5 percent are employed at home, and 27 percent work outside the home. Among those who work outside the home, less than two-thirds work for cash (Table 1). Women's labour-force participation varies greatly across the different states in India, ranging from 70 percent in Himachal Pradesh to 12 percent in Punjab. It is notable that in Himachal Pradesh most of the employed women (80 percent) are working outside their homes, but not for cash. The proportion of women employed away from home for cash is highest (over one-third of all women) in Meghalaya in the east and Andhra Pradesh in the south. In general, women are least likely to be employed at all in the northern states and most likely to be employed in the southern states. Thus, to the extent that the proportion of women employed is an appropriate reflection of the acceptability of female employment, the region of the country is clearly important. Also traditionally, female employment has been eschewed by women of higher castes. In the Indian caste system, strict rules of conduct separate castes, especially the upper from the lower ones, so that lower castes are forbidden the lifestyles of the upper castes (Liddle and Joshi 1986). A critical aspect of the ritual purity of the upper castes is the increased control over the visibility and mobility of women. Consequently, employment has been traditionally considered ritually appropriate for women of the lower castes. Thus, the caste of the woman in question is also a factor that will affect how

**Table 1 Infant and under-five mortality rates, ratio of male-to-female infant and under-five mortality rates, and the percent distribution of women by employment status, all India and by state, National Family Health Survey, 1992–93**

State	Infant mortality		Under-five mortality		Women's employment status (%) <sup>a</sup>			
	Rate (per 1,000)	Male/female ratio	Rate (per 1,000)	Male/female ratio	Not employed	Employed at home	Employed outside home not for cash	Employed outside home for cash
<b>India</b>	78.5	1.06	109.3	0.95	67.2	5.1	10.3	17.3
<b>Northern states</b>								
Bihar	89.2	1.07	127.5	0.93	74.8	2.2	11.1	11.6
Gujarat	68.7	0.82	104.0	0.79	56.4	6.1	16.2	21.3
Haryana	73.3	0.79	98.7	0.67	61.6	3.9	25.5	9.0
Himachal Pradesh	55.8	1.41	69.1	1.39	30.0	3.4	58.7	7.9
Jammu region of J & K	45.4	0.95	59.1	0.86	58.5	3.6	32.1	5.8
Madhya Pradesh	85.2	1.15	130.3	1.05	66.7	5.2	12.5	15.5
Delhi	65.4	1.06	83.1	0.94	80.5	7.2	0.7	11.6
Punjab	53.7	1.16	68.0	0.90	88.4	2.9	3.6	5.0
Rajasthan	72.6	0.83	102.6	0.74	67.7	4.8	19.6	7.7
Uttar Pradesh	99.9	0.99	141.3	0.84	85.6	3.8	5.3	5.1
<b>Eastern states</b>								
Arunachal Pradesh	*	*	*	*	53.1	1.5	25.3	20.2
Assam	88.7	1.17	142.2	1.08	80.3	3.5	0.6	15.6
Manipur	*	*	*	*	44.5	22.5	3.8	29.2
Meghalaya	*	*	*	*	56.9	3.8	3.0	36.3
Mizoram	*	*	*	*	64.9	3.8	8.9	22.4
Nagaland	*	*	*	*	56.4	6.0	21.2	16.4
Orissa	112.1	1.24	131.0	1.09	73.1	3.9	1.2	21.7
Tripura	*	*	*	*	74.2	6.7	5.3	13.8
West Bengal	75.3	0.87	99.3	0.80	77.0	7.2	3.6	12.1
<b>Southern states</b>								
Andhra Pradesh	70.4	1.21	91.2	1.09	45.7	7.6	11.6	35.0
Goa	31.9	1.53	38.9	1.36	69.6	3.7	5.2	21.6
Karnataka	65.4	1.22	87.3	1.08	52.2	6.7	14.1	26.9
Kerala	23.8	1.16	32.0	1.22	74.2	4.4	0.6	20.5
Maharashtra	50.5	1.35	70.3	1.16	49.7	5.0	17.5	27.7
Tamil Nadu	67.7	1.39	86.5	1.49	52.7	8.0	8.2	31.1

Note: Mortality rates are for the five-year period before the survey.

<sup>a</sup>Total may not add to 100 due to rounding and missing cases on the types of employment.

\*Estimates are unavailable because of small samples.

she perceives her own employment status and whether it leads to gains in self-esteem or to any change in gender preferences.

The region of the country is also likely to be important because infant and child mortality vary greatly by region. Not only do the northern states of India have the highest infant- and child-mortality rates, but the excess of female over male child mortality is particularly pronounced in these states. In the southern states, and less so in the eastern states, by contrast, there is either no observed excess female mortality, or discrimination appears at least to be less severe (Miller 1981; Sopher 1980). The mortality rates based on the NFHS data calculated for the five years before the survey clearly reflect the large regional variation in infant and under-five mortality as well as in the ratio of male-to-female mortality rates (Table 1). At the all-India level, the male-to-female infant-mortality ratio of 1.06 is abnormally low compared with the

ratio in less-developed countries as a whole (Tabutin and Willems 1995). Excess female mortality is even more evident for children aged 1–5. At that age, the male mortality rate is only 95 percent as high as the female mortality rate. Notably, however, in 5 of 10 north Indian states, female mortality exceeds male mortality even in the first year of life. By contrast, male infant mortality is higher than female infant mortality in all of the southern states and in the majority of the eastern states. Even in the under-five mortality rate calculations, there is no southern state where female mortality rates exceed male mortality rates. In the north, there are only two states (Himachal Pradesh and Madhya Pradesh) where mortality risks for boys exceed those for girls; in the remaining north Indian states, the male-to-female under-five mortality ratio varies from a low of 0.67 in Haryana to a high of 0.94 in Delhi.

Crosscutting regional differences are the rural-urban differences in mortality and women's employment. Infant and under-five mortality rates are both lower, on average, and excess female mortality is less pronounced in urban than in rural areas. The proportion of women working in rural areas (32 percent) is twice that in urban areas (16 percent). Further, the nature of women's employment is different in rural and urban areas, with rural employment dominated by informal agricultural work and a higher proportion of women who work not receiving cash. Indeed, 95 percent of ever-married women with at least one birth in the past four years who work outside the home without earning cash are working in agriculture. In this context, it may also be noted that 41 percent of those working for cash outside the home and 79 percent of those working at home are working in nonagricultural sectors. In addition, the urban environment is likely to be very different from the rural one, with consequent effects on gender norms, women's adherence to normative gender preferences, and the costs of exercising these preferences. Access to medical care is greater since medical facilities are more common in urban than rural areas. Also, the reach of media is much greater in urban than in rural areas. A greater exposure to media can have the potential advantages of making it less costly for individual women to access child nutrition and health information and exposing women to different ways of thinking and doing things. Urban women also may have different gender preferences than rural women do since they are less likely to need sons to help in agriculture or to inherit agricultural land. Finally, since urban living is more associated with exposure to modernization, it may be expected that urban women will tend to have a more gender-egalitarian view of life. Some of these benefits of urban living can be seen in the mortality differentials found between rural and urban areas in India.

The variation in the amount and type of employment, and in overall mortality and gender differences in mortality between rural and urban areas, leads to the expectation that the strength of the employment-mortality relationship will vary by area of residence. Given that more than two-thirds of the Indian population reside in rural areas, most research on these topics has been limited to the rural population. Conse-

quently, there is little research documenting the net effect of area of residence, especially on mortality by sex of child.

The socioeconomic status of the household is an important mediating factor since mortality is lower for households with greater wealth (although the direction of its effect on gender differentials remains unclear). Women's employment is negatively associated with the level of asset ownership. Also, the more educated a woman is the less likely it is that she is employed: 35 percent of illiterate ever-married women who had a child in the past four years were employed, compared with only 16 percent of those with high school or more education.

Apart from biological effects, birth order has been found to be an important factor in determining a daughter's risk of discrimination. The first daughter is welcome for several reasons, including the fact that the Hindu ritual of giving a daughter in marriage (*Kanyadaan*) yields religious merit. Subsequent daughters may not be as welcome. Higher birth orders have been found to be associated with greater risk of death in the Punjab (Das Gupta 1987) and in Bangladesh (Muhuri and Preston 1991). In addition, research in Uttar Pradesh suggests that female children are most likely to die in families where no more children or no more daughters are desired (Simmons et al. 1982). Most recently, an analysis of the NFHS data revealed that female children with older sisters are often subject to the highest risks of mortality (Arnold, Choe, and Roy in press).

Finally, the risk of mortality for both boys and girls is higher in the first year of life than later in childhood. Infant mortality at the all-India level comprises more than 70 percent of all under-five mortality (IIPS 1995). A large part of the risk of death at the very early stages of life stems from maternal factors such as age of mother at birth, parity, and length of birth interval (Mosley and Chen 1984). These maternal factors appear to have a stronger effect on the survival of children up to their first birthday than on their survival beyond their first year of life (Bicego and Ahmad 1996; Sullivan, Rutstein, and Bicego 1994). Further, the risk of death soon after birth, a time before discrimination or preferential treatment is likely to take effect (ruling out infanticide), is higher for males than females. At the all-India level, neonatal mortality comprises about 60 percent of infant mortality, and during the neonatal period male mortality exceeds female mortality by about one-fifth.<sup>2</sup> In the postneonatal period (1–11 months), some excess female mortality is already evident (the male postneonatal mortality rate is 28.2 compared with the female rate of 31.6). Over the next four years (12–59 months), female mortality exceeds male mortality by almost 23 percent. This age-differentiated evidence of 'excess' female mortality suggests the need to examine separately the effect of mother's employment on infant mortality and on child mortality after the first year of life.

Overall, despite the many mediating factors, there are several reasons to expect women's employment to have a mediating effect on gender differentials in infant and

child mortality. To see to what extent these expectations are upheld, bivariate associations are examined followed by a multivariate analysis controlling for the relevant factors discussed above.

## **A BIVARIATE EXAMINATION OF INFANT AND CHILD MORTALITY BY MOTHER'S EMPLOYMENT**

The bivariate analysis (Table 2) reveals significantly higher infant- and child-mortality rates during the period 0–4 years before the survey for working woman than for nonworking women. The infant-mortality rate for working women is 10 percent higher than for nonworking women, whereas the child-mortality rate is 36 percent higher. Thus, the negative impact of mother's employment on survival is greater after the first year of life. However, not all types of employment have an equally negative effect on infant and child survival. Indeed, only women employed outside the home for cash have both significantly higher infant (higher by 15 percent) and child-mortality rates (higher by 51 percent) than women who are not employed. Women employed away from home without earning cash have significantly higher child-mortality rates (26 percent higher) but not infant-mortality rates, while women working at home do not vary in either their infant- or child-mortality rates from women who do not work.

During the first year of life, gender differences in mortality favour females irrespective of whether mothers are working or not. The difference between the female and male mortality rate is statistically significant (at the 10 percent level) for working women as a whole, but within this group it is only significant for women who work away from home for cash. Moving from the gender differential to a separate examination of male and female mortality rates, it becomes clear that mother's employment status significantly affects the probability of survival to age one only for male children. Infant mortality among male children of working women exceeds the rate for male children of nonworking women by 13 percent; infant mortality among female children is also higher for children of working women, but the difference is not statistically significant. The increase in male mortality for working mothers is due largely to the much higher male infant mortality for mothers who work away from home for cash. The male infant-mortality rate for mothers who work away from home for cash is 22 percent higher than the rate for mothers who do not work. Women in other employment categories do not have significantly higher male infant-mortality rates. The conclusion follows that during the first year of life, mother's employment affects the gender differential in mortality (which, in any case, favours females) by being associated with much higher male but unchanged female mortality.

Female child mortality ( ${}_4q_1$ ), by contrast, is significantly higher than male child mortality for both working and nonworking women. Nonetheless, the ratio of male-

**Table 2 Infant and child mortality (per 1,000 births) by sex of child, confidence intervals, and ratio of male-to-female mortality, National Family Health Survey, 1992–93**

Employment status	Mortality rate			Male/female ratio
	Total	Male	Female	
	<b>Infant mortality (<math>{}_1q_0</math>)</b>			
<b>Mother not employed</b>	76.2 72.6–79.9	77.8 73.0–82.6	74.6 69.7–79.5	1.04
<b>Mother employed</b>	83.6** 77.9–89.2	88.0** 80.1–95.9	79.0 71.4–86.6	1.11+
Employed at home	82.2 67.2–97.3	80.1 58.4–101.8	84.5 64.2–104.8	0.95
Employed outside home not for cash	78.7 69.5–87.9	83.7 71.3–96.1	73.4 61.0–85.8	1.14
Employed outside home for cash	88.0*** 80.2–95.8	94.6*** 82.8–106.3	81.4 71.1–91.7	1.16+
	<b>Child mortality (<math>{}_4q_1</math>)</b>			
<b>Mother not employed</b>	29.9 27.6–32.1	23.9 21.2–26.7	36.2 32.8–39.5	0.66+++
<b>Mother employed</b>	40.6 *** 36.7–44.5	35.2*** 30.5–40.0	46.3*** 40.6–52.0	0.76+++
Employed at home	32.6 24.8–40.3	21.0 13.0–28.9	44.6 31.4–57.9	0.47+++
Employed outside home not for cash	37.6*** 32.1–43.2	35.3*** 27.8–42.7	40.2 32.1–48.3	0.88
Employed outside home for cash	45.1*** 39.2–51.0	39.7*** 32.6–46.7	50.9*** 42.5–59.3	0.78++

Note: Confidence intervals are 95 percent with confidence limits given by  $R \pm 2SE$  where R is the mortality estimate and SE the standard error of the estimate. The Jackknife repeated replication method is used in this table to estimate confidence intervals and significance of estimates.

\*Denotes a significant difference between the given rate and the rate for mother not employed.

(\*\*\* $p < .01$ ; \*\* $p < .05$ ; \*  $p < .10$ ).

+Denotes a significant difference between the male and female mortality rate for a given employment-status category of the mother. (+++ $p < .01$ ; ++ $p < .05$ ; +  $p < .10$ )

to-female child mortality for working women (0.76) is less favourable to males than the ratio for nonworking women (0.66). The narrower differential for working women results from the fact that when mothers work child mortality increases by 47 percent for boys but only by 28 percent for girls. Thus, although both male and female child mortality are higher for working women, the differential is narrower since the increase in female mortality is less than the corresponding increase in male mortality. Notably, however, among the different groups of working mothers, the female child-mortality rate is only significantly higher (by 41 percent) for children whose mothers work outside the home for cash, compared with the rate for children of nonworking mothers. The male child-mortality rate is higher for mothers who work outside the home whether they earn cash or not. Women who work at home have the same child-mortality rates as those who do not work.

Thus, at the national level the bivariate analysis does not indicate that mother's employment is associated with lowered female mortality rates. Indeed, at the infant-

mortality stage, mother's employment leaves female mortality unchanged (any change is not significant), and at the child-mortality stage, mother's employment is associated with an increase in female mortality. Employment of mothers narrows gender differentials in child mortality only because the increase in female mortality is not as large as the increase in male mortality. Further, the type of work associated with the highest increase in child mortality, even for girls, is work away from home for cash. Thus, the one kind of employment most likely to be associated with greater autonomy and resources is the kind also associated with the highest mortality, overall as well as for female and male children. These results suggest that mother's employment negatively affects male survival largely through the physical absence of the mother; the effect on female survival is less easily explained since work outside the home by the mother without cash leaves female mortality unchanged while work for cash increases the probability of death.

However, it may be that the strong positive association between working for cash away from home and child mortality is due in part to poverty that could be simultaneously related to higher infant and child mortality and the need for women to work for cash. Clearly, there is a need to determine whether these relationships hold up within a multivariate framework.

## **VARIABLES AND METHODS FOR THE MULTIVARIATE ANALYSIS**

A piecewise, constant proportional-hazards approach accomplished with logistic regression is used to analyze the relationship between mother's employment and child mortality in the first year of life and from ages 12–47 months. In this approach, the relevant time period is divided into segments, and each segment is assumed to have a constant hazard. For the infant-mortality equations (survival from birth to age one), the duration of life is divided into four segments: 0–2 months, 3–5 months, 6–8 months, and 9–11 months. For the child-mortality regressions (survival from age 12 months to 47 months), the time duration is divided into three segments, each of 12 months duration: 12–23 months, 24–35 months, and 36–47 months.

The effect of employment on infant mortality and child mortality is estimated separately for all children, male children, and female children. Five models are estimated corresponding to alternative formulations of the employment variable described in the preceding theoretical discussion. In the first model, employment is entered as a dummy variable that takes the value of 1 if the woman is employed and 0 otherwise. In the second equation, employment is entered as a four-category variable capturing the type of employment: employed outside the home for cash; employed outside the home without earning cash; working at home with or without earning cash; and not working at all. The remaining models evaluate the effect of the interaction of em-

ployment with the following three variables: area of residence (urban, rural), region, and birth order combined with presence of same-sex siblings. Note that two predictor variables are said to interact if the effect of one on the dependent variable depends on the level of the other. For example, the interaction of employment with rural/urban residence is evaluated because, as explained earlier in the theoretical discussion, the effect of mother's employment on child mortality is likely to be different in rural and urban settings. Since equations are run separately to estimate the probability of dying during infancy and then in childhood, 10 equations are estimated for each dependent variable.

Beside employment, all equations control for the set of explanatory variables given in Table 3. The relevance of these variables is discussed in the theoretical section (the third section) above. Mother's education has been found to be positively associated with the greater survival of children (Bicego and Boerma 1991; Caldwell 1979, 1986; Cleland 1990; Hobcraft 1996). However, the literature on how mother's education affects gender differences in mortality is not unambiguous. Researchers working in the south of India have found gender differentials to be narrower among educated women (Caldwell, Reddy, and Caldwell 1989), whereas those working in the north have found them to be wider or no different (Basu and Basu 1991; Das Gupta 1987). Socioeconomic status of the household is measured by three variables: an asset-ownership index that varies between 0 and 27 based on how many of 11 assets the household owns. Some assets are weighted more than others.<sup>3</sup> The toilet-and-water-facilities index varies from 0 (if the household does not have piped water or a well or handpump in the yard and also does not have its own flush or pit toilet) to 2 (if it has both types of amenity). The scheduled caste variable has a value of 0 if the woman does not belong to a scheduled caste household and 1 if she does. The scheduled castes correspond in general to the castes that were the former 'untouchables'. They are now known as scheduled castes because they are listed in a separate schedule of the Constitution of independent India as requiring special consideration. For the purpose of this report, this variable not only serves as a socioeconomic status delimiter, but also acts as a proxy for the relative acceptability of cash employment.

Several biomaternal factors and child's characteristics are entered into the equations. Following Mosley and Chen (1984), these are: mother's age at birth in three categories (13–19 years, 20–34, years, and 35 years and above); length of previous birth interval in two categories (less than 24 months and a first birth or interval of 24 or more months); and child's birth order, grouped by whether or not there were same-sex siblings alive at the time of his/her birth, in five categories (birth order 1, birth order 2 or 3 with no same-sex siblings, birth order 2 or 3 with same-sex siblings, birth order 4 or higher with no same-sex siblings, and birth order 4 or higher with same-sex siblings). Two types of children will be categorized as having no same-sex siblings at birth: those whose mothers never gave birth to any children of the same sex before the birth of the index child and those whose mothers gave birth to one or more

**Table 3 Births and deaths of children born to ever-married women in the 48 months immediately before the survey, by variables included in the regression analysis, National Family Health Survey, 1992–93**

Variable	Births		Deaths 0–11 months		Deaths 12–47 months	
	Number	%	Number	%	Number	%
<b>Mother's employment</b>						
Mother not employed	34,865	71.3	2,224	69.1	279	59.9
Mother employed	14,011	28.7	993	30.9	187	40.1
Employed at home	2,176	4.5	157	4.9	27	5.8
Employed outside home not for cash	5,548	11.4	370	11.5	68	14.6
Employed outside home for cash	6,241	12.8	466	14.5	90	19.7
<b>Mother's education status</b>						
Has no education	29,948	61.3	2,378	73.9	394	84.5
Has primary education	12,871	26.3	651	20.2	61	13.1
Has secondary or higher education	6,057	12.4	188	5.8	11	2.4
<b>Asset-ownership index<sup>a</sup></b>						
0	12,432	25.4	980	30.5	192	41.2
1–10	29,643	60.7	1,990	61.9	253	54.3
11–20	6,073	12.5	229	7.1	21	4.5
>20	728	1.4	18	0.6	0	0.0
<b>Toilet-and-water-facilities index<sup>b</sup></b>						
Neither toilet nor water	25,864	52.9	2,062	64.1	302	64.8
Either toilet or water	14,323	29.3	840	26.1	141	30.3
Both toilet and water	8,689	17.8	315	9.8	23	4.9
<b>Caste status</b>						
Scheduled caste	6,396	13.1	536	16.7	72	15.5
Not scheduled caste	42,480	86.9	2,681	83.3	394	84.5
<b>Mother's age at birth of child</b>						
<20 years	10,235	20.9	943	29.3	108	23.2
20–34 years	36,008	73.7	2,078	64.6	325	69.7
35 or more years	2,633	5.4	196	6.1	33	7.1
<b>Previous birth interval</b>						
First birth or interval 24 or more months	39,949	81.7	2,384	74.1	334	71.7
Interval <24 months	8,927	18.3	833	25.9	132	28.3
<b>Birth order/presence of same-sex siblings alive at time of birth</b>						
First child	13,855	28.3	1,065	33.1	92	19.7
Birth order 2 or 3, no same-sex sibling	9,295	19.0	538	16.7	82	17.6
Birth order 2 or 3, same-sex siblings	11,222	23.0	601	18.7	105	22.5
Birth order 4 or higher, no same-sex sibling	1,987	4.1	161	5.0	18	3.9
Birth order 4 or higher, same-sex siblings	12,517	25.6	852	26.5	169	36.3
<b>Sex of child</b>						
Male	25,119	51.4	1,756	54.4	172	36.9
Female	23,757	48.6	1,461	45.6	294	63.1
<b>Region</b>						
Northern states	28,641	58.6	2,077	64.6	320	68.7
Southern states	10,568	21.6	522	16.2	62	13.3
Eastern states	9,667	19.8	618	19.2	84	18.0
<b>Area of residence</b>						
Urban	13,143	26.9	654	20.3	72	15.5
Rural	35,733	73.1	2,563	79.7	394	84.5
<b>Percentage of women employed in state<sup>a</sup></b>						
<26	18,753	38.4	1,448	45.0	213	45.7
26–40	14,899	30.5	980	30.5	140	30.0
41 or more	15,224	31.2	789	24.5	113	24.2

Note: Percentages may not add to 100 due to rounding error.

a. The aggregation of the asset-ownership index and percent of women employed in state shown here is only to summarize their distribution. In the regression equations they are entered as continuous variables.

b. Sources of water included are piped water, well or a handpump in the yard; types of toilet included are own flush toilet and own pit toilet.

children of the same sex before the birth of the index child, but those children had died by the time the index child was born. All first-born children are grouped into one category since, by definition, they cannot have any siblings at the time of their birth.

The sex of the child is also included as an explanatory variable in the total mortality regressions. The contextual variables are region of the country (northern states, southern states, and eastern states), area of residence (rural and urban), and percentage of women employed in the state of residence. Note that the variables area of residence, region, and birth order/presence of same-sex siblings are entered jointly with the employment-status variable, as described above, when estimating models 3, 4, and 5, respectively.

A logistic regression is estimated for each model. In a logistic regression, the coefficient for the  $i$ th variable measures the increase or decrease in the log of the odds of the event of interest occurring for every one unit increase in the  $i$ th variable. Thus, if  $p$  is the probability of death, the event of interest in this case, then  $\beta_i$  gives the change in the value of  $\text{Log}(p/(1-p))$  when the  $i$ th explanatory variable increases by one unit. For ease of interpretation, the values given in the tables that follow are of the odds ratios  $e^{\beta_i}$ s rather than of the coefficients ( $\beta_i$ s). The odds ratio is interpreted as the proportionate change in the odds of the event occurring for a unit change in the value of the  $i$ th predictor variable. In the case of a categorical predictor variable, the odds ratio of any one category of the variable is calculated by dividing the odds of dying for that particular category by the odds of dying for the category chosen as the reference category. The odds ratio for the reference category is 1 by definition.

## RESULTS OF THE MULTIVARIATE ANALYSIS

### Total mortality

The probability of a child dying before its first birthday does not vary significantly by mother's employment status within a multivariate framework; however, having survived to the first birthday, a child's survival to its fourth birthday is significantly lower if the mother works than if she does not (Table 4, Figure 1). The odds of dying between the ages of 12 and 47 months increase by about one-third if the mother is employed. However, when mother's employment is disaggregated by where she works and whether or not she works for cash, the odds of survival both up to age one and beyond are found to be significantly affected by some types of employment and not by others. For children whose mothers are employed for cash outside the home, the odds of dying by age one are 13 percent higher than the odds for children whose mothers are not employed; the odds of dying at age 12–47 months are 47 percent higher. These estimates are both highly significant.

To clarify further the effect of mother's employment on child mortality, Figure 1 shows the probabilities of dying at ages 0–11 months and ages 12–47 months by mother's employment status and type of employment estimated from the logistic regression results reported in Table 1, with all other predictor variables held at their mean values. Children of mothers employed outside the home have an 8 percent probability of dying at ages 0 to 11 months, whereas children of mothers who are not employed have a probability of dying that is about 1 percentage point less. The highly significant effect of mother's employment on child mortality at ages 12–47 months translates into a probability of dying of about 2 percent if the mother is not employed, 2.5 percent if the mother is employed, and 2.8 percent if the mother is employed outside the home for cash. The probability of dying is also higher for children whose mothers work at home, but the difference is only marginally significant. Clearly, among all types of employment, net of all other mediating influences, a mother's employment for cash outside the home appears to be most significantly detrimental to the survival chances of young children.

Altering the way in which employment is entered into the regression has either no effect on the value of  $e^{b_i}$  for any explanatory variable, or it has only a negligible effect (no more than  $\pm .03$  over its corresponding value in the base model, Model 1). Consequently, only the values of  $e^{b_i}$  for Model 1 are presented in Table 4.

In general, the effects of all controls appear to be in the expected direction. The higher the mother's education, the lower the probability of a child dying in the first year of life, and more so in the period thereafter. Having a mother with secondary education decreases by 38 percent the odds of dying between the ages of 0–11 months and by 60 percent the odds of dying between 12–47 months. The effect of primary education is weaker but still robust. All three socioeconomic measures play a significant role in determining whether a child survives to age one; however, only the asset-ownership index (strictly a wealth indicator) significantly reduces the probability of death beyond age one.

Similarly, as expected, biomaternal factors have a stronger effect on survival to age one than beyond. Having a mother who was between age 20 and 34 when the child was born decreases significantly the odds of dying, but only to age one. The negative effect of a short (less than 24 months) previous birth interval remains significant throughout early childhood, although it has a stronger impact on the odds of dying up to age one than beyond. As expected, being first born significantly increases the probability of dying at ages 0–11 months. However, the variable birth order/presence of same-sex siblings alive at birth appears to have unpredicted effects on the risk of infant mortality for children at the other birth orders. Children at birth orders 4 and above with no same-sex siblings at birth have a one-third higher risk of mortality than children at birth orders 2 or 3 with no same-sex siblings. They also have a higher risk than children at birth orders 4 and above with same-sex siblings at birth. While this

**Table 4 Odds ratios derived from logistic regressions of child mortality on mother's employment: Results from Models 1 and 2 estimated separately for mortality at ages 0–11 months and ages 12–47 months among children born during the four years preceding the survey, National Family Health Survey, 1992–93**

Explanatory variable	Dependent variable	
	Mortality at 0–11 months	Mortality at 12–47 months
<b>Mother's employment</b>		
Model 1: Employment status		
Not employed	rc	rc
Employed	1.05	1.32***
Model 2: Employment status by type		
Not employed	rc	rc
Employed at home	1.16*	1.45*
Employed outside home not for cash	0.93	1.13
Employed outside home for cash	1.13**	1.47***
<b>The remainder of this table pertains only to Model 1<sup>a</sup></b>		
<b>Mother's education status</b>		
No education	rc	rc
Has primary education	0.77***	0.57***
Has secondary or higher education	0.62***	0.40***
<b>Socioeconomic controls</b>		
Asset-ownership index	0.98***	0.92***
Toilet-and-water-facilities index	0.79***	0.90
Scheduled caste	1.14***	0.97
<b>Biomaternal controls</b>		
Mother's age at birth of child		
< 20 years	rc	rc
20–34 years	0.77***	0.82
35 or more years	0.96	0.86
Previous birth interval		
First birth or interval 24 or more months	rc	rc
Interval < 24 months	1.96***	1.64***
<b>Child's characteristics</b>		
Birth order and presence of same-sex siblings at birth		
Birth order 1	1.70***	0.95
Birth order 2 or 3, no same-sex sibling	rc	rc
Birth order 2 or 3, same-sex siblings	0.98	1.11
Birth order 4 or higher, no same-sex sibling	1.34***	0.90
Birth order 4 or higher, same-sex siblings	1.08	1.26
Sex of child		
Male	rc	rc
Female	0.88***	1.83***
<b>Contextual controls</b>		
Region		
Northern states	rc	rc
Southern states	0.82***	0.60***
Eastern states	0.92*	0.74**
Area of residence		
Urban	rc	rc
Rural	1.02	1.12
Percentage of women employed in state	0.99***	0.99**
<b>Time interval</b>		
0–11 months mortality models		
0–2 months	rc	na
3–5 months	0.14***	na
6–8 months	0.12***	na
9–11 months	0.10***	na
12–47 months mortality models		
12–23 months	na	rc
24–35 months	na	0.62***
36–47 months	na	0.44***

Table 4, continued

Explanatory variable	Dependent variable	
	Mortality at 0–11 months	Mortality at 12–47 months
<b>-2 Log likelihood</b>		
Initial value	31,864.29	5,555.98
Final value	27,877.18	5,238.94

na = Not applicable; rc = Reference category.

a. The remainder of this table pertains only to Model 1a. Model 2 results for predictor variables other than employment are not given since they are virtually the same as those for Model 1.

\*\*\*p<.01; \*\*p<.05; \* p<.10

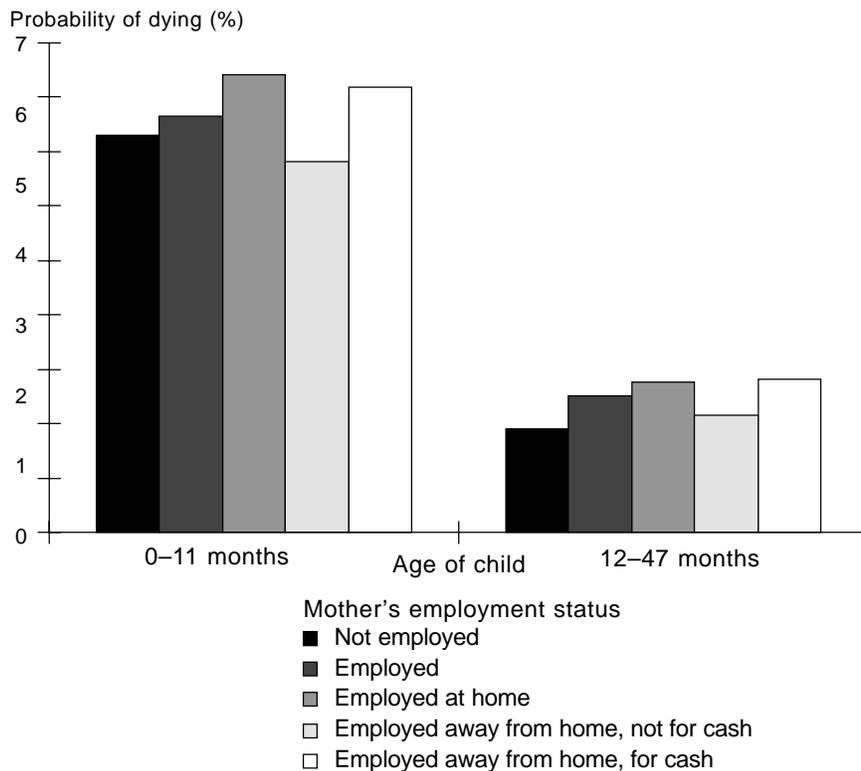
perverse effect needs further investigation, it may be an artifact of the way the variable is constructed. The probability of having no same-sex older sibling ever born falls as birth order increases. Thus, the higher the birth order, the higher the probability that children who are in the category ‘no same-sex siblings alive at birth’ come from families where one or more same-sex sibling was born but died before the birth of the index child. To the extent that this is the case, ‘having no same-sex siblings’, especially at higher birth orders, may be capturing the effect of death clustering in families where deaths have already taken place (Das Gupta 1990) rather than of exclusivity. This may also in part explain why mortality at ages 12–49 months appears unaffected by birth order or presence of same-sex siblings.

Being female reduces the odds of dying between age 0 and 11 months by 12 percent, but almost doubles the odds of dying at age 12–47 months. This suggests that the effects of gender discrimination begin to outweigh the effects of girls’ biological advantage some time before the first birthday. Finally, children born in the north have the lowest probability of survival, even controlling for the percentage of women employed in the area and all other maternal and child characteristics. As expected, the probability of survival is highest for children born in the southern states.

### Effects on total mortality of the interactions of employment with other predictor variables

Models 3, 4, and 5 evaluate the effects on infant and child mortality of the interaction of mother’s employment status with area of residence, region, and birth-order/presence of same-sex siblings at birth, respectively. As discussed in the variables and methods section, the interaction of employment with each of these variables gives the effect of employment on mortality separately for each of the different levels of the other variables in the interaction. All three models are run with the relevant controls described above, although only the odds ratios for the interactions are reported in Table 5.

While employment status is not a significant determinant of the odds of dying in infancy overall (Model 1, Table 4), it is an important factor in urban areas (Model 3, Table 5). Indeed, the odds of an infant dying if the mother is employed and lives in



Note: Probabilities are estimated with all other predictor variables evaluated at their mean values.

**Figure 1 Estimated probability of dying at ages 0-11 months and 12-47 months by mother's employment status**

an urban area are 33 percent higher than if the mother is not employed and lives in an urban area and 23 percent higher than if the mother is not employed and lives in a rural area (not shown). In rural areas, mother's employment status has no effect on infant mortality. The conditioning effect of area of residence is also evident in the relationship between mothers' employment and children's probability of dying at ages 12-47 months. Having a mother who is employed significantly increases the odds of dying during childhood in both urban and rural areas, but more so in urban than in rural areas. A mother's employment more than doubles the odds of dying for a child in urban areas, and increases the odds by 22 percent in rural areas. Clearly, employment in urban areas is particularly associated with increased risks of infant and child mortality.

Like area of residence, region also conditions the relationship between mother's employment status and infant and child survival. Results of Model 4, as shown in Table 5, reveal that employment status of the mother has no significant effect on the odds of an infant dying before its first birthday in the north and the east; however, in the south the odds of an infant dying are 18 percent higher if its mother is employed than if she is not. The odds of dying between 12 and 47 months also do not differ significantly according to the mother's employment status in the north; however, the odds of dying are considerably higher for children of employed mothers in the east

**Table 5 Odds ratios derived from logistic regressions of infant and child mortality on mother's employment interacting with area of residence, region, and birth order/presence of same-sex siblings: Results from Models 3, 4, and 5 estimated separately for mortality at ages 0–11 and 12–47 months among children born during the four years preceding the survey, National Family Health Survey, 1992–93**

Explanatory variable	Dependent variable	
	Mortality at 0–11 months	Mortality at 12–47 months
<b>Model 3: Interaction of employment and area of residence</b>		
<i>Reference category in each area: Unemployed mothers in the same area of residence</i>		
Rural, mother employed	1.00	1.22*
Urban, mother employed	1.33***	2.16***
<b>Model 4: Interaction of employment and region</b>		
<i>Reference category in each region: Unemployed mothers in the same region</i>		
North, mother employed	1.05	1.08
South, mother employed	1.18*	2.00**
East, mother employed	0.94	2.03***
<b>Model 5: Interaction of employment and birth order/presence of same-sex siblings at birth</b>		
<i>Reference category in each birth order/presence of same-sex siblings combination: Unemployed mothers of children of the same birth order/presence of same-sex siblings combination</i>		
Birth order 1, mother employed	1.06	1.16
Birth order 2 or 3		
No same-sex sibling, mother employed	1.22**	1.26
Same-sex siblings, mother employed	1.16	1.46*
Birth order 4 or higher,		
No same-sex sibling, mother employed	1.12	1.13
Same-sex siblings, mother employed	0.89	1.38**

Note: All models are estimated with the same control variables as Model 1 as relevant.

\*\*\*p<.01; \*\*p<.05; \* p<.10

and south. These results suggest that the employment status of mothers has its strongest negative effect on infant and child survival in the southern states and does not affect survival in the north.

Finally, Model 5 evaluates the interactive effect of employment, birth order, and presence of same-sex siblings at time of birth on infant and child survival. Mother's employment, perhaps surprisingly, has significantly detrimental effects on survival to age one only for children at birth orders 2 and 3, irrespective of whether they have same-sex siblings. At other birth orders, survival to age one does not appear to vary significantly by mother's employment status. The interaction of mother's employment status and birth order/presence of same-sex siblings at birth has a more-expected effect on survival at ages 12–49 months. For all birth orders above 1, a mother's employment consistently increases the odds of dying at these ages if children have same-sex siblings but has no effect if children have no same-sex siblings.

### Gender-differentiated effect of mother's employment

To examine whether mother's employment affects the survival chances of female and male children differently, Tables 6 through 9 give the logistic regression results for

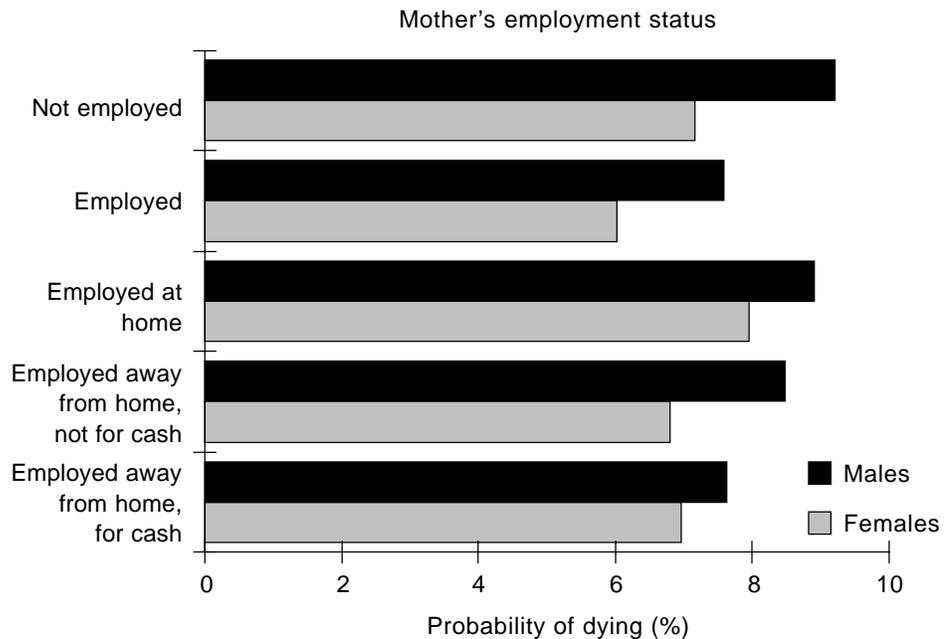
**Table 6 Odds ratios derived from logistic regressions of infant mortality on mother's employment: Results from Models 1 and 2 of mortality at ages 0–11 months estimated separately of male children and female children among children born during the four years preceding the survey, National Family Health Survey, 1992–93**

Explanatory variable	Dependent variable: Mortality at 0–11 months	
	Male children	Female children
<b>Mother's employment</b>		
<b>Model 1: Employment status</b>		
Not employed	rc	rc
Employed	1.12*	0.98
<b>Model 2: Mother's employment status by type</b>		
Not employed	rc	rc
Employed at home	1.18	1.15
Employed outside home not for cash	1.00	0.86*
Employed outside home for cash	1.22***	1.03
<b>The remainder of this table pertains only to Model 1<sup>a</sup></b>		
<b>Mother's education status</b>		
No education	rc	rc
Has primary education	0.75***	0.81***
Has secondary or higher education	0.56***	0.70***
<b>Socioeconomic controls</b>		
Asset-ownership index	0.98***	0.98**
Toilet-and-water-facilities index	0.80***	0.78***
Scheduled caste	1.18**	1.09
<b>Biomaternal controls</b>		
Mother's age at birth of child		
< 20 years	rc	rc
20–34 years	0.80***	0.74***
35 or more years	0.92	1.00
Previous birth interval		
First birth or interval 24 or more months	rc	rc
Interval < 24 months	1.93***	1.99***
<b>Child's characteristics</b>		
Birth order and presence of same-sex siblings at birth		
Birth order 1	1.82***	1.57***
Birth order 2 or 3, no same-sex sibling	rc	rc
Birth order 2 or 3, same-sex siblings	0.92	1.06
Birth order 4 or higher, no same-sex sibling	1.24*	1.49***
Birth order 4 or higher, same-sex siblings	1.06	1.10
<b>Contextual controls</b>		
Region		
Northern states	rc	rc
Southern states	0.92	0.71***
Eastern states	0.99	0.83**
Area of residence		
Urban	rc	rc
Rural	1.00	1.05
Percentage of women employed in state	0.99***	0.99***
<b>Time interval</b>		
0–11 months mortality models		
0–2 months	rc	na
3–5 months	0.14***	0.15***
6–8 months	0.11***	0.14***
9–11 months	0.08***	0.12***
<b>-2 Log likelihood</b>		
Initial value	17,170.82	14,679.02
Final value	14,861.78	12,981.35

rc = Reference category

a. Model 2 results for predictor variables other than employment are not given since they are virtually the same as those for Model 1.

\*\*\*p<.01; \*\*p<.05; \* p<.10



*Note:* Probabilities are estimated with all other predictor variables evaluated at their mean values.

**Figure 2 Estimated probability of dying at ages 0–11 months, by sex of child according to mother's employment status**

mortality at ages 0–11 months and 12–47 months separately for boys and girls using the same five alternative specifications of the employment variable as above. Again, since the coefficients of explanatory variables other than employment do not change significantly between the different models, these coefficients are reported only for Model 1 in each case.

**Age 0–11 months, Models 1 and 2.** Mother's employment significantly increases the probability of dying at ages 0–11 months only for boys (Model 1, Table 6). Not all types of employment produce this increase: only mother's employment outside the home for cash is associated with significantly higher male infant mortality rates (Model 2, Table 6). These conclusions are also clear from Figure 2, which translates these results into probabilities of dying by mother's employment status, holding all other predictor variables at their mean values. The estimated probability of dying at ages 0–11 months is always lower for girls than for boys irrespective of the mother's employment status. The probability that a male child will die before his first birthday is 7.6 percent if his mother is unemployed. If his mother is employed, his probability of dying rises to almost 8.5 percent, and if his mother is employed outside the home for cash, his probability of dying is even higher (more than 9.0 percent). By contrast, the probability of a daughter dying does not vary greatly by mother's employment status, and the variation that does occur is rarely statistically significant.

Few of the control variables have a gender-differentiated effect on the risk of mortality before age one. While having a mother who has a secondary education especially benefits boys, having an educated mother, in general, lowers the odds of dying for both boys and girls. Caste is the only socioeconomic variable that has a strong gender-differentiated impact: the odds of dying before age one for scheduled-caste boys are 18 percent higher than for boys of other castes; for girls the difference is smaller and not significant.

First-born children have a heightened risk of mortality, which can be expected due to biomaternal factors. Among children with no same-sex siblings, those at birth orders 4 and above have a higher risk of mortality than those at birth order 2 or 3. This finding warrants closer scrutiny, particularly in light of the possible association with death clustering. Whatever the underlying cause of the heightened mortality risk observed for children at higher birth orders, it is notable that the increase in risk appears to be much greater for girls than for boys.

Finally, the effect of region on the probability of dying before age one varies by sex. While the survival of boys does not vary significantly by region, the odds of dying for girls are 29 percent lower in the southern states and 17 percent lower in the eastern states than in the northern states.

**Effects of interactions of employment with other predictor variables on mortality at age 0–11 months.** Overall, mother's employment does not affect a female child's survival to age one (Table 6, Model 1), but it does have an effect if rural and urban areas are evaluated separately (Table 7, Model 3). In urban areas, having an employed mother increases a female infant's odds of dying by 37 percent; by contrast, in rural areas, having an employed mother decreases a female infant's odds of dying, although the effect is not significant. For boys, the probability of dying is higher if a mother is employed than if she is not in both urban and rural areas, although the difference is significant only in urban areas. Thus, in urban areas mothers' employment is detrimental to the survival of both girls and boys during infancy; in rural areas, mothers' employment does not significantly affect the survival of boys or girls, although its effects by sex of child may be in opposite directions.

The interaction results of mother's employment status and region (Model 4) reveal that the negative effect of mother's employment on the survival of boys to age one noted in the main effects model (Model 1) is significant and pronounced only in the north. In the north, if mothers are employed, sons have odds of dying that are 14 percent higher than if mothers are not employed. In no region do girls' odds of dying before age one vary significantly by employment status of the mother.

Further insights are provided by disaggregating the effect of mother's employment by birth order and presence of same-sex siblings at birth. It was argued earlier that daughters of a higher birth order born into households that have other daughters

**Table 7 Odds ratios derived from logistic regressions of infant mortality on mother's employment interacting with area of residence, region, and birth order/presence of same-sex siblings: Results from Models 3, 4, and 5 for mortality at ages 0–11 months estimated separately for male and female children among children born during the four years preceding the survey, National Family Health Survey, 1992–93**

Explanatory variable	Dependent variable: Mortality at 0–11 months	
	Male children	Female children
<b>Model 3: Interaction of employment and area of residence</b>		
<i>Reference category in each area: Unemployed mothers in the same area of residence</i>		
Rural, mother employed	1.09	0.92
Urban, mother employed	1.31*	1.37**
<b>Model 4: Interaction of employment and region</b>		
<i>Reference category in each region: Unemployed mothers in the same region</i>		
North, mother employed	1.14*	0.96
South, mother employed	1.21	1.14
East, mother employed	0.97	0.90
<b>Model 5: Interaction of employment and birth order/presence of same-sex siblings at birth</b>		
<i>Reference category in each birth order/presence of same-sex siblings combination: Unemployed mothers of children with the same birth order/presence of same-sex siblings combination</i>		
Birth order 1, mother employed	1.17*	0.92
Birth order 2 or 3,		
No same-sex sibling, mother employed	1.16	1.30*
Same-sex siblings, mother employed	1.22	1.09
Birth order 4 or higher,		
No same-sex sibling, mother employed	1.10	1.16
Same-sex siblings, mother employed	0.98	0.79**

Note: All models are estimated with the same control variables as Model 1 as relevant.

\*\*p<.05; \* p<.10

are less desired and therefore likely to be at a greater risk of mortality than daughters of a lower birth order with no same-sex siblings. Thus, if mothers' employment is relatively beneficial to girls, it should be most evident for girls of higher birth orders and/or daughters with female siblings. There is some limited support for this expectation with regard to the survival by sex of children to age one. Mother's employment is significantly associated with a lowered risk of mortality for girls at higher birth orders who have same-sex siblings. Mother's employment is associated with a heightened risk of mortality for girls at all other birth orders, however, although the association is not always significant. By contrast, mother's employment significantly increases the risk of mortality for boys only if they are first born.

Thus the odds of survival of girl infants to age one are on average unaffected by mother's employment status, and this is true in all regions of the country. There is some indication, however, that girl infants at higher birth orders and with same-sex siblings may have improved survival odds if their mothers are employed. For boys, by contrast, mother's employment reduces the odds of survival to age one, especially if the employment is for cash outside the home, if the family lives in the north of India, or if the boy is first born. Employment of mothers in urban areas reduces the

odds of survival for both male and female infants, although the negative effect is stronger and more robust for females than for males.

**Age 12–47 months, Models 1 and 2.** The gender-differentiated impact of employment on child survival beyond age one is quite different from its effect on survival in the first year (Table 8). Employment of the mother increases the odds of dying at ages 12–47 months by 40 percent for a male child and 27 percent for a female child. Although the effect is weaker for girls than for boys, it is significant for both. A mother's work outside the home for cash increases a boy's odds of dying by almost three-fourths but has no significant negative consequence for a girl. By contrast, a mother's work at home almost doubles the odds of dying for a girl (Table 8, Model 2) but has no significant effect for male children.

Figure 3 presents the effects of employment on child mortality in terms of probabilities. As in Figures 1 and 2, these probabilities are estimated holding all other explanatory variables at their mean values. The figure clearly highlights the much higher mortality risks faced by female than male children at ages 12–47 months. For girls the probability of dying increases from about 2.5 percent if the mother is not employed to more than 3 percent if the mother is employed and to almost 5 percent if the mother is employed at home. By contrast, the probability of dying for male children increases from 1.4 percent if the mother is not employed to 1.9 percent if the mother is employed and is highest, at 2.4 percent, if the mother is employed outside the home for cash.

The fact that work at home has the most inimical effect on the survival of girls should come as no surprise. Work at home is the type of work most likely to limit women's exposure to new ideas and experiences that could help change their gender preferences and normative beliefs about the relative importance of sons and daughters. It is also most likely to promote women's seclusion, a factor that affects women's ability and willingness to interact effectively with the outside world (Basu and Basu 1991). Thus it could legitimately be argued that such work cannot be expected to alter either self-concepts or gender preferences. It is worth noting, however, that mother's work for cash outside the home, which should be empowering, also does not benefit girls, although it is more detrimental to the survival of boys.

Few of the control variables affect survival between the ages of 12 and 47 months differently for boys and girls. Interestingly, having a mother who was 20–34 years old at the time of a child's birth significantly enhances the survival chances of girls but leaves unchanged the survival chances of boys. A very early age at birth is often indicative of a woman's low status (Mason 1986). Perhaps a mother's age at birth of 20 to 34, which within the Indian context is neither too early nor too late, may be proxying for other factors that reflect a high status and associated self-esteem, and this could translate into increased survival probabilities for daughters. Male child

**Table 8 Odds ratios derived from logistic regressions of child mortality on mother's employment: Results from Models 1 and 2 of mortality at ages 12–47 months estimated separately for male and female children among children born during the four years preceding the survey, National Family Health Survey, 1992–93**

Explanatory variable	Dependent variable: Mortality at 12–47 months	
	Male children	Female children
<b>Mother's employment</b>		
<b>Model 1: Employment status</b>		
Not employed	rc	rc
Employed	1.40**	1.27*
<b>Model 2: Mother's employment status by type</b>		
Not employed	rc	rc
Employed at home	0.71	1.91***
Employed outside home not for cash	1.30	1.04
Employed outside home for cash	1.74***	1.31
<b>The remainder of this table pertains only to Model 1<sup>a</sup></b>		
<b>Mother's education status</b>		
No education	rc	rc
Has primary education	0.59**	0.57***
Has secondary or higher education	0.32*	0.45**
<b>Socioeconomic controls</b>		
Asset-ownership index	0.89***	0.94***
Toilet-and-water-facilities index	0.91	0.90
Scheduled caste	0.82	1.05
<b>Biomaternal controls</b>		
Mother's age at birth of child		
< 20 years	rc	rc
20–34 years	1.05	0.70**
35 or more years	1.18	0.70
Previous birth interval		
First birth or interval 24 or more months	rc	rc
Interval < 24 months	1.63***	1.64***
<b>Child's characteristics</b>		
Birth order and presence of same-sex siblings at birth		
Birth order 1	0.82	1.05
Birth order 2 or 3, same-sex siblings	1.01	1.19
Birth order 4 or higher, no same-sex sibling	0.47	1.30
Birth order 4 or higher, same-sex siblings	0.87	1.59**
<b>Contextual controls</b>		
Region		
Northern states	rc	rc
Southern states	0.79	0.51***
Eastern states	1.00	0.59***
Area of residence		
Urban	rc	rc
Rural	0.88	1.30
Percentage of women employed in state	0.99*	0.99
<b>Time interval</b>		
12–47 months mortality models		
12–23 months	rc	rc
24–35 months	0.61***	0.62***
36–47 months	0.41***	0.46***
<b>-2 Log likelihood</b>		
Initial value	2,165.32	3,350.59
Final value	2,052.20	3,167.24

rc = Reference category

a. Model 2 results for predictor variables other than employment are not given since they are virtually the same as those for Model 1.

\*\*\*p<.01; \*\*p<.05; \* p<.10



Note: Probabilities are estimated with all other predictor variables evaluated at their mean values.

**Figure 3 Estimated probability of dying at ages 12–47 months by sex according to mother's employment status**

survival is not significantly affected by birth order or the presence of same-sex siblings at birth. This is also true for all girls except those at birth orders 4 or higher who had older sisters at birth. These girls have a mortality risk 59 percent higher than that of girls at birth orders 2 or 3 with no sisters at birth. Their mortality risk is also higher than that of girls at the same high birth orders but with no older sisters. As for infant mortality, the probability of survival varies significantly by region only for girls, being higher in the south and east than in the north.

**Effects of interactions of employment with other explanatory variables on mortality at ages 12–47 months.** Model 3 (Table 9) disaggregates the effect of employment on the survival of boys and girls to age four, if they have already lived to age one, by urban and rural residence. The results reveal that the odds of dying are higher for both male and female children if the mother is employed, but the effect of mother's employment is significant for girls only in urban areas and for boys only in rural areas. For girls in urban areas, the odds of dying between 12–47 months increase almost threefold if the mother works, but for girls in rural areas the odds increase by only 14 percent (a nonsignificant increase). Thus, although mother's employment in urban areas reduces the survival of all children both to age one and between ages one

**Table 9 Odds ratios derived from logistic regressions of child mortality on mother's employment interacting with area of residence, region, and birth order/presence of same sex siblings: Results from Models 3, 4, and 5 for mortality at ages 12–47 months estimated separately for male and female children among children born during the four years preceding the survey, National Family Health Survey, 1992–93**

Explanatory variable	Dependent variable: Mortality at 12–47 months	
	Male children	Female children
<b>Model 3: Interaction of employment and area of residence</b>		
<i>Reference category in each area: Unemployed mothers in the same area of residence</i>		
Rural, mother employed	1.38*	1.14
Urban, mother employed	1.50	2.72***
<b>Model 4: Interaction of employment and region</b>		
<i>Reference category in each region: Unemployed mothers in the same region</i>		
North, mother employed	1.11	1.05
South, mother employed	2.87**	1.56
East, mother employed	1.64	2.45***
<b>Model 5: Interaction of employment and birth order/presence of same-sex siblings at birth</b>		
<i>Reference category in each birth order/presence of same-sex siblings combination: Unemployed mothers of children of the same birth order/presence of same-sex siblings combination</i>		
Birth order 1, mother employed	2.52**	0.73
Birth order 2 or 3,		
No same-sex sibling, mother employed	1.40	1.16
Same-sex siblings, mother employed	1.48	1.44
Birth order 4 or higher,		
No same-sex sibling, mother employed	0.43	1.56
Same-sex siblings, mother employed	1.06	1.56**

Note: All models are estimated with the same control variables as Model 1 as relevant.

\*\*\*p<.01; \*\*p<.05;

and four, it has its strongest effect on girls between ages one and four. By contrast, the detrimental effect of mother's employment on child survival in rural areas is weak and barely significant, even for boys.

Unlike the case of infant survival, mother's employment has the most negative effect on child survival in the south for boys and in the east for girls (Model 4, Table 9). In the north, mother's employment has no effect on the odds of survival for boys or girls. Among boys whose mothers are not employed, the odds of dying are less than half in the south than in the north. Among girls whose mothers are not employed, the odds of dying are less in the east and south than in the north (not shown).

Finally, the results of Model 5 reveal that mother's employment has a significant negative effect on the survival of boys only at birth order 1. By contrast, for girls, mother's employment significantly increases the odds of dying only at higher birth orders. The effect is significant for girls at birth orders 4 and above who had same-sex siblings at birth. Thus mother's employment further exacerbates the greater risk of death faced by girls at high birth orders who have same-sex siblings.

## CONCLUSIONS

As expected, the relationship between mother's employment and mortality of children in India varies by whether the focus is on the probability of death before age one or between ages one and four. In general, this study finds that *infant mortality* does not vary by whether a mother is employed or not per se, but mother's employment does have negative consequences for infant survival if the mother works away from home for cash, lives in an urban area, or lives in the south of India. The negative influence on infant mortality of work away from home for cash is due to its strong negative effect on the survival chances of male infants. If the effect of employment is examined by area of residence, it becomes clear that the survival of infant girls varies by mother's employment, but the opposing effects of employment on female infant mortality in rural and urban areas may be cancelling each other out. Specifically, if the mother works, an infant daughter's chances of survival to age one are significantly reduced in urban areas but increased in rural areas, although the effect is not significant in rural areas. For boys, on the other hand, mother's employment has negative implications for survival in both rural and urban areas, although the effect is significant only in urban areas. Since the effect of employment is not significant in rural areas for boys or girls, the minimal conclusion is that infant mortality is unaffected by mother's employment in rural areas irrespective of the sex of the child. Thus, at the infant-mortality stage, it appears that women in urban areas are much less successful in combining infant care and work than are rural women. While this result may be the consequence of the interaction of the income effect of mother's work with the greater compatibility of agricultural work with infant care in rural areas, it does give rise to the speculation that rural employed women may have a more gender-egalitarian approach to the care of their young infants than urban employed women.

'Excess' female mortality is most pronounced after the first year of life. This may be because mortality is the result of cumulative discrimination over time, or it may be that the effect of discrimination is more substantial once the infant requires scarce resources for its health and survival. Whether the level of discrimination differs by age or not, it appears in the Indian context that the inherent genetic advantage of female infants may prevent 'excess' female mortality from manifesting itself too strongly in the first year. The same cannot be said for survival in the period beyond the first year.

Mother's employment consistently reduces the probability of survival from ages one to four for all children taken together and for both male and female children separately. The narrowing of gender differentials in mortality among working women, net of all other relevant considerations, results from the fact that the increase in the odds of dying are greater for male children than for female children. This finding suggests that working women are unable to devote as much time and resources as

those who do not work to ensure the survival of both their sons and daughters. It cannot be determined whether the motivations underlying the differential increases in mortality are different for sons and daughters.

However, examining the influence of the type of work sheds some light on possible explanations. The increase in male mortality results largely from much higher odds of male mortality among women who work away from home. The odds of dying for female children are greatest if the mother works at home; they are also increased if the mother is employed outside the home, but not significantly. Thus it appears that female children are not benefited when their mothers are engaged in the type of work that should most produce female empowerment according to the women's-status hypothesis. In addition, they are particularly disadvantaged if their mothers are employed in low-status work. These results, together, permit the speculation that mothers' employment has negative implications for male children only when that employment prevents mothers from personally caring for their sons (and possibly providing preferential treatment) and that mothers' employment does little to better the condition of daughters. Indeed, work at home appears to be associated with an increased risk of mortality for girls, but not for boys. In urban areas, mother's work is particularly detrimental to the survival of girls. Given that considerations such as child care, which may be more important in urban areas where more women work in nonagricultural occupations, should affect the survival of both boys and girls equally, this finding undermines ideas that urban women may be more gender egalitarian in the care of their children.

The analysis reveals that the lower infant and child mortality in the south and east of the country, compared with the north, is due primarily to lower female mortality. The differential effect of mother's employment by region is particularly interesting. Despite the much higher infant and child mortality in the northern states, mother's employment is not, in general, significantly associated with elevated risks of infant and child mortality in the north. There may, however, be one exception: for boys during infancy, mother's employment in the north may be associated with significantly elevated risks of mortality. Employment of mothers in the south and east is associated with elevated mortality for both boys and girls at ages 12–47 months; this effect is significant for boys in the south and for girls in the east.

Finally, the interaction of mother's employment with birth order and the presence of same-sex siblings at birth does not give very consistent results, especially for survival to age one. Children at high birth orders who have no same-sex siblings at birth may be particularly likely to have mothers who have had other children who died in the past. This possibility of death clustering, which may be confounding the effect of birth order and presence of same-sex siblings, calls for further analysis. Nevertheless, there is some suggestion that mother's employment may have mixed effects on mortality risks for girls at higher birth orders with same-sex siblings at

birth (a group deemed to be at high risk): for girls in this category, mothers' employment appears to enhance the probability of survival at ages 0–11 months but to reduce substantially the probability of survival at ages 12–47 months. Thus, despite beneficial effects at earlier ages, mother's employment appears to be particularly detrimental for girls considered to be at the highest risk precisely during those ages when 'excess' female mortality is most evident. For boys, no consistent association is observed between mothers' employment and infant or child mortality linked to specific combinations of birth order and presence of same-sex siblings.

The overall conclusions of this analysis are unavoidable. First, mother's employment outside the home is associated with elevated risks of infant and child mortality; second, the narrowing of gender differentials in child mortality associated with mother's employment found in bivariate data is largely due to the stronger association between mother's employment and mortality risk for boys than for girls. There is not much support for a women's-status type of explanation for the weaker negative effect of mother's employment on the survival of girls, especially at ages 12–47 months. This last conclusion follows from the fact that employment of mothers has particularly negative consequences for the survival of female children in areas where women's status is higher (southern and eastern states) and in areas where women are likely to have greater exposure to gender-egalitarian ideologies (urban areas). Mother's employment has its most inimical influence on precisely the most at-risk female children: those at higher birth orders who have female siblings.

Finally, there remains the issue of causality raised at the beginning of the report. Is the predominant direction of causality, as assumed here, from mother's employment to elevated risks of infant and child mortality or the reverse? While the cross-sectional data on which this analysis is based do not permit a direct answer, the fact that the association of mother's employment with child mortality is found to differ by the sex of the child suggests that the predominance of causality from the death of the child to mother's employment can reasonably be ruled out. It is unlikely that the sex of the child who died will significantly affect a mother's subsequent decision to work or not to work.

One last comment appears to be in order. The fact that children die more often when mothers are employed does not in any way imply that mothers' employment should be discouraged. Instead, it suggests that society and culture have not adapted to ensure that alternatives for child care are available to women who work, irrespective of whether they work out of choice or necessity. The higher mortality of children if mothers work reflects the fact that employment for women is in addition to their traditionally ascribed roles. They alone must fulfill all of these obligations. Similar negative effects on child mortality would surely be evident if fathers had the sole responsibility for the care of infants while having to fulfill their obligations as earners. Unless gender roles and gender relations are renegotiated, children will continue to lose.

## NOTES

1. It may be argued that if there is preferential treatment, then there must be discrimination; that there is redundancy in the use of both terms simultaneously. However, here the term discrimination is used to depict a situation that is not just what happens to one child when the other is given preferential treatment, but rather when there is a *deliberate* withdrawal of resources from one child whether they are then concentrated on the other or not. Similarly, the term preferential treatment is being used here to depict a situation in which there is a deliberate concentration of resources on one child, whether this comes at the expense of another child or not.
2. All rates are calculated using the NFHS data for live births in the period 0–4 years before the survey.
3. The assets included are sewing machine (2), clock (1), sofa (2), fan (2), radio (2), refrigerator (3), TV(3), VCR (3), bicycle (2), scooter (3), and car (4). The number in parenthesis is the weight given to the ownership of the asset in calculating the index.

## ACKNOWLEDGMENTS

We express our appreciation to the United States Agency for International Development that provided funding for both the National Family Health Survey and the research on which this report is based. We thank Dr. Robert D. Retherford and Dr. T. K. Roy for reading the report and providing insightful comments and Sidney B. Westley and Sidney Moore for editorial support. Finally, we thank Dr. Fred Arnold not only for his painstaking review of earlier drafts but also for his patience and unwavering encouragement.

## REFERENCES

- Arnold, Fred, Minja Kim Choe, and T. K. Roy. In press. Son preference, the family building process, and child mortality in India. *Population Studies*.
- Bardhan, Kalpana. 1985. Women's work, welfare, and status: Forces of tradition and change in India. *Economic and Political Weekly* 20(51/52): 2261–69.
- Bardhan, Pranab K. 1974. On life and death questions. *Economic and Political Weekly* 9: 1293–1304.
- Basu, Alaka Malwade, and Kaushik Basu. 1991. Women's economic roles and child survival: The case of India. *Health Transition Review* 1(1): 83–103.
- Bicego, George, and Omar B. Ahmad. 1996. *Infant and child mortality*. DHS Comparative Studies, No. 20. Calverton, Maryland: Macro International Inc.
- Bicego George T., and J. Ties Boerma. 1991. Maternal education and child survival: A comparative analysis of DHS data. In *Proceedings of the Demographic and Health Surveys World Conference*, pp. 177–294. Washington, DC: IRD/Macro International, Inc.

- Cain, Mead T. 1980. Risk, fertility, and family planning in a Bangladesh village. *Studies in Family Planning* 11:219–23.
- . 1982. Perspectives on family and fertility in developing countries. *Population Studies* 36:159–75.
- Caldwell, John C. 1979. Education as a factor in mortality decline: An examination of Nigerian data. *Population Studies* 3(3): 395–413.
- . 1986. Routes to low mortality in poor countries. *Population and Development Review* 12(2): 171–220.
- Caldwell, John C., P. H. Reddy, and Pat Caldwell. 1989. *The causes of demographic change: Experimental research in south India*. Madison, Wisconsin: University of Wisconsin Press.
- Cleland, John G. 1990. Maternal education and child survival: Further evidence and explanations. In John C. Caldwell, Salley Findley, Pat Caldwell, Gigi Santow, Wendy Cosford, Jennifer Braid, and Daphne Broers-Freeman, eds. *What we know about the health transition: The cultural, social, and behavioral determinants of health*. Health Transition Series 1(2): 400–19. Canberra, Australia: The Australian National University, Health Transition Centre.
- Das Gupta, Monica. 1987. Selective discrimination against female children in rural Punjab, India. *Population and Development Review* 13:77–100.
- . 1990. Death clustering, mother's education, and the determinants of child mortality in rural Punjab, India. *Population Studies* 44:489–505.
- Desai, Sonalde, and Devaki Jain. 1994. Maternal employment and changes in family dynamics: The social context of women's work in rural south India. *Population and Development Review* 20(1): 115–36.
- Dixon-Mueller, Ruth. 1993. *Population policy and women's rights: Transforming reproductive choice*. New York: Praeger.
- Dyson, Tim, and Mick Moore. 1983. On kinship structure, female autonomy, and demographic behavior in India. *Population and Development Review* 9:35–60.
- Hobcraft, John. 1996. Women's education, child welfare, and child survival. In *Population and women*. Proceedings of the United Nations Expert Group Meeting on Population and Women Gaborone, Botswana, 1992. New York: United Nations.
- International Institute for Population Sciences (IIPS). 1995. *National Family Health Survey (MCH and Family Planning), India 1992-93*. Bombay: IIPS.
- Kishor, Sunita. 1993. 'May God give sons to all': Gender and child mortality in India. *American Sociological Review* 58(2): 247–65.
- . 1992. *All 'Devis' but not all wanted: A district-level analysis of female discrimination in India, 1961–81*. Paper presented at the 1992 annual meeting of the Population Association of America, Denver, Colorado.

- Kumar, S. 1977. *Role of the household economy in determining child nutrition at low income levels: A case-study of Kerala*. Occasional Paper No. 95. Ithaca, New York: Department of Agricultural Economics, Cornell University.
- Leslie, Joanne. 1989. Women's work and child nutrition in the Third World. In Joanne Leslie and Michael Paolisso, eds. *Women, work, and child welfare in the Third World*. Boulder, Colorado: Westview Press.
- Liddle, Joanna, and Rama Joshi. 1986. *Daughters of Independence: Gender, caste, and class in India*. Totowa, New Jersey: Zed Books Ltd.
- Mason, Karen Oppenheim. 1986. The status of women: Conceptual and methodological issues in demographic studies. *Sociological Forum* 1:284–300.
- Mencher, Joan P. 1988. Women's work and poverty: Women's contribution to household maintenance in south India. In Daisy Dwyer and Judith Bruce, eds. *A home divided: Women and income in the Third World*. Stanford, California: Stanford University Press.
- Miller, Barbara D. 1981. *The endangered sex: Neglect of female children in rural north India*. Ithaca, New York: Cornell University Press.
- Mosley, W. Henry, and Lincoln C. Chen. 1984. An analytical framework for the study of child survival in developing countries. In W. H. Mosley and L. C. Chen, eds. *Child survival: Strategies for research*. *Population and Development Review* 10(Suppl.).
- Muhuri, Pradip K., and Samuel H. Preston. 1991. Mortality differentials by sex in Bangla Desh. *Population and Development Review* 17(3): 415–34.
- Murthi, Mamta, Anne-Catherine Guio, and Jean Dreze. 1995. Mortality, fertility and gender bias in India: A district-level analysis. *Population and Development Review* 21(4): 745–82.
- Popkin, Barry M., and Rebecca Miles Doan. 1990. Women's roles, time allocation, and health. In John C. Caldwell, Salley Findley, Pat Caldwell, Gigi Santow, Wendy Cosford, Jennifer Braid, and Daphne Broers-Freeman, eds. *What we know about health transition: The cultural, social, and behavioral determinants of health*. Health Transition Series 2(2): 683–706. Canberra, Australia: The Australian National University, Health Transition Centre.
- Rosenzweig, Mark R., and T. Paul Schultz. 1982. Market opportunities, genetic endowments, and the intrafamily distribution of resources: Child survival in rural India. *American Economic Review* 72:803–15.
- Schultz, T. Paul. 1990. Women's changing participation in the labor force: A world perspective. *Economic Development and Cultural Change* 27:457–88.
- Simmons, George B., Celeste Smucker, Stan Bernstein, and Eric Jensen. 1982. Postneonatal mortality in rural India: Implications of an economic model. *Demography* 19(3): 371–89.

- Sopher, David E. 1980. *An exploration of India: Geographical perspectives on society and culture*. Ithaca, New York: Cornell University Press.
- Sullivan, Jeremiah M., Shea O. Rutstein, and George T. Bicego. 1994. *Infant and child mortality*. DHS Comparative Studies, No. 15. Calverton, Maryland: Macro International Inc.
- Tabutin, Dominique, and Michel Willems. 1995. Excess female child mortality in the developing world during the 1970s and 1980s. *Population Bulletin of the United Nations* 39:45–78.
- Waldron, Ingrid. 1983. The role of genetic and biological factors in sex differences in mortality. In Alan D. Lopez and L. T. Ruzicka, eds. *Sex differential in mortality: Trends, determinants, and consequences*. Canberra: Department of Demography, Australian National University.
- . 1987. Patterns and causes of excess female mortality among children in developing countries. *World Health Statistics Report* 40:194–210.
- Ware, Helen. 1981. *Women, demography, and development*. Canberra: Australian National University.