

## Modernization and the Male–Female Suicide Ratio in India 1967–1997: Divergence or Convergence?

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The traditional view that modernization is likely to increase male vulnerability to suicide while protecting females from such self-destruction was offered by Durkheim (1951). This implies a theory of divergence of suicide rates such that the male–female suicide ratio should increase with modernization. Contemporary researchers have questioned whether modernization has had such an impact. We conducted a time series analysis of male and female suicide data to determine the impact on the suicide ratio for India for the years 1967 to 1997. We developed a modernization index comprised of urbanization, female literacy, and female work participation rates. Moreover, to improve methodological efficacy, we controlled for the passage of time. However, we found that there is no significant relationship between modernization and the male–female suicide ratio. Our conclusion is that using national male–female suicide ratios to determine modernization effects may mask significant regional gender and age differences, particularly in developing countries such as India.

There is debate about whether modernization has a differential effect on the suicide rates, and therefore suicide ratios, of males and females. The suicide literature presents two main, but contradictory, ways that suicide rates appear to have responded to modernization. These can be broadly described as theories of “convergence” and “divergence.” For example, if relatively higher male suicide rates remain stable but female suicide rates increase during the same time period, this would be an example of convergence. Conversely, if male

rates rose rapidly compared to female rates which remained relatively static, this would be an example of divergence.

A useful technique for examining the effect of modernization on suicide rates and ratios is the statistical technique of time series analysis. Most research using this technique has concentrated on industrialized societies and there has been no use, or critical examination of the relevance, of such a technique in developing countries such as India. The last 30 years or so in India have been marked by unprecedented social, economic, and political upheaval as part of the modernization process. Therefore, in this paper, we examine the effect that modernization has had on the male–female suicide ratio for India from 1967 to 1997, using time series analysis.

The classical viewpoint offered by Durkheim (1951) implied that male and female suicides should diverge with modernization. He argued that male suicides would increase with modernization, but female suicides would tend

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to remain static. His view was that modernization processes, such as urbanization and increased education, encouraged the erosion of traditional values and family ties. Subsequently, this process isolated the individual from social integration or "the collective," making one more vulnerable to suicide. This notion of integration was fundamental to Durkheim's theory of suicide, which postulated that a highly integrated individual would feel a greater sense of belonging and purpose than one who felt isolated from the mores of society.

Durkheim argued, however, that suicide was fundamentally a male behavior because females, by their nature and position in society, were protected from the ravages of modernization. Women were less vulnerable than males to the weakening of social ties and the perils of modernity and thus, he concluded, more integrated into traditional family life, which was the best protection against suicide. Conforming to a traditional family life ensured that religious faith and domestic ties, to home and children, remained strong and these were the greatest deterrents to self-destructive behavior. Women were therefore more protected from self-destructive behaviors such as suicide. If, on relatively infrequent occasions, women did commit suicide it was because those individuals had deviated from their traditional roles and entered the modernization process which was, historically, the realm of males. By doing this they were taking on the male role with its inherent responsibilities, thus increasing their vulnerability to suicide (Durkheim, 1951).

More recent research provides mixed support for the theory that male-female suicide rates have diverged with modernization. For example, and in contrast to Durkheim, Stack and Danigelis (1985) reported that modernization in 17 industrialized nations from 1919 to 1972 was related to a rise in female suicide rates relative to male rates. This resulted in a decrease in the male-female ratio or a convergence of the rates. Contrary to these findings, Hassan and Tan (1989) found that female suicide rates in Australia increased from 1901 but then decreased after the mid-

1960s, culminating in a divergence of rates. They concluded that overall, modernization protected females against suicide. Other research also appears to support this idea of divergence. For example, Steffensmeier (1984) reported that during the late 1970s, emancipation appeared to have curtailed the rise of suicide among White American females, relative to White males. In a similar fashion, Krull and Trovato (1994) reported that modernization had a more detrimental effect on males than females in Quebec during the years 1931 to 1986, again suggesting divergence of rates.

However, Trovato and Vos (1992) found that between 1971 and 1981, the risk of suicide associated with change in traditional roles for Canadian women reversed for both sexes. By 1981, as women's participation in the workforce became more accepted, the risk of suicidal deaths fell for both males and females. In a recent demonstration that the changes wrought by modernization are far from static, Trovato and Lalu (2001) reported that the survival probabilities from suicide for Canadian males have improved more than for females. Along with better long-term prognoses of heart disease and lung cancer, Canadian males are enjoying improved survival rates compared to women, implying a convergence of rates.

From a different perspective, Stack's (1987) suggestion of a curvilinear relationship has also been supported by research. This is based on the idea that with urbanization more women enter the workforce and this is initially linked to increased suicides among women which then plateau and decline as people adjust to urban life. This means that there should be a convergence of rates followed by a divergence (Stack, 2000). Pampel (1998) also found with data from 18 industrialized countries over 40 years (1953 to 1992) that the ratio generally converged and then later diverged, due to a fall followed by a rise in male suicide rates, although this varied depending upon age group. Clearly the ratio of male to female suicides has altered dependent on the country and culture and period of time under investigation.

In opposition to both theories, Kushner (1993) implied that neither a convergence nor

a divergence theory can be supported because there is no persuasive historical evidence that women were immune to suicidal behavior in the early stages of modernization in Europe, Britain, and North America. Kushner contends that any differences observed by Durkheim were instead an artifact of the "gendered assumptions" (p. 9) prevalent in the late nineteenth century. The accepted definition of suicide as completed suicide and the methods of collecting suicide statistics at that time failed to take into account attempted suicide, the most common form of suicidal behavior, and that most commonly carried out by women.

Parenthetically, it should be noted that this is an aspect of the well-known gender-paradox arising from the less violent—and hence less lethal—methods of suicide utilized by women; as a consequence males complete suicides more than females, while females attempt suicide more than males (Canetto & Lester, 1998; Canetto & Sakinofsky, 1998). According to Kushner, by ignoring attempted suicides Durkheim and other researchers thus consistently eliminated most suicidal behavior, and therefore statistics about women, from analysis. This failure has perpetuated the belief that women are relatively immune to suicide. Kushner's implicit advocacy of a null hypothesis of no difference in female and male suicide rates is an important alternative to the classical argument of Durkheim, although its validation requires reliable data on attempted suicides, which are not always reported.

Moreover, these concerns may be less relevant in a developing country like India where, in part because suicide is still treated as a criminal act, data about attempted suicides is not available. Also, because very lethal methods including poisoning, hanging, and self-immolation are the means employed in nearly 75% of suicides in India, the number of attempted suicides is probably far lower than in economically developed countries (National Crime Records Bureau, 2001, p. 123).

### ISSUES OF METHODOLOGY

As there is no systematic collection of data on attempted suicides in India, our paper

therefore focuses on available completed suicide data from India with the specific aim of addressing the question of how modernization affects suicide among males and females by utilizing time series methodology similar to that used by Stack and Danigelis (1985) and Hassan and Tan (1989).

While both studies used time series analysis, Hassan and Tan (1989) have criticized conclusions made by Stack and Danigelis (1985), arguing that they failed to account for "trend" in their data. They contended that a variable such as modernization, consisting of cumulative measures such as number of telephones or extent of female literacy, would naturally increase over time. They further argued that, to effectively examine suicide ratios over time, a time variable must be included in the data set as an explanatory variable (see Tintner, 1952). Furthermore, in a related paper, Hassan and Tan (1989) query the validity of research that concludes that modernization is significantly related to a fall in the male-female suicide ratio while failing to account for trend.

Besides the need to account for trend, Mayer (2000) has further argued that reaching conclusions about the effects of modernization on the male-female suicide ratio depends on how modernization is measured. For example, measures of family integration such as divorce, family size, and female labor force participation are important indicators of modernization; however, relevant time series data are not always available for particular countries either at all, or for the time frame under consideration (Hassan & Tan, 1989).

Stack and Danigelis (1985) used an index of modernization consisting of measures of urbanization, industrialization, and education for the industrialized nations they studied. Hassan and Tan (1989) used an index composed of female participation rate in the workforce, urbanization rate, and the male-female education and employment ratios for Australia. Krull and Trovato (1994) used several indicators of integration in Quebec from 1931 to 1986, including religion, female labor force participation, divorce, and unemployment.

In his cross-sectional study of the gender suicide ratio in 37 nations, Mayer (2000) used the United Nations Development Programme's (UNDP) Human Development Index (HDI), which consists of measures of the physical quality of life, literacy levels, economic development, and gender equality. The only significant correlation reported was between reduced quality of life and increased male-female suicide ratio. Mayer concluded that while the suicide gender ratio decreased in the countries under investigation as a consequence of female emancipation and rising female suicide rates, it was only a slight decrease. More recently, Mayer (2003) used the UNDP's Gender-related Development Index (GDI), which summarizes equality of achievement between males and females on the components of the HDI, to examine the relationship between suicide rates and increasing human development in 16 Indian states during 1994. In this case, a positive and significant correlation between the GDI and the suicide ratio was reported.

#### MODERNIZATION AND SUICIDE IN INDIA

As mentioned above, previous research has mostly concentrated on industrialized nations and there has been little testing of such ideas for developing countries such as India. Mayer and Ziaian (2002) found that Indian suicide rates fluctuated somewhat in the 1990s, rising from 9.2 per 100,000 (1991) to 10.00 in 1997. Moreover, Steen and Mayer (2003) found that 1997 Indian suicide rates correlated significantly with modernization indices such as increased female literacy, falling birth rates, and fewer infant and maternal mortality deaths, but they also found that urbanization was not significantly correlated. However, this study did not examine changes in the male-female suicide ratio over a longer time period, particularly with respect to modernization.

India is a predominantly rural country with a low level of urbanization compared to other developing nations such as Brazil (Jones & Visaria, 1997). By 1991, the number

of people living in urban centers had risen to only 26% (Visaria, 1997). More specifically, the urbanization rate increased gradually during the 1950s to the 1970s but declined from 1981 to 1991. Despite this relatively low urbanization, nearly 65% of city dwellers were living in Class 1 cities (i.e., population > 100,000 persons) by the time of the 1991 census, implying that large urban areas are very densely populated.

Development, in terms of urbanization, has contributed to better conditions for some, such as middle class women, who have had greater educational and employment opportunities than in the past (Ghosh & Roy, 1997). However, according to Hirway (1990), job opportunities for some women have declined in post-independent India, particularly for the illiterate and poor. For example, many rural women are illiterate and if employed, work at menial, poorly paid tasks (Ghosh & Roy, 1997). Moreover, most of them have not benefited from development but rather suffer under increased work burdens. Lingam (1994) reports that this is due to a decreasing sustenance base, changes in control of incomes, and consumption patterns. Also, many women are forced into taking control of households. This can occur when they are widowed or divorced or when males desert the family to find work or to avoid financial responsibilities (Lingam, 1994).

Ghosh and Roy (1997) note that due to definitions of workers in both the 1981 and 1991 census data, many women have been mis-classified as "marginal" (i.e., secondary) rather than "main" workers. As India is primarily a patriarchal society, many of these women are not recognized as legitimate providers and have less access to government assistance or kinship support networks. Moreover, as women they are often underpaid and expected to do more arduous work than males. These conditions suggest that as life becomes more difficult for many Indian women, there is likely to be an increase in the numbers of women who are vulnerable to death by suicide.

We examined the effect modernization has had on the male-female suicide ratio for India during a 30-year period. We were re-

stricted in the data available as, for example, there is no available time series data on family size or divorce rates for the period we investigated. Earlier time frames are even more bereft of relevant information, which precluded study of any time before 1967. We hypothesized that the modernization process in India would have promoted sexual equality and exposed women to not only increased education and employment opportunities, but also "to the same competitive pressures as men experience" (Mayer, 2000, p. 367). Thus, contrary to the classical Durkeimian hypothesis, this process should have led to a convergence of the male-female suicide ratio. We tested this by deriving the male-female suicide ratios for all India from state suicide rates from 1967 to 1997.

## METHOD

Our analyses are based on data from the Indian states as they were in 1997,<sup>1</sup> though not all had that status in 1967. For example, Goa was a Union Territory (UT) from 1967 to 1986 but became a state in 1987. Similarly, Himachal Pradesh was a UT from 1967 to 1969 and became a state in 1970. We have included them from 1967 despite their change in status. Suicide numbers for males and females for 1967 to 1997, per state, were taken from the National Crime Records Bureau annual report, *Accidental Deaths and Suicides in India*. We used census data to calculate a population increase factor (PIF) in order to estimate male and female populations for the states in question as a whole for each intercensal year. This was necessary to calculate the yearly male and female suicide rates, and subsequently the male-female suicide ratios (MSR/FSR), for all India, per lakh (per 100,000 persons), for the years 1967 to 1997.

1. These include Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, and West Bengal.

Our modernization index consists of an equal-weighted sum of the urbanization rate, the female literacy rate, and the female workforce participation rate for all India for the years 1967 to 1997. We were restricted in the data we could use due to missing data from some of the states. For example, some data sets are not complete for years where census was not conducted (e.g., Assam in 1981), and Jammu and Kashmir figures may be projected or omitted for some years. The data were mainly obtained from the Census of India (1991: series 2) and [www.censusindia.net](http://www.censusindia.net) for 2001 data. Inter-censal year data were calculated by linear interpolation. We use the term *urbanization* to refer to the urban population as a percentage of the total population, while *literacy* was measured by the number of female literates as a percentage of the total literate population. *Female work participation* was measured as a percentage of the total female population; however, as female work participation data for 2001 are not yet available, intercensal years between 1991 and 1997 were also calculated by linear interpolation based on the 1991 census.<sup>2</sup>

In order to de-trend the data, we included a time variable as recommended by Hassan and Tan (1989).<sup>3</sup> Moreover, data were checked for auto-correlation in a preliminary analysis using ordinary least squares means (OLS). Auto-correlation can be problematic in time series because it indicates that the error term and its lag are correlated, thus violating one of the assumptions of regression analysis (Johnston, 1984).

## RESULTS

All rates, ratios, percentages, and the modernization indices for the years 1967 to

2. More recent data were made available via the *National Family Health Survey 1998-1999*, but when used to calculate the female work participation rates for 1992-1997 were found to be very similar to those based on the Census of India data for 1991.

3. We also referred to Tintner (1952) as they recommended for details about implementing this methodology.

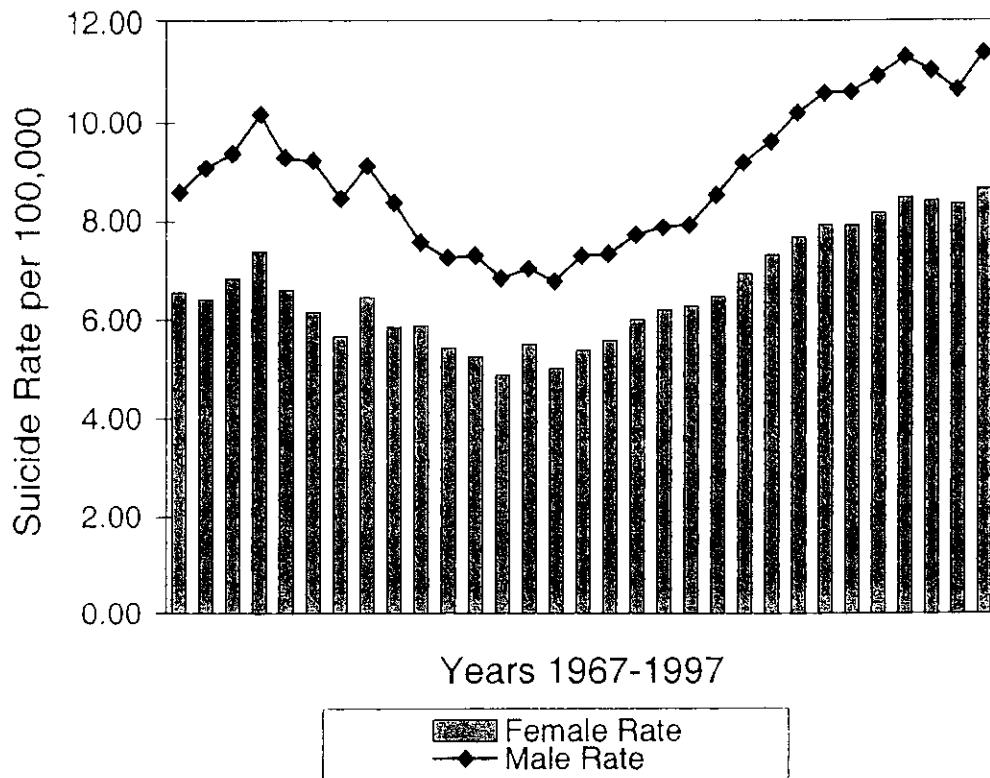


Figure 1. Male and female suicide rates, all India, 1967-1997.

1997 are presented in the Appendix. With respect to auto-correlation, when checking from the Durbin Watson tables (SPSS, 1993) we found that our calculated  $d$  value of 1.15 was not significantly indicative of auto-correlation among the residuals. We then graphed the male and female suicide rates for all India for the years 1967 through to 1997 (see Figure 1).

The ratio of male to female suicide rates was calculated and a scatterplot of this dependent variable and the modernization index revealed that the relationship was non-linear. Therefore, in accordance with a suggestion by Bryman and Cramer (1994), we corrected the dependent variable by a log transformation before it was entered into analysis.

As can be seen from Figure 1, the differences between male and female suicide rates appear to remain relatively stable over the 30-year period. This is confirmed with Figure 2, which compares the modernization index with the male-female suicide ratio. As can be seen, it appears that as modernization increases, there is little change in the ratio.

#### *Multiple Regressions*

We performed linear multiple regressions on the data with the male-female suicide ratio as the dependent variable. Analysis results are presented in table form to assist comparison with the results of Hassan and Tan (1989, 1992). Figure 2 and Table 1 (equation 1) both indicate that before adjustment is made for trend, the male-female suicide ratio is inversely correlated with the modernization index. However, equation 2 in Table 1 shows that once the data have been de-trended or once time is included as an explanatory variable, the relationship is positive but not significant. While this is one method for de-trending, it can also be done by transforming variables into their deviations from trend<sup>4</sup> (Hassan & Tan, 1992). We did this as a check, graphing the result, and Figure 3 confirms the lack of significant relationship between ratio and modernization.

4. See Gujarati (1995, p. 240) for details about this technique.

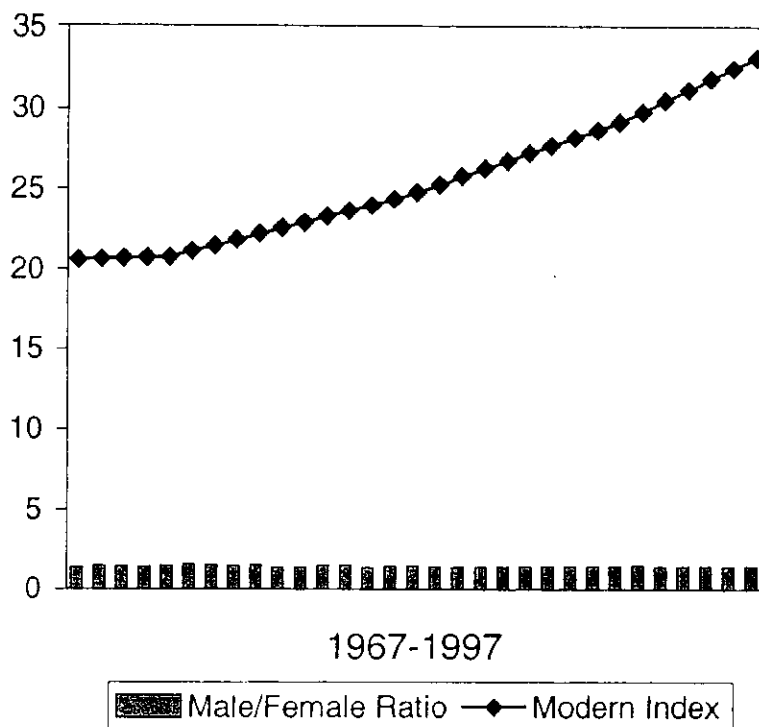


Figure 2. Male-female suicide ratio and modernization (before de-trending), all India, 1967-1997.

In line with the data analysis suggestions by Hassan and Tan (1989), we also determined how the modernization component variables each functioned in multiple regression equations, initially without de-trending (Table 2) and then controlling for time (Table 3). Table 2 shows that when urbanization, fe-

male literacy, and female workforce are entered into three separate regressions without inclusion of the time variable, urbanization and female literacy are negative and significant. When the regressions are each repeated with the addition of the time variable (see Table 3), only urbanization is (inversely) significant to ratio. Female literacy becomes positive and is no longer significant, while female workforce is not significantly related to ratio, either before or after controlling for time. On checking these results, however, it is clear that urbanization, female literacy, and time exhibit multicollinearity, which implies that the regression coefficients are likely to be unstable (Bryman & Cramer, 1994). This suggests that the results are spurious. In effect, in this data set there is no significant relationship between the male-female suicide ratio and the modernization index or any of its components.

TABLE 1

*Modernization and the Male-Female Suicide Ratio in India, 1967-1997, Before (Equation 1) and After (Equation 2) Controlling for Time*

Variable	Equation 1	Equation 2
Modernization	-0.54** (-3.49)	0.15 (0.16)
Time		-0.71 (-0.74)
Adj. $R^2$	0.27	0.26
$F$	12.20** (1, 29)	6.28** (2, 28)
Durbin Watson	1.13	1.16

*Note.* Male-female suicide ratio is the dependent variable. Time (trend variable); main statistic is *beta*, figures in parentheses are *t* values; \*\* $p = 0.01$

## DISCUSSION

In this study, we tested the effect of modernization on the ratio of male to female

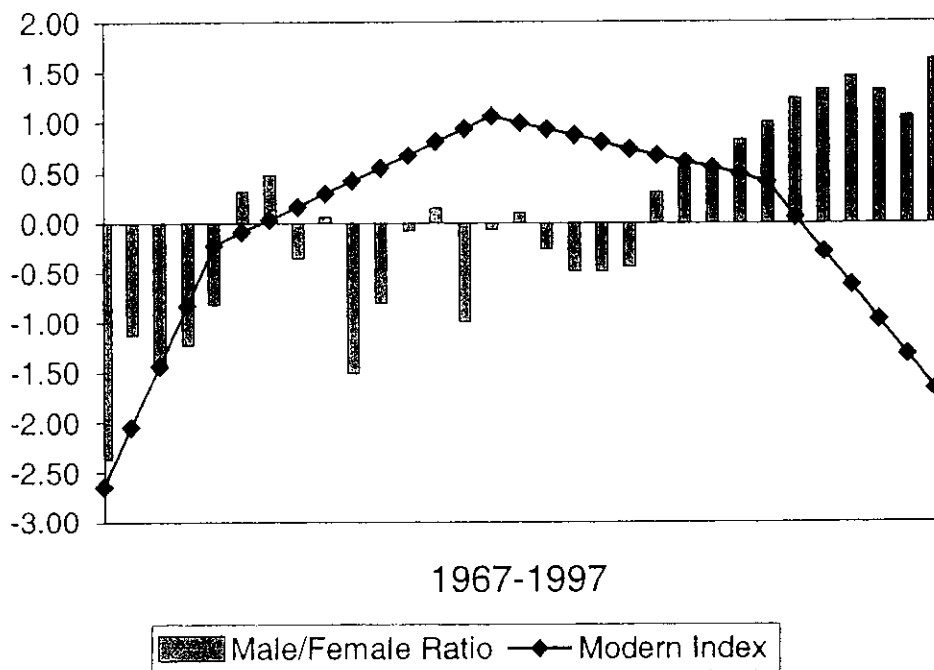


Figure 3. Deviations from trend male-female suicide ratio and modernization, all India, 1967-1997.

suicide rates in India over 30 years from 1967 to 1997. We found that the male-female suicide ratio during this time was not related to modernization, but was significantly and negatively related to one of its components, urbanization. However, this result proved to be spurious. Our findings therefore do not support either the work by Stack and Danigelis (1985) nor that of Hassan and Tan (1989;

Hassan & Tan, 1992). We feel the finding is a robust one as it is sustained even when trend effects are accounted for. This finding also implies that we can neither refute or confirm the Durkheimian hypothesis that modernization results in a divergence of the male-female suicide rate, at least not for a large developing country such as India.

Unlike the industrialized countries in-

TABLE 2  
*Modernization Index Components and the Male-Female Suicide Ratio in India, 1967-1997, Before De-Trending*

Variable	Equation 1	Equation 2	Equation 3
Urbanization	-0.58*** (-3.85)		
Female literacy		-0.54** (-3.42)	
Female participation in the workforce			-0.29 (-1.64)
Adj. $R^2$	0.32	0.26	0.05
$F(1, 29)$	14.82***	11.70**	2.68
Durbin Watson	1.21	1.12	0.85

Note. Male-female suicide ratio is the dependent variable. Main statistic is *beta*, figures in parentheses are *t* values; \*\* $p = 0.01$ ; \*\*\* $p = 0.001$ .

**TABLE 3**  
*Modernization Index Components and the Male-Female  
 Suicide Ratio in India, 1967-1997, De-Trended*

Variable	Equation 1	Equation 2	Equation 3
Urbanization	-5.70** (-2.82)		
Female literacy		1.13 (0.86)	
Female participation in the workforce			-0.02 (-0.10)
Time	5.13* (2.54)	-1.68 (-1.28)	-0.55** (-3.02)
Adj. $R^2$	0.42	0.28	0.26
$F(2, 28)$	12.03***	6.80*	6.27*
Durbin Watson	1.47	1.19	1.16

*Note.* Male-female suicide ratio is the dependent variable. Main statistic is *beta*, figures in parentheses are *t* values; \* $p = 0.05$ ; \*\* $p = 0.01$ ; \*\*\* $p = 0.001$ .

investigated in previous research, both Indian male and female suicide rates co-varied over the time period relative to each other. Both rates gradually declined from 1970 to 1980, with a slight rise in 1974. From 1981 the rates have been rising slowly, reaching a peak in 1997. It should be noted, however, that the rates are relatively low and gender differences are small; for example, 6.75 (male) per 100,000 and 4.96 (female) per 100,000 in 1981 and 11.37 (male) per 100,000 and 8.6 (female) per 100,000 in 1997, with trivial attendant MSR/FSR ratio changes from 1.36 to 1.32. In effect, there is no real trend in the Indian suicide ratio data.

Our investigation has led us to question the usefulness of longitudinal analysis using national, as opposed to subnational, suicide ratios in a developing country such as India, which has more than 30 states and union territories at different stages of development. Using a suicide ratio of national rates is not necessarily informative with respect to specific rates in individual states/territories. For example, suicide rates in India varied from 0.56 in Manipur to 52.07 in Pondicherry in 1997 (National Crime Records Bureau, 1999).

Moreover, using national female and male suicide rates masks age and gender dif-

ferences. For example, we reported previously that the suicide rate for 45- to 59-year-old males in Kerala in 1997 was 94.3 (Steen & Mayer, 2003). In other research, we report that in 1997 in Pondicherry the suicide rates for 15- to 24-year-old females and 45- to 54-year-old males were 64 and 146.8, respectively (Vaidyanathan, Mayer & Steen, 2001). More specifically, the data from Pondicherry revealed that there is a suicide epidemic among young adults in particular, which so far has remained relatively unnoticed by authorities. These rates are much higher than the national rates for both genders over the last 30 years.

More recently, we investigated Indian suicide rates for the period 1981 to 1994. We found that 18- to 29-year-old females and 30- to 49-year-old males had shown the most dramatic increases in suicide rates compared to all other age and gender groups during that time (Mayer & Steen, under review). These groups have remained largely unrecognized in terms of suicide risk. As mentioned, we have also found in previous research that high suicide rates are associated with other indices such as increased female literacy and falling birth rates (Mayer & Ziaian, 2002; Steen & Mayer, 2003). Furthermore, southern India shows a distinctive pattern of suicide compared to northern

India (Mayer, 2001). All these findings indicate that a methodology using a national male-female suicide ratio is not necessarily appropriate for a developing country that has major social and regional disparities.

Contrary to expectations, female literacy, as part of the modernization index, was not related to the suicide ratio once the data were de-trended. Female literacy rates have more than doubled in the 30-year period and we found them to be significantly correlated to regional suicide rates in a previous paper (Steen & Mayer, 2003). While Hassan and Tan (1989; Hassan & Tan, 1992) imply that female literacy should be related to the male-female suicide ratio, it is not clear from their paper if this is what they found. Stack and Danigelis (1985) found that a modernization index, of which education was a part, was inversely and significantly correlated with the suicide ratio. In the present study, female literacy was inversely and significantly related to the ratio, before de-trending, as expected; however, once time was controlled for, the relationship was positive and no longer significant. Our findings are therefore not consistent with the previous research. Further data analysis showed that female literacy accounted for considerable variance in both the female and male suicide rates, as would be expected. Once they were converted to a ratio, however, female literacy no longer accounted for significant variability in the ratio. Moreover, as with the urbanization variable, female literacy was highly correlated with time, which implies that a multiple regression analysis is likely to produce spurious results.

We found the female workforce participation rate in India was also unrelated to the male-female ratio both before and after de-trending, contrary to research conducted elsewhere (Stack & Danigelis, 1985). It can be seen from the Appendix that the female workforce participation rate in India has fluctuated little in the last 30 years. As with female literacy, further analysis showed that this variable was highly correlated with both the male and female suicide rates as would be expected from previous studies (Hassan & Tan, 1989; Stack &

Danigelis, 1985). Again, once converted into a ratio, the relationship disappeared. These findings add further weight to our argument that reducing suicide rates to a ratio with its implicit privileging of gender differences, tends to mask the serious age and regional discrepancies that our previous research has revealed.

A further limitation of the female workforce participation rate in this study is that we cannot be sure of the reliability of these data. For example, Ghosh and Roy (1997) suggest that census data may be flawed due to inconsistent definitions. For example, many "main" female workers may have been misclassified as "marginal," thus artificially deflating the female work participation rate. In addition, due to the growing migration of males from the rural to urban regions in search of jobs, many more rural women may be acting as household heads, but not be officially recognized as such (Lingam, 1994).

To complicate the situation, other researchers suggest that the statistics may truly reflect decreasing rural employment for women. For example, Srinivasan (1997) notes that rural women may have been marginalized by development that has tended to perpetuate traditional caste and gender roles for women. In contrast, their city sisters may have received some benefit from the western model of development with its inherent expectation of breaking down class and patriarchal structures. Such a model is not easily applied to a society such as India, especially in more traditional rural areas. In addition, the relative difference between literacy and education of urban, as opposed to rural, women has probably had the biggest effect on the increased health and life expectancy of urban women compared to rural women (Srinivasan, 1997). This is reflected in data from the 1971 census showing that 89% of female laborers were illiterate (Ghosh & Roy, 1997). This suggests that most rural female workers are employed in low paid and low skilled jobs. Moreover, Srinivasan (1997) notes that when women migrate to the cities due to lack of opportunity in the rural areas, they are often only able to get low status, poorly paid work.

According to Hassan and Tan (1992), the relationship between the male–female suicide ratio and modernization is complex. We can certainly concur with that in relation to India. Unlike Australia, which has seen a declining female suicide rate since the mid-1960s, the Indian female suicide rate has been gradually increasing and keeping pace with the male rate such that the gender suicide ratio has remained relatively unchanged over the last 30 years. Our results show that there has been no substantial effect of modernization

on the gender suicide ratio in India even once correction for trend was made in our analysis. Moreover, this study has exposed major limitations in the established method of examining the ratio between male and female suicide. In the present examination of trends in the gender suicide ratio in India, the disparate patterns revealed in our previous research were not apparent. Our findings indicate that continued research into the use of longitudinal trend analysis is warranted, especially for developing countries.

## APPENDIX

### *India: Male–Female Suicide Rates and Ratios with Percentages and Indices, 1967–1997*

Year	Male suicide rate	Female suicide rate	M/F suicide ratio	% Urbanization	% Female Literacy	% Female Workforce	Modernization Index
1967	8.59	6.53	1.32	19.13	19.32	23.40	20.62
1968	9.07	6.39	1.42	19.33	19.99	22.64	20.65
1969	9.38	6.80	1.38	19.52	20.66	21.88	20.69
1970	10.18	7.34	1.39	19.72	21.33	21.12	20.72
1971	9.27	6.57	1.41	19.91	22.00	20.36	20.76
1972	9.22	6.14	1.50	20.25	22.78	20.29	21.11
1973	8.45	5.61	1.51	20.60	23.56	20.23	21.46
1974	9.12	6.43	1.42	20.94	24.34	20.16	21.81
1975	8.37	5.81	1.44	21.28	25.12	20.10	22.17
1976	7.56	5.88	1.29	21.63	25.90	20.03	22.52
1977	7.23	5.39	1.34	21.97	26.68	19.96	22.87
1978	7.30	5.23	1.40	22.31	27.46	19.90	23.22
1979	6.81	4.86	1.40	22.65	28.24	19.83	23.57
1980	7.03	5.47	1.29	22.99	29.02	19.77	23.93
1981	6.75	4.96	1.36	23.34	29.80	19.70	24.28
1982	7.27	5.35	1.36	23.58	30.75	19.96	24.76
1983	7.32	5.55	1.32	23.82	31.70	20.22	25.25
1984	7.70	5.99	1.29	24.05	32.65	20.48	25.73
1985	7.85	6.16	1.27	24.29	33.60	20.74	26.21
1986	7.89	6.24	1.27	24.53	34.55	21.00	26.69
1987	8.49	6.43	1.32	24.77	35.49	21.26	27.17
1988	9.17	6.89	1.33	25.00	36.44	21.52	27.65
1989	9.58	7.28	1.32	25.24	37.39	21.78	28.14
1990	10.16	7.63	1.33	25.48	38.34	22.04	28.62
1991	10.55	7.89	1.34	25.72	39.29	22.30	29.10
1992	10.59	7.86	1.35	25.98	40.78	22.56	29.77
1993	10.91	8.12	1.34	26.24	42.27	22.82	30.44
1994	11.30	8.42	1.34	26.49	43.76	23.08	31.11
1995	11.01	8.36	1.32	26.75	45.25	23.34	31.78
1996	10.63	8.29	1.28	27.01	46.74	23.60	32.45
1997	11.37	8.60	1.32	27.27	48.23	23.86	33.12

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