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ENSURING DAUGHTER SURVIVAL IN TAMIL NADU, INDIA

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Abstract

The south Indian state of Tamil Nadu is a relatively recent entrant to the list of Indian states exhibiting the phenomenon of 'missing girls'. A substantial proportion of these missing girls may be attributed to the differential survival of girls and boys in the 0-6 age group due to daughter elimination in the form of sex selection, neglect and infanticide. Notwithstanding the state's relatively recent history of daughter elimination, the government and NGOs in Tamil Nadu have been active in terms of data collection to track gender differences in survival and in introducing interventions to prevent daughter elimination. Against this background, this paper has two aims. First, it provides a temporal and spatial analysis of patterns of daughter deficits in Tamil Nadu over the period 1996 to 2003. Second, it undertakes an examination of the modus operandi, underlying assumptions, strengths and weaknesses of various interventions and assesses their effect on daughter elimination.

Keywords

Declining sex ratios, daughter elimination, female infanticide, gender discrimination, interventions, Tamil Nadu, India, Asia

Ensuring daughter survival in Tamil Nadu, India[1]

1 Introduction

The phenomenon of 'missing' women is well-established in the Indian context (Sen, 1990). While the latest Indian census conducted in 2001 points to a slight improvement in the overall population sex ratio, the proportion of girls to boys or the 0-6 sex ratio continues to decline, falling from 976 in 1961 to 927 in 2001. The sex ratio at birth has also declined sharply and estimates based on the National Family Health Surveys (NFHS) and Sample Registration Surveys (SRS) show that this ratio has fallen from 943 in the 1980s to 876 in 2001-03.[2] A substantial proportion of this decline may be attributed to the differential survival of girls and boys in the 0-6 age group due to daughter elimination in the form of sex selection, infanticide and neglect.

While several North Indian states have a long history of daughter elimination, the south Indian state of Tamil Nadu is a relatively recent entrant to the list of states exhibiting the phenomenon. Notwithstanding its recent addition, the state government and NGOs in Tamil Nadu have been active in terms of data collection efforts to track gender differences in survival and in introducing programs to prevent daughter elimination, some of which have been adopted in other states or have been introduced on an all-India basis. While details are provided later, broadly, following the political cycle, government schemes and attention to the issue of daughter elimination in Tamil Nadu may be divided into a first phase of interventions which lasted between 1992 and 1996, and a second phase characterized by a sharp increase in intervention intensity and attention being paid to daughter elimination since May 2001. The interim period (May 1996 to May 2001) was marked by a lull in

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[2] Sex ratio at birth figures for the 1980s are based on NFHS1 and are from Retherford and Roy (2003). Figures for the period 2001-2003 are from the Office of the Registrar General (2007).

government efforts.[3]

Against this background, this paper has two aims. First, to examine temporal and spatial patterns in daughter deficits in Tamil Nadu over the period 1996 to 2003. Following the pattern of interventions, we focus on changes before and after 2001. Second, to examine the rationale, modus operandi, strengths and weaknesses of various interventions and provide an assessment of their effect on daughter elimination.

The paper is based on primary and secondary data which are both quantitative and qualitative in nature. The main source of quantitative data are five rounds of Vital Events Surveys (VES) conducted by the Directorate of Public Health (DPH) of Tamil Nadu annually between 1998 and 2000 (for the birth years 1996, 1997, 1998 and 1999) and in 2004 (for the birth year 2003). Information on various interventions is obtained from relevant government departments, NGOs and newspaper reports. Interviews and discussions with NGO staff, government staff, women's self-help groups (SHG) and local respondents in different districts were carried out over several rounds of fieldwork between 2000 and 2008.

To preview our results, based on the Vital Events Surveys (VES) we find that between 1996 and 2003 there has been a sharp decline in daughter deficit. Other sources of data such as the SRS, and Primary Health Centre (PHC) records also provide support for this finding. Furthermore, we find that the decline is especially sharp in those parts of the state where government and NGO interventions have been most active suggesting that over the period under scrutiny the various interventions have led to a reduction in daughter elimination.

The rest of the paper is organized as follows. The following section presents a temporal and spatial analysis of daughter deficits in the state. Section 3 provides an assessment of the various interventions that have been in place in Tamil Nadu since the official acknowledgement of the prevalence of female infanticide in the early 1990s. Section 4 provides a more detailed account of the experience of tackling female infanticide in Salem—the district with the highest daughter deficit in the state. Section 5 summarises and concludes.

2 Temporal and spatial patterns of daughter deficit in Tamil Nadu

2.1 Definitions and a framework

Daughter deficit is defined as the gap between the number of expected daughters and the number of daughters born or alive in a certain age group. It is a proxy for the extent of daughter elimination and may occur before birth (pre-birth), within a year after birth (early post-birth deficit) or beyond age one

[3] The state government was headed by Ms. J. Jayalalitha of the AIADMK between June 1991and May 1996. She lost the following elections, and returned to power in May 2001 and remained chief minister for most of the period between May 2001 and May 2006.

(late post-birth deficit). In this paper we focus on deficits which occur before birth and within a year after birth.[4] To estimate the extent of daughter deficit the first task is to establish benchmarks for the number of daughters expected in the absence of interference against which the prevailing figures may be compared.

While a detailed discussion is provided in Srinivasan and Bedi (2008), it is widely accepted that in the absence of interference, the sex ratio at birth is around 952 female live births per 1000 male live births (see Ramachandran and Deshpande, 1964; Johansson and Nygren, 1991; Klasen and Wink, 2003; Sudha and Rajan, 2003). Sex ratios at birth (SRB) which are statistically different from and less than 952 are treated as evidence of pre-birth daughter deficit. Thus, pre-birth daughter deficit (DD_{pre}) defined as the gap between the number of expected girls and the number of girls born may be calculated as,

$$DD_{pre} = N_m SRB_e - N_f , \quad (1)$$

where, N_m and N_f denote the number of live male and female births and SRBe denotes expected SRB. Dividing and multiplying the right-hand-side of (1) by N_f yields,

$$DD_{pre} = \left(\frac{SRB_e}{SRB_s} - 1 \right) N_f , \quad (2)$$

where $SRB_s = N_f / N_m$,, denotes the estimated sex ratio at birth. Districts where SRB_s is less than SRB_e experience a daughter deficit, and (2) provide a measure of the extent of this deficit. Districts where SRB_s is not statistically different from and less than the expected SRB ((2) is zero or negative) are viewed as areas with no evidence of daughter deficit.

Turning to post-birth deficit, for various biological reasons, female infant mortality is usually lower than male infant mortality. Several authors (see Waldron, 1983; Johansson and Nygren, 1991; Hill and Upchurch, 1995) have shown that in the absence of interference, female infant mortality may be pegged in the range of about 77 to 85 percent of male infant mortality. Model life tables for the United States and the United Kingdom also show that the expected female IMR lies at about 80-82 percent of male IMR.[5] Based on these estimates, we peg expected female IMR at about 80 percent of male IMR. Thus, post-birth daughter deficit (DD_{post}) is,

$$DD_{post} = \{ FIMR_s - (0.8 * MIMR_s) \} N_f , \quad (3)$$

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[4] Srinivasan and Bedi (2009) show that in Tamil Nadu for the period that we focus on, daughter deficit may be attributed almost entirely to pre- and early post-birth deficit (within the first year of birth).

[5] For the United Kingdom, model life tables are available at http://www.statistics.gov.uk/downloads/theme_population/Interim_Life/ILTUK0507Reg.xls and for the United States model life tables are available at http://www.cdc.gov/nchs/products/life_tables.htm. Accessed on June 12, 2009.

where $FIMR_s$ and $MIMR_s$ are estimated female and male infant mortality rates, respectively. Alternatively, (3) may be written as,

$$DD_{post} = (FIMR_s - FIMR_e)N_f, \tag{4}$$

where $FIMR_e$ denotes the expected female IMR. If estimated female IMR is higher and statistically, significantly different from the expected female IMR, it is treated as evidence of post-birth daughter deficit.

Combining (2) and (4), total daughter deficit (*TD*) in a given year/period (*t*) we get,

$$TD_t = \underbrace{\left(\frac{SRB_e}{SRB_{st}} - 1\right)N_{ft}}_{DD_{pre,t}} + \underbrace{(FIMR_{st} - FIMR_{et})N_{ft}}_{DD_{post,t}}. \tag{5}$$

Using (5), changes in daughter deficit between time period *t* and *j* may be decomposed into

$$\begin{aligned} TD_t - TD_j = &\left[\left(\frac{SRB_e}{SRB_{st}} - 1\right) + dFIMR_t\right](N_{ft} - N_{fj}) \\ &+ N_{fj}\left(\frac{SRB_e}{SRB_{st}} - \frac{SRB_e}{SRB_{sj}}\right) + N_{fj}(dFIMR_t - dFIMR_j) \end{aligned} \tag{6}$$

As shown in (6), temporal changes in total daughter deficit may be decomposed into a part which may be attributed to a secular decline in number of female births (first term on the right-hand-side), to changes in SRB and to changes in differential mortality.

Since it is unlikely that there has been a sharp change in the number of female births during the period under analysis we assume that $N_{ft} = N_{fj}$ and treat changes in total daughter deficit before and after 2001 as a function of changes in *SRB* and changes in differential mortality.[6] With this simplification (6) reduces to,

[6] While we do not have census information on the number of births for 1997-2000 and for 2003, the VES data show that the average number of births per year between 1997 and 2000 was 173,651 while in 2003 the number of births was 171,427 or a small reduction of 1.28 percent. According to the Sample Registration Survey (www.census.tn.nic.in accessed on December 10, 2007) in 1997, the birth rate (95% C.I.), that is, the number of live births per 1000 population, was 19 (18.4-19.6) per 1000 for the state and 19.3 (18.6-20) and 18.3 (17.1-19.5) in rural and urban areas, respectively. In 2003, the birth rates (95% C.I.) were 18.3 (17.8-18.8), 18.8 (18.2-19.4) and 17.3 (16.2-18.4) for the state, rural and urban areas, respectively. These figures show that between 1997 and 2003 the births rates in rural and urban areas are not statistically different at a significance level of 5 percent.

$$TD_t - TD_j = N_{fj}\left(\frac{SRB_e}{SRB_{st}} - \frac{SRB_e}{SRB_{sj}}\right) + N_{fj}(dFIMR_t - dFIMR_j) \quad (7)$$

To compute (7), as will be discussed below, we use information on the total number of live female births (N_{fj}) from the census conducted in 2001, while vital events surveys covering the period 1996-1999 and 2003 are used to obtain estimates of *SRB* and *IMR* for the period before and after 2001, respectively.

2.2 Data

Following (7), at the very least, an intra-state assessment of daughter deficits requires district-level data on SRB and male and female infant mortality. Such an assessment should yield a more detailed idea of daughter deficit and its patterns which a state-level analysis may mask. The civil registration system which in principle should contain district-level figures on vital events is not complete. Other sources such as the SRS provides information on SRB and infant mortality only at the state-level and do not support an intra-state examination. Census data on district-level SRB was collected for the first time only in 2001 and hence does not permit a temporal analysis and there are no census-based data on infant mortality.

Accordingly, while we do use SRS and Census 2001 data, the bulk of the paper relies on five rounds of Vital Events Surveys (VES) conducted by the Directorate of Public Health (DPH) of Tamil Nadu. These VES were launched by the state government in 1997 to track vital events on a more regular basis and to generate district-level information for the purpose of, among others, reducing infant mortality, infanticide and gender gap in IMR. Since then several editions of the VES have been conducted spanning the birth years 1996, 1997, 1998, 1999 and 2003. These surveys gather information among others on number of male and female live births, and infant deaths during the year preceding the survey. Each of the surveys is based on a sample of about six million individuals in rural (non-municipal) areas and three million individuals in urban (municipalities and corporations) areas. At the district level this entails a sample size of about 200,000 individuals in rural (non-municipal) areas and 100,000 individuals in municipal areas. The surveys were conducted by 36 trained enumerators per district. While additional details on the surveys are available in Athreya (1999), the methodical approach to data collection and data capture and the large size of the sample suggest that the surveys contain high quality data on vital events. The volume of data available in each of the VES, nine million individuals and 174,000 births, may be contrasted with the Sample Registration Surveys which usually covers 355,000 individuals and about 6000-7000 births in each round.

To analyse temporal patterns we divide the period covered by the data into a pre- and post- 2001 period. While details are discussed later, this division coincides with a time period before and after intensification of efforts to tackle daughter elimination. To focus on these two broad periods, pre-2001 estimates are based on VES covering the period 1996 to 1999. Information from the four surveys is pooled and accordingly, the pre-2001 analysis relies on

responses from 36 million individuals or about 1.25 million individuals per district. The total numbers of births analyzed during this period are 694,605. For the post-2001 analysis we rely on VES 2003 which covers nine million individuals and includes 171,427 births. In addition, we also use data from the census conducted in 2001 which covers 14 million households and 895,765 births for Tamil Nadu.

2.3 Estimates

Infant mortality and post-birth deficit, 1996-2003

Table 1 provides VES based estimates of IMR for the whole state over the period 1996-1999 and for 2003. As shown in the table, in 1996-1999 the male IMR was 36 while the female IMR was 39 as opposed to an expected female IMR of 29. In terms of a broad spatial distribution, the female disadvantage emanates mainly from rural areas. In the urban areas of the state the estimated and expected female IMR (19 versus 18.4, respectively) are not statistically different. The rural areas of the state reveal a different picture with a male IMR of 41 and a female IMR of 48 as compared to an expected female IMR of 33.

A few years later, based on VES 2003, the male and female IMR are the same (30 per 1000). While these numbers still reflect a statistically significant 5.7 point female disadvantage, temporally, the decline in female IMR outstrips the decline in male IMR, resulting in a 4.5 point decline in the gap between estimated and expected female IMR. The decline is pronounced in rural areas with a sharp 8.2 point reduction in the gap between estimated and expected female IMR (a reduction from 15.2 to 7). In contrast, in urban areas the temporal change between estimated and expected female IMR is statistically significant and suggests an increase in daughter deficit. However, the magnitude of the gap is not large.

Table 2 provides a district-specific picture of male and female infant mortality for 1996-1999 and 2003. As shown in the table, consistent with the overall state pattern of low post-birth female deficits in urban areas, in the period 1996-1999, post-birth deficit appears to exist in the urban areas of only three districts (Dharmapuri, Dindigul and Salem). In contrast, the estimated female IMR in rural areas of 19 of the state's 29 districts is (statistically) greater than the expected female IMR. While the shortage exists in many districts, districts with the strongest evidence of post-birth female deficit are rural Salem and rural Dharmapuri where the gap between estimated and expected female IMR is 82 and 66 points, respectively. These two districts are followed by rural parts of Theni (43 points), Namakkal (25.6) and Madurai (25.2).

District-specific figures for 2003 show a clear decline in the number of districts with evidence of daughter deficit (see Table 2). There is evidence of post-birth daughter deficit in the urban area of one district while daughter shortages are now restricted to the rural areas of 10 districts as compared to 19 districts in 1996-1999. While both districts with the largest female disadvantage in 1996-1999 continue to display evidence of post-birth deficit in 2003, there is a sharp decline in the extent of the deficit. Across the various districts, rural Salem and Dharmapuri experience the sharpest decline in the gap between estimated and expected female IMR. The gap drops from 82 to 17 in Salem

Table 1
Infant Mortality Rates in Tamil Nadu

Year/Statistic	IMR Tamil Nadu			IMR Urban Tamil Nadu			IMR Rural Tamil Nadu		
	Male	**Female**	**Expected Female**	**Male**	**Female**	**Expected Female**	**Male**	**Female**	**Expected Female**
1996-1999	36	39	28.8	23	19	18.4	41	48	32.8
Absolute value of test statistic		23.5			1.01			26.8	
p-value [a]		(0.000)			(0.313)			(0.000)	
2003	30	29.7	24	24	21	19.2	32.6	33.1	26.1
Absolute value of test statistic		7.20			1.43			7.11	
p-value [a]		(0.000)			(0.152)			(0.000)	
Change in *dIMR* (1996-1999 to 2003)		4.5			-1.2			8.2	
Absolute value of test statistic		17.15			8.33			21.6	
p-value [b]		(0.000)			(0.000)			(0.000)	

Notes: Infant mortality rate (IMR) is defined as the number of infant deaths (age 0-365 days) per 1000 live births. All calculations are based on the Vital Events Surveys 1996-1999 and 2003. [a] H_0: estimated female IMR is greater than the expected female IMR (0.8*MIMR).
[b] H_0: temporal change in difference between estimated female IMR and expected female IMR (*dIMR*) is zero.

Table 2
District Specific Male and Female Infant Mortality Rates
Tamil Nadu, 1996-1999 and 2003

	MIMR Urban 1996-99	FIMR Urban 1996-99	MIMR Rural 1996-99	FIMR Rural 1996-99	MIMR Urban 2003	FIMR Urban 2003	MIMR Rural 2003	FIMR Rural 2003
Chennai	19	15	.	.	17	14	.	.
Coimbatore	27	20	39	30	15	13	25	21
Cuddalore	18	16	37	36*	32	22	32	35
Dharmapuri	21	25 *	56	111*	21	16	45	49*
Dindigul	25	27 *	43	56*	33	35	30	54*
Erode	23	21	41	41*	26	18	34	28
Kancheepuram	16	16	30	25	23	21	23	22
Kanyakumari	13	9	20	19	26	11	.	.
Karur	20	20	43	41*	26	31	37	35
Madurai	31	24	41	58*	22	20	30	42*
Nagapattinam	19	16	37	34	25	26	34	30
Namakkal	26	16	43	60*	13	9	31	26
Nilgiris	18	13	41	35	20	26	32	24
Perambalur	.	.	47	51*	.	.	31	38*
Pudukottai	28	19	36	38*	20	19	31	35*
Ramanathapuram	28	17	51	47*	27	31	37	31
Salem	32	33 *	49	121*	29	33	35	45*
Sivaganga	21	17	34	36*	27	10	28	24
Thanjavur	24	16	43	34	18	13	38	26
Theni	23	21	48	81*	28	31	35	42*
Thirunelveli	35	34	39	35	38	31	36	32
Thiruvallur	22	14	31	30*	16	15	28	24
Thiruvannamalai	25	17	38	42*	25	18	32	34
Thiruvarur	23	14	39	32	13	26*	34	19
Thuthukudi	20	13	45	40	24	20	33	30
Tiruchirapalli	21	22	52	48*	30	24	29	42*
Vellore	26	18	42	56*	24	20	36	48*
Villupuram	19	14	48	45*	33	22	32	36*
Virudhunagar	23	21	39	40*	24	28	38	31

Notes: Infant mortality rate (IMR) is defined as number of infant deaths (age 0-365 days) per 1000 live births. The IMR figures are our calculations based on the Vital Events Surveys, 1996-1999. * indicates that the estimated female IMR is greater than the expected female IMR at at least the 5% level of significance.

and from 66 to 13 in Dharmapuri respectively. These two districts no longer have the highest differential between estimated and expected female IMR and are replaced by rural parts of Dindigul and Tiruchirapalli. Between the two periods, the gap in these districts increases from 21 to about 30 and six to 18 respectively. While the declines in Salem and Dharmapuri have been accompanied by an increase in deficit in other districts, the overall message from the temporal comparison of the differences between the estimated and expected female IMR is one of declining post-birth daughter deficit.

To obtain an idea of the absolute magnitude of this deficit we use (5) and the estimated and expected female IMR for 1996-1999 and 2003 to compute deficits for both periods and (7) to compute changes in post-birth deficit over time. As shown in Table 3, we estimate an annual state-wide post-birth deficit of 4,485 girls for the period 1996-1999.[7] As discussed earlier, daughter deficit is essentially a rural phenomenon and the rural areas of the state account for almost the entire deficit. In terms of a district-specific distribution, a little more than 50 percent of the deficit may be attributed to just two districts—Dharmapuri accounts for 26.5 percent of the deficit while Salem accounts for 24 percent of the deficit (Table 3, column 1).

Post-birth deficit figures for 2003 are presented in column 2 of table 3 while changes in the deficit between the two periods, 1996-1999 and 2003 are provided in column 3. District-specific figures in column 3 indicate whether changes in the post-birth deficit are statistically different from zero, a positive number indicates that the deficit has declined while a negative number indicates that the deficit has increased over time. As shown in Table 3, post-birth deficit records a sharp decline of a little more than 2,000 girls, which translates into a decline of 46 percent between the two reference periods. The decline is dominated by Dharmapuri and Salem which together account for 85 percent of the decline. Post-birth daughter deficit in Dharmapuri declines from 1,189 to 219 or a reduction of about 82 percent while the corresponding decline in Salem is 73 percent (from 1067 to 283). Other districts such as Theni, Namakkal, Madurai, Vellore and Dindigul which displayed strong evidence of post-birth daughter deficit in 1996-1999, present a mixed picture. Theni, Madurai and Namakkal experience a decline in post-birth daughter deficit, there is no increase in Vellore while Dindigul and Tiruchirapalli experience an increase in the deficit.While there are four districts in which the deficit is statistically different and larger than in 1996-1999, these increases are modest. The main picture emerging from the analysis is that post-birth

[7] Based on records maintained by primary health care centers in the state, for the birth year 1995, Chunkath and Athreya (1997) report 3,226 cases of female infant deaths due to 'social causes', a euphemism for infanticide. The authors write that PHC records may not be complete but that they provide useful information to support district-level comparisons.

Table 3
Post-Birth Daughter Deficit

	Overall Deficit 1996-1999 (1)	**Overall Deficit 2003 (2)**	**Overall** Change in deficit 1996-1999 to 2003 **(3)**	**Urban Deficit 1996-1999 (4)**	**Urban Deficit 2003 (5)**	**Urban Change in deficit 1996-1999 to 2003 (6)**	**Rural Deficit 1996-1999 (7)**	**Rural Deficit 2003 (8)**	**Rural Change in deficit 1996-1999 to 2003 (9)**
Tamil Nadu [a]	*4485*	*1829*	*2070*	*130*	*26*	*-63*	*4017*	*1799*	*1978*
Chennai	0	2	-2	0	2	-2	.	.	.
Coimbatore	0	11	-11†	0	14	-14†	0	2	- 2†
Cuddalore	85*	98	-13	7	0	7	78 *	110*	-32
Dharmapuri	1189*	219*	970†	31 *	0	31†	1311*	258*	1053†
Dindigul	222*	289*	-67†	31 *	37	-6	177 *	241*	-64†
Erode	89*	0	89†	19	0	19†	60*	3	57†
Kancheepuram	24	58	-34†	32	21	11	6	31	-25†
Kanyakumari	28	.	.	0	0	0	15	.	.
Karur	38*	41	-3	8	21	-13†	28*	22	6
Madurai	311*	230*	81†	0	19	-19†	198*	138*	60†
Nagapattinam	45*	40	5	3	14	-11†	46	24	22†
Namakkal	135*	4	131†	0	0	0	132*	7	126†
Nilgiris	7	12	-5	0	33	-33†	6	0	6†
Perambalur	52*	49*	3	.	.	.	45*	42*	3
Pudukottai	66*	92*	-26†	0	6	-6†	91*	97*	-6
Ramanathapuram	28	36	-8	0	22	-22†	48*	11	37†
Salem	1067*	283*	784†	68 *	83	-15	844*	178*	666†
Sivaganga	45*	0	45†	0	0	0	47*	8	39†
Thanjavur	0	0	0	0	0	0	0	0	0
Theni	227*	88*	139†	12	31	19†	137*	46*	91†
Thirunelveli	101*	59	42†	61	11	50†	47	42	5
Thiruvallur	48	35	13	0	25	-25†	46*	13	33†
Thiruvannamalai	110*	82	28	0	0	0	149*	107	42
Thiruvarur	0	0	0	0	26 *	-26†	2	0	2
Thuthukudi	24	37	-13	0	7	-7†	31	27	4
Tiruchirapalli	98 *	230*	-132†	39	6	30†	58*	182*	-124†
Vellore	395*	349*	46	0	1	0	367*	312*	55
Villupuram	113*	143	-30	0	0	0	137*	195*	-58†
Virudhunagar	96*	37	59†	16	52	-36†	64*	3	61†

Notes: [a]The total for the state is based on districts where the estimated FIMR is statistically greater than the expected FIMR * indicates that the estimated FIMR is greater than the expected FIMR at at least the 5% level of significance.

† indicates that the temporal change in difference between estimated female IMR and expected female is statistically different from zero at at least the 5% level of significance.

daughter deficit experienced a spectacular decline of 46 percent between 1996-1999 and 2003 and that most of the decline may be attributed to just two districts—Salem and Dharmapuri.

Evidence in support of the decline in post-birth daughter deficit also comes from other sources. As shown in Table 1, the gap between estimated and expected female IMR for Tamil Nadu was 10.2 points in 1996-1999 which drops to a gap of 5.7 in 2003. Over roughly the same period, while the level of IMR for the state is much higher, SRS based estimates display temporal patterns that are remarkably similar. According to SRS data, in 1999, the gap between estimated and expected female IMR was 14 points while in 2003 the gap declined to 5.8 points.[8] Both sources of data support the conclusion that during this period post-birth daughter deficit drops sharply and may have halved between 1996-1999 and 2003.[9]

SRB and pre-birth daughter deficits, 1996-2003

Computations covering the period 1996-1999, yield a SRB of 935 for the state and 943 and 932 for the urban and rural parts of the state respectively (Table 4). While the urban SRB of 943 lies just about within the expected range (a 95 confidence interval of 935 to 951), the rural SRB of 932 and the SRB for the state as a whole (935) are statistically different from 952, suggesting pre-birth daughter deficit. Census information confirms this pattern—the state's SRB in 2001 remains at 935, indicating possible pre-birth deficit. The lower than expected ratio is driven by the rural SRB (919) which is 33 points lower than expected. At 960, the SRB in urban areas does not suggest a pre-birth deficit.

Between 1996-1999 and 2003, for the state as a whole there is a nine point increase in the SRB from 935 to 944 (p-value 0.092). While both urban and rural Tamil Nadu experience an increase in the SRB, in neither case is the change statistically significant. In 2003, the SRB for urban Tamil Nadu is well within the normal range while for the rural parts the data continue to show evidence of pre-birth daughter deficit. Similar to the IMR patterns, pre-birth daughter deficit arises mainly from rural areas of the state.

Table 4 also provides district-specific information on SRB for 1996-1999 and 2003. As displayed in column 1 of the table, based on the 1996-1999 VES data the SRB ranges from a low of 874 in the Northern district of Salem to a high of 965 in the southern district of Thuthukudi. Eleven of the state's districts have

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[8] According to SRS data, (SRS Bulletin, Volume 35, No. 1) female IMR in Tamil Nadu in 1999 was 54.5 while male IMR was 50.3, that is a gap of 14.26 points (54.5 - 50.3*0.8) between expected and actual female IMR. In 2003, (SRS Bulletin, Volume 39, No. 1) female IMR was 41 per 1000 and male IMR was 44 per 1000, a gap of 5.8 points (41 – 44*0.8).

[9] A third data source, NFHS-3, conducted in 2005-06 does not yet provide state-level gender-specific IMR, however, existing data show that for the five-year period preceding the survey, the IMR in Tamil Nadu was 30.4 (www.nfhsindia.org/nfhs3_national_report), a figure which matches the IMR estimate of 30 obtained using VES 2003 (see Table 1). A fourth data source, state PHC records also leads to the same conclusion. The number of female infant deaths due to "social causes" declined from an average of about 3000 a year between 1995 and 1999 to 372 in 2002, that is, a decline of about 88 percent (State Planning Commission, 2005).

ratios that are statistically different and lower than 952 at conventional levels of significance. Census based figures for 2001 (column 2) show that the SRB varies from a low of 838 in Salem to a high of 988 in the Nilgiris. According to the census there are 18 districts where the SRB is less than 952 and 12 where it is less than or equal to 935. A comparison of the VES and census based figures suggest that the VES data are reliable in terms of identifying districts with unusually low SRB.[10] There are clear differences across the rural and urban parts of the districts. In 1996-1999 except for two districts (870 in urban Karur and 880 in urban Virudhunagar) the urban parts of most other districts have SRB that are not statistically different from the expected SRB (column 4). In contrast there is evidence of pre-birth deficit in the rural areas of 10 districts (column 7).

To compute the absolute magnitude of pre-birth daughter deficit for 1996-1999 we rely on (2), while changes in pre-birth daughter deficit between the reference periods are computed on the basis of (7). Estimates of pre-birth daughter deficit are displayed in Table 5. Based on the gap between the expected and actual SRB in 1996-1999 and the total number of live births from Census 2001, we compute a pre-birth deficit of 6,244 females (column 1).[11] Most of this shortfall emanates from the rural areas of the state and is dominated by Salem (27 percent of the deficit) followed by Dharmapuri (12 percent). Between 1996-1999 and 2003 the shortfall declines slightly from 6,244 to 5,294 (6,244 - 950). For the most part there is not much change in pre-birth daughter deficit in urban areas as 26 of the 29 districts do not display statistically significant differences in SRB between 1996-1999 and 2003 (column 6). In rural areas, pre-birth daughter deficit declines from 4,386 to about 3,318 (4386-1068) and five districts display a reduction in pre-birth daughter deficit that is statistically different from zero (column 9). Between 1996-1999 and 2003 the SRB in rural Salem records a statistically significant increase from 843 to 893 translating into a reduction in pre-birth daughter deficit in the district. In Dharmapuri the differences in SRB

[10] Except for one district (Nagapattinam), the remaining 10 districts which have a SRB statistically lower than 952 in the VES also show up as districts with a shortfall in the census figures. Of the eight additional districts displaying shortfalls based on census figures, five also had ratios less than 952 in the VES but were not statistically different from the expected ratio.

[11] This figure, which depends on survey based estimates of SRB and only on those districts where the gap between the estimated and expected SRB are statistically different, probably understates the extent of pre-birth daughter deficit. Based on census figures the extent of the pre-birth daughter deficit is closer to 10,000. We rely on the survey based estimates as we are interested in temporal changes.

Table 4
District Specific Sex Ratios at Birth
(95% C.I.)

District	Overall			Urban			Rural		
	1996-1999 VES (1)	2001 Census (2)	2003 VES (3)	1996-1999 VES (4)	2001 Census (5)	2003 VES (6)	1996-1999 VES (7)	2001 Census (8)	2003 VES (9)
Tamil Nadu	935 (931-940)*	935	944 (935-953)	943 (935-952)	960	954 (935-971)	932 (927-937)*	919	940 (929-951)**
Chenna**i**	947 (921-973)	979	970 (916-1028)	947 (921-973)	979	970 (916-1028)	.	.	.
Coimbatore	950 (927-973)	963	928 (885-973)	999 (953-1047)	964	904 (819-997)	932 (906-959)	961	935 (886-987)
Cuddalore	946 (922-970)	930	953 (907-1001)	956 (912-1000)	932	979 (890-1077)	941 (913-970)	929	943 (890-1000)
Dharmapuri	922 (902-942)*	869	931 (888-976)	958 (918-1001)	936	945 (860-1037)	909 (886-933)*	859	926 (876-978)
Dindigul	922 (900-944)*	934	950 (901-1001)	936 (893-981)	955	1006(913-1109)	917 (891-943)*	923	926 (870-987)
Erode	928 (904-953)**	934	942 (892-994)	950 (905-999)	962	985 (888-1093)	919 (890-948)*	910	926 (868-987)
Kancheepuram	946 (924-969)	949	931 (890-974)	951 (907-997)	964	951 (861-1050)	945 (920-970)	934	926 (881-974)
Kanyakumari	948 (922-975)	988	.	933 (884-985)	1000	956 (865-1057)	953 (923-985)	968	.
Karur	893 (869-917)*	910	928 (879-979)	870 (826-916)*	941	984 (884-1095)	901 (873-930)*	895	909 (854-968)
Madurai	924 (902-947)*	951	922 (878-968)	918 (876-960)	973	911 (830-1000)	927 (901-954)**	925	926 (875-981)
Nagapattinam	928 (905-952)**	982	987(938-1038)	916 (874-959)	975	978 (891-1073)	934 (906-963)	984	990 (932-1052)
Namakkal	911 (887-934)*	859	903 (856-952)*	932 (888-977)	916	906 (816-1105)	902 (874-930)*	829	901 (847-960)**
Nilgiris	959 (930-990)	988	964 (902-1029)	955 (905-1008)	963	1007(896-1131)	962 (925-1000)	1023	943 (871-1022)
Perambalur	932 (906-960)	896	943(888-1000)	.	903	.	932 (906-960)	894	943 (888-1000)
Pudukottai	947 (925-970)	935	926 (882-972)	917 (876-959)	879	978 (887-1076)	959 (932-986)	945	909 (859-962)
Ramanathapuram	949 (925-975)	990	922 (875-971)	943 (899-987)	1019	953 (865-1050)	952 (923-982)	981	909 (853-968)
Salem	874 (852-896)*	838	899 (853-947)*	943 (902-985)	880	912 (827-1005)	843 (817-869)*	806	893 (839-951)*
Sivaganga	934 (910-959)	955	976 (927-1026)	962 (916-1009)	952	966 (880-1059)	923 (894-952)**	956	980 (922-1041)
Thanjavur	939 (916-963)	962	981 (932-1032)	965 (919-1012)	994	931 (843-1027)	929 (902-958)	948	1000(942-1060)
Theni	932 (909-956)**	895	960 (913-1012)	921 (878-965)	924	983 (894-1080)	937 (910-964)	862	952 (895-1012)
Thirunelveli	925 (902-948)*	946	939 (893-988)	924 (886-966)	944	894 (817-977)	925 (898-954)**	948	962 (904-1023)
Thiruvallur	945 (922-967)	953	974 (930-1020)	938 (896-982)	971	902 (822-989)	947 (920-974)	936	1000(948-1054)
Thiruvannamalai	957 (932-982)	922	924 (877-973)	966 (922-1011)	1016	940 (854-1033)	953 (923-983)	905	917 (862-976)
Thiruvarur	959 (935-984)	967	934 (887-984)	973 (927-1020)	999	977 (887-1075)	954 (925-983)	960	917 (861-976)
Thuthukudi	965 (939-992)	956	1022 (969-1078)	992 (943-1041)	977	1048(953-1153)	954 (923-985)	941	1010(947-1078)
Tiruchirapalli	945 (921-970)	951	932 (883-982)	961 (915-1008)	964	1009(914-1113)	939 (910-968)	941	901 (846-960)**
Vellore	952 (929-975)	907	923 (878-969)	958 (914-1004)	951	961 (874-1056)	950 (923-977)	885	909 (859-963)
Villupuram	958 (935-982)	938	947 (902-994)	946 (920-1021)	955	933 (848-1025)	963 (935-991)	936	952 (890-1008)
Virudhunagar	908 (886-931)*	945	955 (908-1003)	880 (837-923)*	966	859 (778-948)*	919 (893-946)*	930	990 (935-1049)

***Notes**:* The sex ratio at birth (SRB) is defined as the number of female live births per 1000 male live births. The SRB figures are our calculations based on the Vital Events Surveys (VES), 1996-1999.
*, ** indicate that the SRB is statistically different from the expected SRB of 952, at the 5% and 10% level of significance, respectively.

Table 5
Pre-Birth Daughter Deficit

District	Overall			Urban			Rural		
	1996-1999 VES	**2003** VES	**Change 1996-1999 to 2003** VES (p-value)	**1996-1999** VES	**2003** VES	**Change 1996-1999 to 2003** VES (p-value)	**1996-1999** VES	**2003** VES	**Change 1996-1999 to 2003** VES (p-value)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Tamil Nadu [a]	*6244*	*1563*	*950*	*682*	*635*	*-720*	*4386*	*1514*	*1068*
Chennai	124	0	124 (0.453)	124	0	124 (0.453)	.	.	.
Coimbatore	53	665	-612 (0.390)	0	894	-894 (0.066) [†]	185	158	27 (0.914)
Cuddalore	108	0	108 (0.789)	0	0	0 (0.651)	133	113	20 (0.956)
Dharmapuri	756*	534	222(0.711)	0	26	-26 (0.776)	930*	556	374 (0.560)
Dindigul	407*	31	376(0.312)	75	0	75 (0.184)	316*	229	87 (0.759)
Erode	380**	162	218(0.635)	11	0	11 (0.537)	283*	221	62 (0.843)
Kancheepuram	126	449	-323(0.529)	7	10	-3 (0.996)	77	275	-197(0.491)
Kanyakumari	48	.	.	149	0	149 (0.675)	0	.	.
Karur	422*	165	257(0.206)	198*	0	198 (0.040)[†] (0.891)	240*	202	38 (0.809)
Madurai	529*	567	-38(0.934)	355	427	97 (0.209)	216**	222	-6 (0.988)
Nagapattinam	301**	0	301(0.034) [†]	97	0	-88 (0.624)	178	0	178(0.086)[†]
Namakkal	368*	448*	-80(0.771)	65	153	0 (0.418)	287*	292**	-5 (0.991)
Nilgiris	0	0	-0(0.909)	0	0	.	0	22	-22(0.673)
Perambalur	81	37	44(0.740)	.	.	66 (0.237)	68	31	37(0.740)
Pudukottai	63	332	-269 (0.411)	66	0	23 (0.840)	0	480	-480(0.094)[†]
Ramanathapuram	30	315	-285(0.322)	23	0	-286 (0.546)	0	339	-339(0.189)
Salem	1682*	1115*	567 (0.338)	85	371	0 (0.939)	1342*	683*	659(0.099)[†]
Sivaganga	149	0	149 (0.133)	0	0	-116 (0.520)	174**	0	174 (0.084)[†]
Thanjavur	224	0	224 (0.131)	0	116	129 (0.220)	266	0	266 (0.030)[†]
Theni	150**	0	150 (0.295)	129	0	-320 (0.513)	52	0	52 (0.645)
Thirunelveli	600*	281	319 (0.597)	279	599	-422 (0.448)	326**	0	326 (0.271)
Thiruvallur	151	0	151 (0.241)	148	570	-35 (0.609)	55	0	55 (0.077)
Thiruvannamalai	0	479	-479 (0.233)	0	35	0 (0.943)	0	496	-496 (0.280)
Thiruvarur	0	162	-162 (0.367)	0	0	0 (0.304)	0	261	-261 (0.257)
Thuthukudi	0	0	0 (0.059)	0	0	0 (0.384)	0	0	0 (0.118)
Tiruchirapalli	125	374	-249 (0.624)	0	0	0 (0.955)	133	539**	-406 (0.249)
Vellore	0	796	-796 (0.267)	0	0	-44 (0.789)	43	774	-731 (0.182)
Villupram	0	117	-117 (0.670)	18	62	-151 (0.673)	0	0	0 (0.732)
Virudhunagar	649*	0	649 (0.077) [†]	484*	635**		271*	0	271 (0.022)[†]

Notes: [a]The total for the state is based on districts where the difference between the estimated and expected SRB is statistically different.

*, ** indicate that the SRB is statistically different from the expected SRB of 952, at the 5% and 10% level of significance, respectively.

[†] Indicates that the temporal change in SRB is statistically different from zero at at least the 10% level of significance.

are not statistically significant and the extent of pre-birth deficit remains unchanged. While the decline in pre-birth deficit is not as spectacular as the decline in post-birth deficit, during the period examined here, at least the reduction in post-birth deficit (female infanticide) is not matched by an increase in pre-birth deficit (sex selective abortion).

3 Preventing daughter elimination: Course of action

In 1992, the government of Tamil Nadu officially acknowledged the prevalence of female infanticide and announced several schemes to 'eradicate' it. These included the Cradle Baby Scheme (CBS), legal action against perpetrators of infanticide and the Girl Child Protection Scheme (GCPS). In addition to these three government-led interventions, several NGO-led initiatives were located in the three districts of Madurai (including Theni), Salem (including Namakkal) and Dharmapuri. This section examines each of these interventions.

3.1 Cradle Baby Scheme (CBS)

The Cradle Baby Scheme (CBS) was introduced in Salem district in 1992. Instead of resorting to female infanticide, parents who were unwilling to bring up their female babies could place them anonymously in cradles located in noon meal centres, primary health centres, selected orphanages and NGOs. Subsequent to their placement in cradles, babies were to be placed for adoption. Between 1992 and 1996, 140 babies were placed in government cradles (*The Hindu*, June 24, 2001). The scheme had a short life and following elections and a change of government in May 1996, it was shelved.[12]

In May 2001, the Cradle Baby Scheme was reintroduced. The new version of the scheme was initially launched in five districts (Salem, Madurai, Theni, Dindigul and Dharmapuri) but was soon extended to the entire state. The involvement of NGOs in scheme implementation and placement of the babies for adoption was enhanced. Numerous cradle points were opened and frequent public announcements and advertisements in the press popularised the scheme particularly in districts notorious for the practice of female infanticide. The scheme recorded a sharp increase in the number of babies and between May 2001 and November 2007, 2410 baby girls had been received (see Table 6). The bulk of these babies were handed over in Salem and Dharmapuri.

To provide an idea of the role of the scheme in bringing down daughter deficit, consider that according to our analysis (see Table 3), post-birth daughter deficit fell from an annual shortfall of about 4,500 during the period 1996-99 to about 1,800 in 2003—a decline of about 2,700 babies. Over the 6.5 years between May 2001 and November 2007, on average the scheme received

[12] Despite the low priority to the scheme after 1996, babies continued to be surrendered, and between 1993 and 2001 a total of 150 babies were received in Salem district (see Table 6).

about 370 female babies per year. These figures suggest that the CBS may have accounted for about 14 percent (370/2700) of the reduction in post-birth daughter deficit observed between 1996-1999 and 2003.

Table 6
Babies received in the Cradle Baby Scheme

	Male	Female
Phase 1: 1992-13.05.2001		
Salem	0	150
Phase 2: 14.05.2001-30.11.2007		
Salem	57	665
Madurai	30	109
Theni	20	146
Dharmapuri	40	965
Dindigul	12	38
Other districts	231	487
Total	390	2410

Source: Directorate of Social Welfare, Government of Tamil Nadu. ROC No.58544/CW6/2007, dated 3.1.2008.

Notwithstanding what appears to be the role of the scheme in reducing daughter deficits and a recent proposal to extend the scheme to every district in the country, the CBS has been criticised on various grounds.[13] An immediate concern is the state's capacity to settle the cradle babies in adopted homes and the survival rate of babies handed over to the CBS. While there is limited information on the fate of the babies after they are handed over to the scheme, according to information gathered during field work, the mortality of babies surrendered to the CBS was about four times higher than the state's female IMR in the first phase (Action Aid workshop in Delhi, 2007; CASSA, Cradle Baby Scheme, position note, May 2007). Relatedly, it is feared that the scheme feeds into a child trafficking network (Bos, 2007; *Frontline*, Vol.22, issue 11, May 21-June 03, 2005). For instance, when the CBS was revived in 2001, the number of adoption centres rose from 11 to 23 and the CBS is supposed to have created a "girl baby glut" for these centres (CASSA, Cradle Baby Scheme, position note, May 2007; Krishnakumar, *Frontline*, Vol.22, issue 11, May 21-June 03, 2005).

More fundamentally, NGOs and activists have criticised the scheme on the grounds that it absolves parents of their responsibility towards their daughters. For instance, Ruby Thiagarajan, President of Salem's YWCA

[13] Declaring the continued decline in the 0-6 sex ratio in various parts of the country as a 'national emergency', the central government as part of its national child protection programme proposed a crèche in every district so that parents can leave their unwanted female babies in them (*The Hindu*, 22 February 2007). This has come under severe criticism from civil society actors (*The Hindu*, 03 March 2007; Action Aid workshop in Delhi, December 2007).

(*Sunday Magazine*, 06 January 2002) argues that the scheme actually encourages son preference as women can continue to 'dump the girl child in the cradles' till they have the desired number of sons. The Campaign Against Sex Selective Abortion (CASSA) rejects the CBS on the grounds that it violates the Convention on the Rights of the Child (CASSA, Cradle Baby Scheme, position note, May 2007).[14]

At the grassroots level the unpopularity of the scheme is due to a different factor expressed in a popular Tamil saying, 'we may give (children) to *Yama* (the Hindu God of death) but none to others (in adoption)' (Field work, Salem district, 2002). Surrendering threatens a man's image as the provider and protector, echoed in responses like 'He (household head) cannot bring up a daughter, is he a man?' (Field work, Salem district, 2002) Concerns about the quality of female life also surface in the decision to surrender or eliminate. These concerns are couched in the image of the ideal "good" mother to justify daughter elimination over giving away unwanted daughters, as illustrated by this response from one of the study villages,

> Only mothers who have got a child in wrong ways will surrender. A true mother will never have the heart to do so. She will say, "if the baby is killed, I will be upset for 2 days". But this is better than thinking, "Am I a mother? I gave away my offspring". (Field work, Salem district, 2002)

Countering these criticisms, government officials and NGOs involved in implementing the scheme argue that handing over babies to the scheme is a more humane option than murder and that the scheme offers the potential of a better life for unwanted babies. For example, having come under severe criticism for encouraging parents to surrender their daughters, the Collector of Salem noted, 'I asked the officials to stop receiving babies. Soon after, there were babies abandoned in gutters and garbage bins. We cannot let this happen. So we had to reopen the scheme' (Field work, Salem district, 2002). According to him, the scheme was not a permanent solution but acted as only a temporary safety valve and would be discontinued the day FI deaths stop. Likewise one of the NGOs involved in adoption put it, 'Instead of certain death, they (female babies) now have secure lives' (Trustee, Karnaprayag in *Sunday Magazine*, 06 January 2002). Considering the socio-cultural baggage that parents have to deal with in surrendering their unwanted daughters, a former senior government official noted that whatever may be the criticisms directed at the scheme, the fact that many women chose to surrender rather than resort to female infanticide showed the courage of these women in challenging social ridicule (interview with a former Collector, Madurai district, April 2000; also Rajivan, 1998).

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[14] CASSA is a state-wide network of more than 60 NGOs whose main aim is to ensure effective implementation of the Pre-Conception and Pre-Natal Diagnostic Techniques (Prohibition of Sex Selection) Act (2003). CASSA's objection to the CBS is that the scheme violates articles 7 and 9 of the UN Convention on the Rights of the Child which deal with the child's right to be cared for by her biological parents and requires the State to ensure that children shall not be separated from their parents and in case of separation from one or both the parents, the State should respect the rights of the child to maintain personal relationship with both parents.

While the well-being and placement of "cradle babies" are issues that merit immediate and concerted attention, given the post-2001 increase in the number of female babies handed over to the scheme and the sharp reduction in daughter deficit during the same period, it does seem that the CBS has played an important role in reducing daughter elimination.

3.2 Legal action against female infanticide

In 1992-93, the government decided to pursue legal action against those who committed or attempted female infanticide. According to police records obtained from each district (see Table 7), the first arrests for female infanticide were made in Salem district in December 1992. Following these arrests, in July 1995, the father received life imprisonment and the mother five years rigorous imprisonment. In January 1994, Karupayee, a mother of two daughters from Usilampatti in Madurai district was arrested and sentenced in 1996 to life imprisonment for killing her third daughter. Several arrests were made in Theni (January 1997 and February 1998) and Perambalur (1997). In the post-2001 phase police and legal action against infanticide registered an increase especially in Salem (five cases after 2001) and Theni (four cases after 2001) districts. Overall, ten cases of police and legal action were recorded between in 2001 and 2003 as compared to seven cases between 1992 and 2000.

In terms of the effectiveness of a legal approach, the sharp decline in daughter deficits in districts (Salem and Theni) which have witnessed a preponderance of the post-2001 arrests suggests that legal action is likely to have deterred female infanticide. A commonly encountered response in fieldwork in Salem during the post-2001 period is, 'Killing of female infants used to happen earlier but not now. How can you? They will arrest you'. Newspaper reports, also suggest that fear of police action has led to a reduction in infanticide. For example, Rajam, a member of a self-help group in Omalur block of Salem, who herself killed her girl child, stated that it was fear of the police, more than anything else, that convinced villagers not to commit infanticide (*The Hindu*, April 10, 2004).

Based on various rounds of field work and conversations with NGOs and government officials, it is clear that opinions are divided on the efficacy and equity of using legal measures to curb daughter elimination. Those who favour such measures argue that pursuing legal action is the responsibility of the state and such actions serve as a strong deterrent. Those who are opposed to legal action argue that it may yield limited short-term gains but that such actions are typically directed at poor families which may leave them in debt while well-off families are not targeted. It is also argued that such actions treat the 'victimised' mother as a criminal and can lead to unexpected consequences. Extreme examples of the consequences of legal action come from the cases of two women who attempted suicide and the case of Lakshmi, a mother from Theni district who committed suicide, when she was found guilty of infanticide (*The Hindu*, July 31, 2001). There are cases in which the women are reported to have returned from jail to find their husbands remarried or have been deserted or divorced. In situations where both parents have been arrested, children who

are left behind have been neglected (Public hearing of the Tamil Nadu Women's Commission, July 2002; *The Hindu*, several issues).

These consequences have inspired a campaign against treating the mother as a criminal and calls not to purse legal action. This was demonstrated at a public hearing organized by the Tamil Nadu Women's Commission on female infanticide and foeticide in 2003. The one-day hearing turned out to be a one-sided affair, in which various NGOs sought to establish that women (who had committed female infanticide) were victims of state action. Twenty-eight cases were presented, all of whom pleaded innocence and presentations by NGO workers sought to establish that the law was used to victimise the poor, socially disadvantaged groups and the powerless. Indeed in a sharp reversal, NGOs such as the Indian Council for Child Welfare (ICCW), which helped file cases against female infanticide in Madurai, have over the years come to oppose legal action.

Notwithstanding such campaigns and opposition to legal action, in its hearings in 2003 the Women's Commission concluded that a heinous act of gender discrimination could not be ignored, and recommended milder punishment (*The Hindu*, 09 June 2003 & 21 July 2003). In cases in which both parents are imprisoned, the Commission proposed that the government must ensure educational, medical and nutritional provisions for the children. It went a step further seeking the government's action to curb lavish display of wealth at weddings to address the wider social context within which female infanticide occurs as well as conduct large scale awareness programmes to enhance the status of women.

While the fairness of punishing mothers who may be compelled by their husbands or other family members to eliminate their daughters may be questioned, legal action is a clear signal of the state's unwillingness to tolerate infanticide. Based on the spatial patterns of decline in daughter deficit and the various responses, it is likely that the increased incidence of legal action after 2001 has played an effective role in shaping the temporal decline in daughter deficit.

3.3 Girl Child Protection Scheme

The GCPS was launched in 1992. According to government documents the aim of the scheme is to promote family planning, eradicate female infanticide and promote the welfare and status of girl children in poor families (Directorate of Social Welfare, ROC No.58544/CW6/2007, dated 3.1.2008). The scheme is based on the assumption that given the perception of girls as an economic burden, it is necessary to enhance their economic value by providing financial support to families that raise girls. The scheme is targeted at families below the poverty line, who have only daughters in the age group 0-4 and no sons, and if either of the parents have undergone sterilization before the age of 35 years. During the first period of the scheme's operation (1992 to 1997) programme uptake was limited; and only 2,039 families had benefited from the

Table 7
Legal action against female infanticide, 1992 to 2003

District	Date arrested	Status of case
Chennai	No information	.
Coimbatore	0	.
Cuddalore	0	.
Dharmapuri*	December 2000	November 2004 , mother convicted, life imprisonment
Dindigul	2 cases, no dates available	One convicted, one dismissed
Erode	0	.
Kancheepuram	0	.
Kanyakumari	0	.
Karur	0	.
Madurai	January 1994	December 1996, mother convicted, life imprisonment; sentence commuted in 2004
Nagapattinam	0	.
Namakkal [a]	0	.
Nilgiris	December 2001	January 2003, mother convicted, 3 months simple imprisonment
Perambalur*	1997	2003, mother convicted, life imprisonment
Pudukottai	0	.
Ramanathapuram	0	.
Salem	December 1992	July 1995, father and mother convicted, life imprisonment and 5 years rigorous imprisonment respectively
	May 2001	November 2003, acquitted
	July 2001	February 2003, convicted
	September 2001	April 2003, convicted
	November 2001	November 2002, acquitted
	2002	2 cases booked, both acquitted
Sivaganga	0	.
Thanjavur	0	.
Theni [a]	January 1997	September 2003, acquitted
	January 1997	December 2004, acquitted
	February 1998	.
	January 2001	Convicted, 3 years imprisonment and Rs. 1000 fine
	July 2003	May 2004, acquited
	August 2003	May 2005, convicted, 3 years rigorous imprisonment and Rs. 500 fine
	August 2003	October 2005, acquitted
Thirunelveli	0	.
Thiruvallur	No information	.
Thiruvannamalai	2001	July 2004, acquitted
Thiruvarur	0	.
Thuthukudi	0	.
Tiruchirapalli	0	.
Vellore	No information	.
Villupuram	0	.
Virudhunagar	October 2002	April 2004, acquitted

Notes: Till January 1997, Namakkal was part of Salem district and Theni was part of Madurai district. *Source*: Reports obtained from the district offices of the Assistant/Deputy Superintendent of Police. * Information for Perambalur and Dharmapuri comes from newspaper reports (*The Hindu*, July 31, 2001 and *The Hindu*, November 27, 2004)

scheme (Social Welfare Department, Government of Tamil Nadu).[15]

In 2001-02 the GCPS was restructured to confer increased financial benefits. Currently, in the case of poor families with only one daughter and no son, and where either parent has undergone sterilization before the age of 35 years, the government deposits Rs.22,200 and in the families with two girls and no sons, Rs.15,200 each, for 20 years in the Tamil Nadu Power Finance and Infrastructure Development Corporation. Interest accruing from this deposit provides monthly payments of about Rs.150 to the family and a terminal payment, at age 20, of Rs.80,000 for a one-girl family and a benefit of Rs.40,000 per girl for families with two girls.[16] A sum of Rs.227 million, in real terms 2.83 times more than the allocation in 1991-92, was allocated for the scheme in 2001-02. The scheme has witnessed a 50 fold increase in the number of beneficiaries and according to the Corporation's policy note 2006-2007, a sum of about Rs.1750 million benefiting 115,171 children has been received under the scheme between 2001 and mid-2006.

While the number of beneficiaries has increased sharply, the effect of such a programme on altering attitudes towards girls and reducing daughter elimination is unclear. Available district-specific data (see Table 8) show that the programme had beneficiaries from all the state's districts and that in the first two years of the restructured programme (2001-02 and 2002-03) only 15 percent of the beneficiaries were from the five high infanticide districts of Dharmapuri, Madurai, Salem, Theni and Namakkal while 22 percent of the beneficiaries were from seven districts (Chennai, Coimbatore, Kancheepuram, Kanyakumari, Nilgiris, Thanjavur, Thiruvarur) where there is limited (no) evidence of the practice. More formally, there is a very weak correlation (0.13) between the extent of daughter deficit in 1996-99 and the number of GCPS beneficiaries, suggesting that the programme was not targeted towards districts exhibiting a high prevalence of daughter deficit. Additionally, there is almost no correlation (0.009) between district-specific changes in daughter deficit over the period 1996-99 and 2003 and the number of GCPS beneficiaries.

The principle of providing economic support to protect girls may be appropriate but the implementation of the scheme and the eligibility criteria suggest that the GCPS is unlikely to have achieved its objectives. First, as discussed above the scheme is not targeted at districts with high rates of daughter deficit. Second, the GCPS targets families below the poverty line and frames daughter elimination as a problem amongst the poor. However, existing evidence shows that daughter deficit is not more likely to occur in poorer families and indeed maybe more prevalent in better-off families. Based on

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[15] In the first version of the scheme the government deposited Rs. 2000 on behalf of eligible families in an interest-bearing fund. Money from this fund was to be paid out to families on occasions such as the first birthday of the child, on joining school and on joining class VI with a terminal payment of Rs. 10,000 at the age of 20. A sum of Rs. 40 million per year was allocated for the scheme (Frontline, 19(03), Feb.02-15, 2002).

[16] Based on income limits for scheme eligibility, the sum of Rs.150 per month leads minimally to a 15 percent increase in income for families with two girls and a 4 percent increase for families with one girl.

regression analysis of data from Salem district, Srinivasan and Bedi (2008) show that the probability of daughter elimination does not differ across castes and is not responsive to differences in income, wealth and education. Siddhanta *et al.* (2003) show that at the national level and in many large states the female to male 0-14 sex ratio declines with increasing levels of expenditure. Data from census 2001 reveals that the SRB is more likely to be masculine for mothers with more education (Bhatt and Zavier, 2007). Education and prosperity appear to facilitate knowledge of, access to and the use of technology for sex selection (Agnihotri, 2003; Jha *et al.,* 2006). Third, although participation in the programme is voluntary, given the sterilization clause, families with a strong son preference and who have only daughters are unlikely to be attracted to the scheme. The following response is illustrative. A pregnant woman with a daughter in Dharmapuri district, whose husband was an active member of the political party which floated the scheme, said 'So what if my husband belongs to AIADMK. We want a son, we don't want the scheme' (Field work, Dharmapuri district, 1996). The possibility that

Table 8
GCPS beneficiaries and daughter deficit in Tamil Nadu

Districts	Number of GCPS beneficiaries 2001-03	Distribution of beneficiaries (percent) 2001-03	Distribution of daughter deficit (percent) 1996-99	Change in daughter deficit (percent) 1996-99 to 2003
Chennai	254	3.06	1.16	4.80
Coimbatore	452	5.45	0.49	-24.52
Cuddalore	495	5.97	1.8	3.74
Dharmapuri	235	2.83	18.13	46.92
Dindigul	270	3.25	5.86	12.16
Erode	312	3.76	4.37	12.08
Kancheepuram	361	4.35	1.4	-14.05
Kanyakumari	446	5.38	0.71	.
Karur	308	3.71	4.29	10
Madurai	208	2.50	7.83	1.69
Nagapattinam	302	3.64	3.22	12.04
Namakkal	193	2.32	4.69	2.00
Nilgiris	71	.856	0.07	-.196
Perambalur	164	1.97	1.24	1.85
Pudukottai	167	2.01	1.2	-11.61
Ramanathapuram	294	3.54	0.54	-11.53
Salem	370	4.46	25.62	53.18
Sivagangai	60	.723	1.81	7.63
Thanjavur	162	1.95	2.09	8.81
Theni	222	2.67	3.51	11.37
Tirunelveli	413	4.98	6.53	14.21
Tiruvarur	132	1.59	1.85	6.45
Thiruvannamalai	398	4.80	1.02	-17.75
Thiruvallur	407	4.91	0	-6.37
Tiruchirapalli	167	2.01	0.22	-.511
Tuticorin	251	3.02	2.08	-15
Vellore	370	4.46	3.68	-29.52
Virudhunagar	225	2.71	1.05	-5.78
Villupuram	579	6.98	6.94	27.87

Source: Directorate of Social Welfare, ROC No.58544/CW6/2007, dated 3.1.2008

the scheme attracts those who do not have a strong son preference is consistent with the district-wise distribution of the larger share of GCPS beneficiaries in districts with limited evidence of daughter deficit.

Notwithstanding these shortcomings, similar schemes have been replicated by several state governments.[17] While such cash transfers will certainly increase the ability of poor families to educate and take care of their girls and indeed other family members, it is unlikely that schemes such as the GCPS which focus only on the poor (while daughter elimination is more widespread) and impose sterilization as an eligibility requirement will have a substantial effect on reducing daughter deficits.[18]

3.4 Behavioural change campaign in Dharmapuri

In addition to the state-wide interventions discussed above, in 1997-99, a special, one-off effort was made to tackle infanticide in Dharmapuri. While details are provided in Athreya and Chunkath (2000), under the Tamil Nadu Area Health Care Project, project administrators developed a strategy to tackle female infanticide through a process of social mobilization. A strong communication programme with *kalaipayanams* (itinerant street theatre) at its centerpiece was used to create awareness, highlight the value of girls and mobilize the population against female infanticide. Trained troupes delivered 3,000 performances between April 26 and June 6, 1998 in each of the 18 blocks of the district. These performances were witnessed by about a third of the district's population. According to Athreya and Chunkath (2000) the direct and indirect reach of the programme was universal and "every one either knew of it beforehand or came to know of it afterward".

In order to ensure sustainability of the message delivered through the *kalaipayanams*, the project leadership built a long term intervention strategy around the elected local-body leaders. In 1999, conferences of panchayat presidents, health functionaries and social activists were held in the eight panchayat unions of Dharmapuri health unit district. At each of these the panchayat presidents committed themselves to a goal of preventing female infanticide. Soon after, the project leadership claimed that their social mobilization programme had led to a reduction in infanticide in Dharmapuri. The strength of this programme lay in its district-wide mobilization and demonstrated the commitment of the government to tackle the issue of female infanticide. However, counter to the government's claims, NGOs working on the issue expressed skepticism of the effect of the campaign. As one NGO

[17] NGOs engaged in preventing daughter elimination also use a similar approach. However, as compared to the GCPS, they follow a targeted approach and provide support to high-risk families. This support usually takes the form of educational/training sponsorship of girls and/or direct financial support to their families.

[18] In March 2007, the government of Madhya Pradesh launched its Girl Child Protection Scheme (*Ladli Lakshmi Yojana*) which was targeted at poor families and included sterilisation as a condition for eligibility. However, in April 2008, the government dropped the sterilisation condition and has now extended the scheme to all non-income tax payees.

coordinator put it, 'if *kalaipayanam* is all that it takes to eliminate female infanticide, we would have achieved it long time back' (field work in 2000). Notwithstanding this remark it is clear from the analysis presented in section 2 that there has been a sharp decline in daughter deficit in the district. While it is unlikely that a one-off campaign on its own can deliver a sustained reduction in daughter deficit, the programme did turn the spotlight on female infanticide and displayed the government's will to prevent the practice.

3.5 NGO strategies

In addition to these government interventions, several NGOs initiated activities against daughter elimination in the three heavily-affected districts of Madurai (including Theni), Salem (including Namakkal) and Dharmapuri.[19] NGO initiatives to tackle daughter elimination combine short and long term measures. Short term measures are geared towards rescuing the female infant, while long term measures are aimed at sensitising and bringing about changes in attitudes towards the girl child. While details differ across NGOs, broadly NGO approaches consist of three aspects (for details see George, 1997; Srinivasan, 2006). First, formation of women's self-help groups (SHGs) for savings, and income generation, and to explicitly tackle female infanticide. Second, identification, monitoring and counselling of high-risk (those with more than one daughter and no son) pregnant women and their families on the value of girl children and against any attempt at female infanticide. This is often done with the help of and through SHGs. When counselling, persuasion and emotional appeal fail, the threat of police action is invoked. Third, provision of economic support for daughters and their families either through their own programs or through government schemes. If these efforts are unsuccessful, surrendering the female baby to the CBS is offered as a last resort. Specific details on some of the main NGOs operating in Madurai and Salem are provided below.

In 1992-93, the Indian Council for Child Welfare (ICCW) set up its office in Usilampatti, Madurai (the region where female infanticide was first reported) with the main objective of rescuing female babies from infanticide. Along with other programmes, it used the government's women's programme (*mahalir thittam*) to form women's self-help groups in villages to serve as a watchdog to monitor and prevent female infanticide.[20] Group members were provided with training and other inputs on various aspects of gender discrimination including female infanticide, status of women and girl children and women's rights. Groups were expected to prevent and report female infanticide and seek the

[19] Till January 1997, Theni was part of Madurai district, while Namakkal was part of Salem.

[20] Most of the women's self-help groups (SHGs) in Tamil Nadu are formed through the government's *mahalir thittam* (women's programme). The programme was initially funded by the International Fund for Agricultural Development (IFAD) and allowed for the formation of SHGs in five districts Dharmapuri, Salem, South Arcot, Madurai and Ramanathapuran with the help of NGOs between 1989 and 1998. By 2000 the programme had been extended to all the districts in the state and as of January 2003 there were 118,413 self-help groups operating in the state.

assistance of the NGO where necessary. Every member took a vow that she would not practise or let others practise female infanticide. Locally recruited animators worked closely with the groups to monitor and counsel high risk pregnant women and their families on the value of girl children and against any attempt at female infanticide and if needed invoked the threat of legal action. In addition, ICCW facilitated adoption, sponsored education for girls and implemented various government welfare schemes. ICCW also conducts workshops for adolescent girls and boys on life skills as well as to create awareness about the value of daughters.

Through these measures, ICCW is reported to have brought down the incidence of female infanticide in about 300 villages in Usilampatti block, from nearly 200 cases of female infanticide in 1991-92 to zero in 2002-03. According to Ms.Valli Annamalai (one of the honorary secretaries), 'ICCW was confident of withdrawing from the block. The new result is: the cradle placed at the 'child reception centre' has vanished' (*The Hindu*, 09 December 2003).

There are three main NGOs operating in various parts of Salem. The Community Services Guild (CSG) which was instrumental in bringing female infanticide to public attention in the early 1990s (Venkatachalam and Srinivasan, 1993) started working on the issue in 1993 and broadly adopted the approach outlined above.[21] In 1996 the Village Reconstruction and Development Programme (VRDP) published a study on the prevalence of female infanticide in Salem district and at the same time formed Kurinji, a network of like-minded NGOs and women's SHGs to monitor and prevent the practice of female infanticide in Salem (and Namakkal).[22] VRDP staff explained that preventing female infanticide and sex selection were part of its rights-based agenda like the struggle for equal wages, land rights along with tribal area development, property rights for women and health issues. VRDP facilitates SHGs to discuss and prevent domestic violence, intervene in dowry-related problems, prevent female infanticide, monitor scan centres, and regularly sends SHG members as decoy mothers to track malpractice in scan centres. In the words of Mr.Ranganathan, Director of VRDP, 'it is only women's empowerment that will stop female infanticide and sex selection. Merely focusing on bringing down IMR, or encouraging or threatening people to surrender unwanted baby girls will not work' (Field work, Salem district, 2002).

Poonthalir, which started working on this issue in 1998, was driven by the immediate need to ensure the survival of the newborn female and it adopted a "whatever it takes" approach to the issue. Unlike other NGOs, Poonthalir relies mainly on its own staff rather than SHGs to prevent daughter

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[21] CSG has been operating income generation activities for women in Salem since 1982. In 1993 when conducting a survey to identify 'beneficiaries' for the IFAD project, it discovered female infanticide in some blocks, which led to the Safe Childhood Scheme (SAFE) project, a multi-pronged strategy to tackle female infanticide in five blocks.

[22] Started in the 1980s VRDP's main objective is to enable adivasis (Scheduled Tribes) to (re)assert their rights vis-à-vis the state. The adivasi population is 3.5 percent of the total population of Salem district.

elimination. The NGO targeted Idapadi, a block in Salem district with one of the highest incidence of female infanticide. Similar to the approach of other NGOs, Poonthalir staff identified high-risk pregnant women with the help of health and nutrition workers, SHG members and key informants. In addition, staff member were assigned to each primary health centre and hospital in the area to gather information on pregnant women. Subsequently, Poonthalir staff befriended and engaged in intensive rounds of monitoring and counselling with high risk women and their families. These counselling sessions involve listening and understanding the needs and challenges faced by these women and their families, their reasons for eliminating daughters and subsequently highlighting the value of girl children and discouraging any attempt at female infanticide. Where needed, Poonthalir offers economic support. If necessary, the NGO uses the threat of police action and if all else fails it directs parents to the CBS. After the birth of a female infant, staff members provide gifts, increase the intensity of visits in the first month after birth (in most cases infanticide takes place soon after birth) and attempt to ensure that the mother and the family bond with the newborn female. Beyond a month, visits become less frequent but Poonthalir continues to monitor girls in these families (Discussions with Mr.Chezian, Director of Poonthalir and other staff, August 2008).

According to its records, between 1998 and 2008, Poonthalir has provided educational support to 350 girls, placed 350 girls for adoption, returned 25 girls handed over to the CBS to their biological parents, prevented 1157 cases of female infanticide by "integrating" girls with their families and been instrumental in 10 to 15 arrests. Based on the overall decline in daughter deficit in Salem district between 1996-99 and 2003 (about 1325) and the average number of cases (116) prevented by Poonthalir over this ten year period, it seems that the NGO may be directly responsible for about nine percent of the decline in daughter deficit. Regardless of the exact contribution made by NGOs, it is clear that the reports on the effect of various NGOs on preventing daughter elimination are consistent with the temporal decline observed on the basis of the VES data.

There are several notable aspects of the NGO interventions discussed above. First, unlike government interventions, NGO interventions are not as sensitive to changes in government and continued uninterrupted during the period 1992 to 2003. Second, as compared to state-wide government interventions, NGO efforts are specifically targeted at certain districts and also within districts, NGOs tend to focus on those parts of a district which exhibit the highest incidence of female infanticide. For instance, ICCW operated in two of Madurai district's 13 blocks. In Salem, CSG operated in five blocks while VRDP operated in three of the district's 20 blocks and in Dharmapuri, AID's (Alternative for India Development) efforts were restricted to one of the district's 18 blocks. Third, while well-targeted, typically, NGO operations are small in scale and restricted to a limited geographic area and it may not be difficult to escape the scrutiny of such operations by travelling to neighbouring blocks or districts.

The sharp temporal decline after 2001, especially in districts like Salem that have a combination of government and NGO interventions suggests that the scale and political will implicit in renewed government interventions combined with the intensity of the NGO grassroots targeted approach may have been the key to reducing daughter deficits. To illustrate such interactions the penultimate section of the paper takes a closer look at the experience of tackling daughter elimination in Salem district.

4 Reactions and counter reactions: The case of Salem

Salem district has the lowest sex ratio at birth and the highest daughter deficit in the state. Although interventions such as the CBS and legal action were launched in Salem, the general approach to tackling female infanticide in the first phase was not systematic as pointed out in the section 3. Between 1996 and 2001 the government paid little attention to preventing daughter elimination in the district.

In 2001, with the latest round of Census, Salem was once again the spot light for being the only district in south India with a 0-6 sex ratio below 850. At the same time, a change in government brought the issue of daughter elimination back on the public agenda. Between June 2001 and July 2003 under the leadership of the Collector, Dr. Radhakrishnan, the Salem district administration adopted a zero-tolerance approach towards female infanticide, and worked closely with a wide range of district officials, health and nutrition workers and NGOs to prevent the practice. Several measures were taken. First, to demonstrate its zero-tolerance approach and the importance given to the issue, district officials led by the Collector utilised every public opportunity to condemn female infanticide and sex selective abortion. Officials and workers, particularly of the health and nutrition department, were deemed accountable for any infant death. Second, to enable village-level workers to provide information on female infanticide while at the same time not be ostracised by their communities, a 24-hour toll-free phone line was set up in the Collector's bungalow. Third, to monitor and counsel high-risk pregnant women the NGO model was scaled up. SHGs were encouraged to actively prevent female infanticide, health and nutrition workers were required to monitor and village-level committees, consisting of Panchayat members, SHG representatives, Village Health Nurses (VHN) and nutrition workers were set up in 385 of the district's 557 villages. Fourth, the CBS was re-energized and finally arrests and subsequent legal action were stepped up – at least six cases of police and legal action were initiated during this period as compared to one during 1992-2000 (see Table 7).

Despite sustained efforts, some pockets in the district continued to report exceptionally high female IMR. Even the threat of punishment appears to have been an inadequate deterrent, as the following response illustrates. For example, the husband of a woman with three daughters trying for a son told a VHN,

> What is the punishment (for FI death)? Two years? That's all no? Okay. We will kill the next one if it is a girl (Field work, Meicheri block, Salem district, 2002).

In other instances, government and NGO pressure led to changes in the manner in which daughters were eliminated and/or the manner in which the death was hidden. Initially, in the case of a female infanticide, parents falsified the cause of death. However, post-2001, any instance of a female infant death raised suspicion and led to exhumation and a post-mortem examination. Since suspicion was aroused only in the case of death of female infants, the sex of the dead infant began to be misreported. In some cases, the pregnancy itself was denied or families borrowed female babies and claimed them as their own till the pressure subsided.[23]

To counter such responses, the district administration began conducting a death audit for all infants— male and female. This in turn led to a change in the method of killing the female infant— from poisoning or strangling to "natural" death due to neglect (starvation or being left in the open). Parents of the dead infant feigned ignorance— that they did not know the infant was unwell and that it was too late before they got medical attention. This forced the district administration to officially bring neglect as a case of FI death. If the death was caused due to a medical reason, parents had to produce proof that they had taken the infant to the doctor and that every attempt was made to save the infant (Discussion with medical officers, Kolathur block, Salem district, 2002). In Meicheri block, discussion with a group of VHNs revealed that there were cases in which they reported FI deaths, but because parents produced false medical certificates no action could be taken. According to them, parents bribed private medical practitioners to issue false certificates for a non-existent medical condition, treatment provided and the outcome (death). Another strategy used to escape monitoring at the time of childbirth was for the expectant mother to travel to a neighbouring district or state where there

[23] In a case in Kolathur block in Salem the family denied that the woman in question was pregnant, despite the fact that the woman was registered and monitored throughout her pregnancy and it was the VHN who attended the childbirth at the Health sub-Centre (HSC). When the VHN visited the woman following childbirth, she gathered that nobody had seen the female newborn and that something was wrong. She returned with the medical officer. When they asked the husband who was sitting outside the house to bring his wife with the newborn, he looked surprised and yelled out to his wife, 'you have been pregnant? I did not know at all?' (VHNs meeting, Kolathur block). In a similar case in Dharmapuri, a neighbouring district, the family enjoyed the strong support of the villagers who feigned ignorance as well as surrounded the Collector and other district administrators preventing them from investigating the case (*The Hindu*, 05 July 2000).

was less surveillance to dispose of the infant if female, with relative ease.[24]

Notwithstanding the reactions and counter-reactions, the figures suggest that the post-2001 intervention strategy adopted in Salem was successful in reducing daughter deficit. During the period June 2001 and July 2003, the Salem CBS received 370 babies which maybe compared with the 77 babies received during the first phase of the CBS. A distinct aspect in this phase was that most infants were not surrendered anonymously. Usually the mother and sometimes both parents approached NGOs and officials to hand over their unwanted babies.[25] In an environment of zero tolerance for FI deaths, personally handing over unwanted babies in public appears to have served as a record that parents did not commit female infanticide and also assured parents that the baby was in safe hands. Beyond the CBS, as shown in Table 2, between 1996-99 and 2003, female IMR in Salem dropped drastically from 121 to 45 supporting the district administration's claim that their efforts had led to a reduction in female infant mortality/infanticide.[26]

5 Concluding remarks and discussion

This paper provided a temporal and spatial analysis of daughter deficits in Tamil Nadu over the period 1996 to 2003 and undertook an examination of the modus operandi, underlying assumptions, strengths and weaknesses of various interventions that have been used in the state to prevent daughter elimination. Total daughter deficit in 1996-1999, a period characterized by a lull in government interventions, amounted to an annual shortfall of about 11,000 daughters. Following a change of government, the period since May 2001 was marked by an increase in efforts to prevent daughter elimination. Our analysis showed that in 2003, daughter deficit declined to about 7,700. The decline between 1996-1999 and 2003 was driven mainly by a 46 percent reduction in

[24] The surveillance also led to a breakdown of trust. There were instances where due to enmity or jealousy, neighbours or other individuals in the village used the anonymous hotline to report false cases of female infant death. Other instances bring out the conflict of interest between those seeking to dispose of the female infant and those expected to prevent the practice— as in the case of a Panchayat member whose family had to mobilise over Rs.150,000 to hush up a female infant death. There were also cases of doctors selling fake death certificates; or the case of a Revenue Officer, who was part of an investigation team, but called up to instruct the suspected family to destroy the body of the dead infant as the team was returning to exhume the body. The instances cited above occurred at different places but their subsequent adaptation was to be found almost all over Salem as well as in other districts like Dharmapuri and Madurai. Heightened media coverage of the issue and people to people contact not only created awareness about the administration's stand against female infant deaths; it also facilitated the transfer of such ideas.

[25] In December 2001, on a day meant for people to meet the Collector with their problems and complaints, two women handed over their female babies. Following this, it became a routine for parent(s) to hand over their babies mainly to the Collector.

[26] Salem district won accolades from the Chief Minister each year during the second phase for its efforts to tackle female infanticide.

post-birth daughter deficit. The sharpest reductions were recorded in Salem and Dharmapuri. These districts displayed the highest incidence of pre- and post-birth deficit in 1996-1999 and were the focus of various government and NGO initiatives to prevent daughter elimination.

While it is difficult to draw a causal link between the various interventions and the decline in daughter deficit, the sharp temporal decline in post-birth deficit especially in those districts that had a concentration of government and NGO interventions supports the idea of a strong link between the various efforts and the declining deficit.[27] The analysis presented here provides several important insights. First, the Cradle Baby Scheme serves as a safety valve and may account for about 14 percent of the decline in post-birth daughter deficit. Second, it is unlikely that the Girl Child Protection Scheme has played a substantial role in preventing daughter elimination. The GCPS is not appropriately targeted and the imposition of sterilization is unlikely to have attracted families with strong son preference. The analysis presented here suggests that if schemes such as the GCPS are to play a role in reducing daughter deficit it is important to remove the sterilization requirement and to think of ways of extending the scheme beyond the poor. Third, despite the uninterrupted operations of NGOs, the reduction in daughter deficit mainly in the post-2001 period suggests that without the scale, support and will of the government, NGO interventions are unlikely to lead to a widespread decline in daughter deficit. Likewise, legal action and state-wide schemes such as the CBS and the GCPS without being linked to a grassroots approach are unlikely to lead to a reduction in daughter deficit. Finally, the sharp decline in daughter deficit precisely in those districts that had a combination of government and NGO interventions suggests that widespread monitoring and counselling of high risk mothers at the grassroots level through a network of NGOs, SHGs, health and nutrition workers linked to the credible threat of legal action and some form of economic support, comprises an intervention model which may be used in other parts of the country.

The decline in daughter deficit over this period has come mainly from a reduction in female infanticide. An obvious concern is that over this period post-birth daughter deficit may have been replaced by pre-birth deficit. Our analysis showed that between 1996-99 and 2003, pre-birth daughter deficit does not appear to have increased even as post-birth daughter deficit declined. This is supported by more recent evidence. During field work in Salem in 2007 and 2008, NGOs and health and nutrition workers pointed to a decline in the prevalence of female infanticide as well as in sex selective abortion. The director of VRDP stated that,

> Sex selective abortion has definitely come down as we are constantly watching the scan centres. We know the centres where there is malpractice and we are watching these closely and hope that some day we can catch them (Field work, Salem district, 2008).

[27] Bedi and Srinivasan (2008) attempt to use difference-in-differences methods to identify the causal effect of the various interventions on daughter deficit.

A second concern is whether the observed decline in daughter deficit is temporary or whether there has been a structural change. It is of course unlikely that 20 years of interventions will have succeeded in altering deep-rooted patterns of son preference and daughter aversion, and it is quite possible that a reduction of government interest in preventing daughter elimination will lead to a rise in daughter deficits (a change of government took place in 2006). While a new round of VES data is required to assess post-2003 changes, discussions during field work in 2007 and 2008 suggest that while an environment favourable to daughters is still a far cry, at least the effects of the interventions in terms of limiting daughter elimination are still being felt. The following excerpts are illustrative.

Illustration 1 (Discussion with an elderly woman, Field work, Sankari block, Salem district, 2007)
My daughter-in-law had twin daughters from her first pregnancy. When she was pregnant again we went to a doctor in Bhavani (in the neighbouring district). We explained that with two daughters we could not afford to have any more daughters. Initially the doctor refused to even see us. But we waited and pleaded with her. She agreed finally but only after repeated assurances that we would not breathe a word to anyone. She said, "I'm trying to help you. Please understand that my name or my clinic's should not be brought to disrepute".

Illustration 2 (Discussion with a VHN, Field work, Sankari Block, Salem district, 2007)
On giving birth to her second daughter, the faces of the mother and her mother-in-law became small. I stayed up till about 4.00a.m. to cheer her up.

Later in the day I visited her house. In a small room, the woman and her mother-in-law were sitting with an astrologer discussing the prospects of the newborn. Next to the woman, her three-year old daughter was trying to stuff a loaf of bread into the newborn's mouth. I rushed in and grabbed the newborn. I was very angry and asked the woman "How could you let this happen to the newborn"? She replied, "I was so engrossed in the conversation that I did not notice what was happening". I said, "Would you have let this happen if it were a boy"? The woman said, "Why are you making such a scene? People in Erode are getting rid of unwanted babies. So what if I get rid of her"? I said, "Try doing any such thing and you will land in prison as I will lodge a police report against you. If you don't want the child, you can give it to the CBS. But you are not going to kill her". I just hope that she will not harm the child any more.

Illustration 3 (Discussion with Poonthalir staff, Idapadi block, Salem district, 2008)
Researcher: Will female infanticide occur if Poonthalir were not around?
Staff 1*:* Yes. Now they don't do it out of fear.
Staff 2: When we don't go to a village for one or two months, people think our office is closed or we have moved to another area and try to commit female infanticide. But we somehow get the news and land there at the right time.
Staff 3*:* People think nothing will be done as it is now a DMK government. It was Jayalalitha who put the law in place and they assume that only under her administration action will be taken. We tell them the Noon-meal Programme, which was started by Kamaraj, continues till today. Similarly, this law is effective at all times.

While the continued sustainability of the reduction in daughter deficit may be doubted, the analysis presented here shows that daughter elimination is amenable to public policy.

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