

## APPENDIX A

### ESTIMATES OF SAMPLING ERRORS

Two types of errors affect the estimates from a sample survey: (1) nonsampling errors and (2) sampling errors. Nonsampling errors are the result of errors committed during data collection and data processing, such as failure to locate and interview the correct household, misunderstanding of the questions on the part of either the interviewer or the respondent, and data entry errors. Although numerous efforts were made during the implementation of NFHS-2 to minimize nonsampling errors, they are impossible to avoid and difficult to evaluate statistically.

Sampling errors, on the other hand, can be evaluated statistically. The sample of women selected in NFHS-2 is only one of many samples that could have been selected from the same population, using the same design and expected sample size. Each of these samples would yield results that differ somewhat from the results of the actual sample selected. The sampling error is a measure of the variability among all possible samples. Although the degree of variability is not known exactly, it can be estimated from the survey results.

The sampling error is usually measured by the *standard error* for a particular statistic (for example, a mean or percentage), which is the square root of the variance. The standard error can be used to calculate confidence intervals within which the true value for the population can reasonably be assumed to fall. For example, for any given statistic calculated from a sample survey, the value of that statistic will fall within a range, calculated as the value of the statistic plus or minus two times the standard error of that statistic, in 95 percent of all possible samples of identical size and design.

If the sample of women had been selected as a simple random sample, it would have been possible, for many statistics, to use straightforward formulas for calculating sampling errors. However, the NFHS-2 sample is the result of a multi-stage stratified sample design, and it is therefore necessary to use more complex formulas. The computer software used to calculate sampling errors for NFHS-2 is ISSA (the Integrated System for Survey Analysis). The linear Taylor series approximation method for variance estimation is used for estimates of means, proportions, and ratios. The JACKKNIFE repeated replication method is used with ISSA for variance estimation for more complex statistics such as fertility and mortality rates.

The ISSA package treats any percentage or average as a ratio estimate,  $r = y/x$ , where  $y$  represents the sample value for variable  $y$ , and  $x$  represents the number of cases in the group or subgroup under consideration. The variance of  $r$  is computed using the formula given below, with the standard error being the square root of the variance:

$$var(r) = \frac{1 - f}{x^2} \sum_{h=1}^H \left[ \frac{m_h}{m_h - 1} \left( \sum_{i=1}^{m_h} z_{hi}^2 - \frac{z_h^2}{m_h} \right) \right]$$

in which

$$z_{hi} = y_{hi} - rx_{hi}$$

$$z_h = y_h - rx_h$$

where

- $h$  = the stratum that varies from 1 to H,
- $m_h$  = the total number of PSUs selected in the  $h^{\text{th}}$  stratum,
- $y_{hi}$  = the sum of the values of variable  $y$  in PSU  $i$  in the  $h^{\text{th}}$  stratum,
- $x_{hi}$  = the sum of the number of cases in PSU  $i$  in the  $h^{\text{th}}$  stratum,
- $f$  = the overall sampling fraction, which is so small that the program ignores it.

In addition to the standard error, ISSA computes the relative standard error, confidence limits for the estimates, and the design effect (DEFT) for each estimate. The design effect is defined as the ratio of the standard error using the given sample design to the standard error that would result if a simple random sample had been used. A DEFT value of 1.0 indicates that the sample design is as efficient as a simple random sample, while a value greater than 1.0 indicates the increase in the sampling error due to the use of a more complex and less statistically efficient design.

Sampling errors for NFHS-2 are calculated for selected variables considered to be of primary interest. The results in this appendix are presented for the state as a whole and for urban and rural areas separately, except for the variable on salt iodization for which the results are shown separately for large cities, small cities, towns, and rural areas. For each variable, the type of statistic (mean, proportion, ratio, or rate) and the base population are given in Table A.1. Table A.2 presents the value of the statistic (R), its standard error (SE), the relative standard error (SE/R), and the 95 percent confidence limits ( $R \pm 2SE$ ) for each variable. In addition, for all variables except the fertility and mortality rates, the table shows the unweighted number of cases (N), the weighted number of cases (WN), the standard error assuming a simple random sample (SER), and the design effect (DEFT).

Table A.1 List of selected variables for sampling errors, Karnataka, 1999

Variable	Estimate	Base population
Sex ratio	Ratio	<i>De facto</i> household population
Illiterate	Proportion	<i>De facto</i> household population age 6 and above
Have tuberculosis	Rate	1,000 <i>de jure</i> household population
Salt iodized at 15 ppm or more	Proportion	Households
Illiterate	Proportion	Ever-married women age 15–49
High school complete and above	Proportion	Ever-married women age 15–49
Currently married	Proportion	Ever-married women age 15–49
Number of children ever born	Mean	Currently married women age 15–49
Number of living children	Mean	Currently married women age 15–49
Have ever used any method	Proportion	Currently married women age 15–49
Currently using any method	Proportion	Currently married women age 15–49
Currently using any modern method	Proportion	Currently married women age 15–49
Currently using pills	Proportion	Currently married women age 15–49
Currently using IUD	Proportion	Currently married women age 15–49
Currently using condoms	Proportion	Currently married women age 15–49
Currently using female sterilization	Proportion	Currently married women age 15–49
Currently using male sterilization	Proportion	Currently married women age 15–49
Currently using rhythm/safe period	Proportion	Currently married women age 15–49
Using public source for modern method	Proportion	Current users of modern methods
Do not want any more children	Proportion	Currently married women age 15–49
Want to delay birth at least 2 years	Proportion	Currently married women age 15–49
Ideal number of children	Mean	Ever-married women age 15–49
Ideal number of sons	Mean	Ever-married women age 15–49
Ideal number of daughters	Mean	Ever-married women age 15–49
Visited by health/family planning worker	Proportion	Ever-married women age 15–49
Received no antenatal check-up	Proportion	Births in past 3 years
Received iron and folic acid tablets or syrup	Proportion	Births in past 3 years
Received medical assistance during delivery	Proportion	Births in past 3 years
Received postpartum check-up	Proportion	Noninstitutional births in past 3 years
Had diarrhoea in the past 2 weeks	Proportion	Children under 3 years
Treated with ORS packets	Proportion	Children under 3 with diarrhoea in past 2 weeks
Taken to a health facility/provider for diarrhoea	Proportion	Children under 3 with diarrhoea in past 2 weeks
Showing a vaccination card	Proportion	Children age 12–23 months
Received BCG vaccination	Proportion	Children age 12–23 months
Received DPT vaccination (3 doses)	Proportion	Children age 12–23 months
Received polio vaccination (3 doses)	Proportion	Children age 12–23 months
Received measles vaccination	Proportion	Children age 12–23 months
Fully vaccinated	Proportion	Children age 12–23 months
Received vitamin A	Proportion	Children age 12–35 months
Had reproductive health problem	Proportion	Currently married women age 15–49
Not involved in any decisionmaking	Proportion	Ever-married women age 15–49
Ever beaten or physically mistreated since age 15	Proportion	Ever-married women age 15–49
Not worked in past 12 months	Proportion	Ever-married women age 15–49
Anaemic women	Proportion	Ever-married women age 15–49
Anaemic children	Proportion	Children age 6–35 months
Fertility rates	Rate	All women, population
Mortality rates	Rate	Births, population

Table A.2 Sampling errors, Karnataka, 1999

Variable/ residence	Value (R)	Standard error (SE)	Number of cases		Standard error assuming SRS (SER)	Design effect (DEFT)	Relative standard error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)				R-2SE	R+2SE
Sex ratio ( <i>De facto</i> household population)									
Urban	970	16.365	4019	4017	16.366	1.000	0.017	938	1003
Rural	999	14.803	7396	7399	13.282	1.115	0.015	969	1029
Total	989	11.324	11415	11415	10.351	1.094	0.011	966	1012
Illiterate ( <i>De facto</i> household population age 6 and above)									
Urban	0.188	0.021	7065	7063	0.007	3.087	0.110	0.147	0.229
Rural	0.439	0.016	12892	12896	0.006	2.528	0.036	0.408	0.471
Total	0.350	0.016	19957	19959	0.005	3.237	0.047	0.318	0.383
Have tuberculosis (1,000 <i>de jure</i> household population)									
Urban	2.161	0.511	7835	7832	0.522	0.979	0.236	1.139	3.183
Rural	2.974	0.548	14718	14723	0.521	1.053	0.184	1.878	4.071
Total	2.692	0.400	22553	22554	0.385	1.038	0.149	1.892	3.492
Salt iodized at 15 ppm or more (Households)									
Large city	0.874	0.043	339	344	0.018	2.401	0.050	0.787	0.961
Small city	0.651	0.095	404	403	0.024	4.010	0.146	0.460	0.841
Town	0.593	0.064	809	805	0.017	3.679	0.107	0.466	0.720
Rural	0.299	0.024	2721	2721	0.009	2.771	0.081	0.251	0.348
Total	0.434	0.027	4273	4273	0.008	3.602	0.063	0.379	0.489
Illiterate (Ever-married women age 15-49)									
Urban	0.317	0.035	1504	1523	0.012	2.911	0.110	0.247	0.387
Rural	0.677	0.020	2870	2851	0.009	2.302	0.030	0.637	0.717
Total	0.552	0.023	4374	4374	0.008	3.078	0.042	0.506	0.598
High school complete and above (Ever-married women age 15-49)									
Urban	0.378	0.040	1504	1523	0.013	3.230	0.107	0.297	0.459
Rural	0.097	0.010	2870	2851	0.006	1.891	0.108	0.076	0.118
Total	0.195	0.019	4374	4374	0.006	3.171	0.097	0.157	0.233
Currently married (Ever-married women age 15-49)									
Urban	0.931	0.005	1504	1523	0.007	0.827	0.006	0.920	0.942
Rural	0.911	0.006	2870	2851	0.005	1.082	0.006	0.899	0.922
Total	0.918	0.004	4374	4374	0.004	1.034	0.005	0.909	0.927
Number of children ever born (Currently married women age 15-49)									
Urban	2.524	0.093	1400	1418	0.048	1.930	0.037	2.339	2.710
Rural	2.973	0.065	2615	2597	0.040	1.613	0.022	2.843	3.102
Total	2.814	0.056	4015	4015	0.031	1.789	0.020	2.703	2.926
Number of living children (Currently married women age 15-49)									
Urban	2.328	0.085	1400	1418	0.043	1.961	0.037	2.158	2.498
Rural	2.585	0.052	2615	2597	0.033	1.547	0.020	2.482	2.688
Total	2.494	0.046	4015	4015	0.026	1.720	0.018	2.403	2.585
Have ever used any method (Currently married women age 15-49)									
Urban	0.654	0.018	1400	1418	0.013	1.395	0.027	0.618	0.689
Rural	0.590	0.017	2615	2597	0.010	1.798	0.029	0.556	0.625
Total	0.613	0.013	4015	4015	0.008	1.695	0.021	0.587	0.639

Table A.2 Sampling errors, Karnataka, 1999 (contd.)									
Variable/ residence	Value (R)	Standard error (SE)	Number of cases		Standard error assuming SRS (SER)	Design effect (DEFT)	Relative standard error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)				R-2SE	R+2SE
Currently using any method (Currently married women age 15–49)									
Urban	0.599	0.015	1400	1418	0.013	1.155	0.025	0.569	0.630
Rural	0.574	0.017	2615	2597	0.010	1.784	0.030	0.540	0.609
Total	0.583	0.012	4015	4015	0.008	1.590	0.021	0.558	0.608
Currently using any modern method (Currently married women age 15–49)									
Urban	0.564	0.016	1400	1418	0.013	1.212	0.028	0.532	0.596
Rural	0.566	0.018	2615	2597	0.010	1.820	0.031	0.531	0.601
Total	0.565	0.013	4015	4015	0.008	1.623	0.022	0.540	0.591
Currently using pills (Currently married women age 15–49)									
Urban	0.010	0.004	1400	1418	0.003	1.320	0.350	0.003	0.017
Rural	0.004	0.001	2615	2597	0.001	1.064	0.351	0.001	0.006
Total	0.006	0.002	4015	4015	0.001	1.254	0.259	0.003	0.009
Currently using IUD (Currently married women age 15–49)									
Urban	0.050	0.008	1400	1418	0.006	1.397	0.162	0.034	0.067
Rural	0.015	0.003	2615	2597	0.002	1.169	0.183	0.010	0.021
Total	0.028	0.004	4015	4015	0.003	1.427	0.134	0.020	0.035
Currently using condoms (Currently married women age 15–49)									
Urban	0.024	0.006	1400	1418	0.004	1.402	0.241	0.012	0.035
Rural	0.003	0.001	2615	2597	0.001	1.226	0.423	0.000	0.006
Total	0.010	0.002	4015	4015	0.002	1.444	0.222	0.006	0.015
Currently using female sterilization (Currently married women age 15–49)									
Urban	0.471	0.017	1400	1418	0.013	1.305	0.037	0.436	0.506
Rural	0.539	0.017	2615	2597	0.010	1.782	0.032	0.504	0.574
Total	0.515	0.013	4015	4015	0.008	1.659	0.025	0.489	0.541
Currently using male sterilization (Currently married women age 15–49)									
Urban	0.009	0.003	1400	1418	0.003	1.025	0.283	0.004	0.015
Rural	0.005	0.001	2615	2597	0.001	1.034	0.286	0.002	0.008
Total	0.007	0.001	4015	4015	0.001	1.036	0.202	0.004	0.009
Currently using rhythm/safe period (Currently married women age 15–49)									
Urban	0.031	0.008	1400	1418	0.005	1.758	0.261	0.015	0.048
Rural	0.006	0.002	2615	2597	0.002	1.172	0.291	0.003	0.010
Total	0.015	0.003	4015	4015	0.002	1.680	0.214	0.009	0.022
Using public source for modern method (Current users of modern methods)									
Urban	0.707	0.038	790	800	0.016	2.331	0.053	0.632	0.783
Rural	0.933	0.011	1481	1470	0.007	1.713	0.012	0.911	0.955
Total	0.853	0.018	2271	2270	0.007	2.409	0.021	0.818	0.889
Do not want any more children (Currently married women age 15–49)									
Urban	0.212	0.015	1400	1418	0.011	1.387	0.072	0.182	0.242
Rural	0.121	0.008	2615	2597	0.006	1.188	0.063	0.106	0.136
Total	0.153	0.008	4015	4015	0.006	1.443	0.054	0.137	0.169
Want to delay birth at least two years (Currently married women age 15–49)									
Urban	0.119	0.009	1400	1418	0.009	1.063	0.077	0.101	0.138
Rural	0.116	0.007	2615	2597	0.006	1.151	0.062	0.102	0.131
Total	0.117	0.006	4015	4015	0.005	1.114	0.048	0.106	0.129

Table A.2 Sampling errors, Karnataka, 1999 (contd.)									
Variable/ residence	Value (R)	Standard error (SE)	Number of cases		Standard error assuming SRS (SER)	Design effect (DEFT)	Relative standard error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)				R-2SE	R+2SE
Ideal number of children (Ever-married women age 15–49)									
Urban	2.037	0.042	1435	1453	0.018	2.327	0.020	1.954	2.121
Rural	2.264	0.040	2743	2725	0.015	2.595	0.018	2.184	2.345
Total	2.185	0.031	4178	4178	0.012	2.591	0.014	2.123	2.247
Ideal number of sons (Ever-married women age 15–49)									
Urban	0.715	0.051	1435	1453	0.018	2.851	0.072	0.612	0.818
Rural	0.982	0.037	2743	2725	0.014	2.650	0.038	0.907	1.056
Total	0.889	0.032	4178	4178	0.011	2.831	0.036	0.825	0.953
Ideal number of daughters (Ever-married women age 15–49)									
Urban	0.626	0.040	1435	1453	0.015	2.622	0.064	0.546	0.705
Rural	0.819	0.026	2743	2725	0.011	2.317	0.032	0.767	0.871
Total	0.752	0.023	4178	4178	0.009	2.531	0.031	0.705	0.798
Visited by health/family planning worker (Ever-married women age 15–49)									
Urban	0.064	0.012	1504	1523	0.006	1.953	0.193	0.039	0.089
Rural	0.229	0.017	2870	2851	0.008	2.189	0.075	0.195	0.264
Total	0.172	0.014	4374	4374	0.006	2.440	0.081	0.144	0.200
Received no antenatal check-up (Births in past 3 years)									
Urban	0.055	0.020	393	398	0.012	1.633	0.356	0.016	0.095
Rural	0.173	0.022	889	882	0.014	1.602	0.127	0.129	0.217
Total	0.137	0.017	1282	1280	0.010	1.651	0.126	0.102	0.171
Received iron and folic acid tablets or syrup (Births in past 3 years)									
Urban	0.834	0.031	393	398	0.019	1.656	0.037	0.771	0.896
Rural	0.756	0.023	889	882	0.014	1.600	0.031	0.710	0.802
Total	0.780	0.019	1282	1280	0.012	1.621	0.024	0.742	0.818
Received medical assistance during delivery (Births in past 3 years)									
Urban	0.863	0.026	393	398	0.019	1.390	0.030	0.811	0.916
Rural	0.469	0.027	889	882	0.018	1.523	0.058	0.414	0.523
Total	0.591	0.028	1282	1280	0.015	1.862	0.047	0.536	0.647
Received postpartum check-up (Noninstitutional births in past 3 years)									
Urban	0.419	0.060	84	84	0.054	1.105	0.143	0.299	0.538
Rural	0.343	0.027	547	542	0.020	1.335	0.079	0.289	0.397
Total	0.353	0.025	631	626	0.019	1.303	0.070	0.304	0.403
Had diarrhoea in the past 2 weeks (Children under 3 years)									
Urban	0.124	0.021	373	377	0.017	1.221	0.168	0.082	0.166
Rural	0.146	0.015	836	830	0.012	1.191	0.100	0.117	0.175
Total	0.139	0.012	1209	1207	0.010	1.183	0.085	0.115	0.163
Treated with ORS packets (Children under 3 with diarrhoea in past 2 weeks)									
Urban	0.390	0.052	46	47	0.074	0.700	0.132	0.287	0.493
Rural	0.325	0.043	122	121	0.043	1.012	0.132	0.239	0.412
Total	0.343	0.035	168	168	0.037	0.935	0.101	0.274	0.413
Taken to a health facility/provider for diarrhoea (Children under 3 with diarrhoea in past 2 weeks)									
Urban	0.826	0.043	46	47	0.055	0.784	0.052	0.740	0.912
Rural	0.622	0.042	122	121	0.045	0.953	0.068	0.537	0.707
Total	0.679	0.035	168	168	0.036	0.956	0.051	0.610	0.749

Table A.2 Sampling errors, Karnataka, 1999 (contd.)

Variable/ residence	Value (R)	Standard error (SE)	Number of cases		Standard error assuming SRS (SER)	Design effect (DEFT)	Relative standard error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)				R-2SE	R+2SE
Showing a vaccination card (Children age 12–23 months)									
Urban	0.528	0.059	126	128	0.045	1.311	0.111	0.410	0.645
Rural	0.362	0.035	300	298	0.028	1.262	0.097	0.292	0.432
Total	0.412	0.031	426	426	0.024	1.299	0.076	0.350	0.474
Received BCG vaccination (Children age 12–23 months)									
Urban	0.874	0.035	126	128	0.030	1.168	0.040	0.805	0.943
Rural	0.837	0.030	300	298	0.021	1.418	0.036	0.776	0.898
Total	0.848	0.024	426	426	0.017	1.352	0.028	0.801	0.895
Received DPT vaccination (3 doses) (Children age 12–23 months)									
Urban	0.781	0.056	126	128	0.037	1.519	0.072	0.669	0.893
Rural	0.740	0.030	300	298	0.025	1.192	0.041	0.680	0.801
Total	0.752	0.027	426	426	0.021	1.279	0.036	0.699	0.806
Received polio vaccination (3 doses) (Children age 12–23 months)									
Urban	0.812	0.051	126	128	0.036	1.419	0.063	0.710	0.914
Rural	0.770	0.023	300	298	0.024	0.959	0.030	0.723	0.817
Total	0.783	0.022	426	426	0.020	1.097	0.028	0.738	0.827
Received measles vaccination (Children age 12–23 months)									
Urban	0.694	0.060	126	128	0.041	1.463	0.087	0.574	0.815
Rural	0.664	0.035	300	298	0.027	1.278	0.053	0.594	0.733
Total	0.673	0.030	426	426	0.023	1.324	0.045	0.612	0.733
Fully vaccinated (Children age 12–23 months)									
Urban	0.590	0.058	126	128	0.044	1.308	0.098	0.474	0.706
Rural	0.604	0.035	300	298	0.028	1.253	0.059	0.533	0.675
Total	0.600	0.030	426	426	0.024	1.260	0.050	0.540	0.660
Received vitamin A (Children age 12–35 months)									
Urban	0.507	0.045	245	248	0.033	1.366	0.089	0.416	0.597
Rural	0.474	0.027	558	554	0.022	1.247	0.057	0.420	0.528
Total	0.484	0.023	803	802	0.018	1.277	0.048	0.438	0.530
Had reproductive health problem (Currently married women age 15–49)									
Urban	0.186	0.013	1400	1418	0.010	1.293	0.072	0.159	0.213
Rural	0.189	0.010	2615	2597	0.008	1.271	0.051	0.170	0.209
Total	0.188	0.008	4015	4015	0.006	1.271	0.042	0.173	0.204
Not involved in any decisionmaking (Ever-married women age 15–49)									
Urban	0.069	0.008	1504	1523	0.007	1.269	0.121	0.052	0.085
Rural	0.088	0.009	2870	2851	0.005	1.704	0.103	0.070	0.106
Total	0.081	0.007	4374	4374	0.004	1.597	0.081	0.068	0.094
Ever beaten or physically mistreated since age 15 (Ever-married women age 15–49)									
Urban	0.168	0.017	1504	1523	0.010	1.793	0.103	0.134	0.203
Rural	0.240	0.012	2870	2851	0.008	1.550	0.052	0.215	0.264
Total	0.215	0.010	4374	4374	0.006	1.652	0.048	0.194	0.235
Not worked in past 12 months (Ever-married women age 15–49)									
Urban	0.694	0.025	1504	1523	0.012	2.102	0.036	0.644	0.744
Rural	0.365	0.016	2870	2851	0.009	1.804	0.044	0.333	0.397
Total	0.479	0.020	4374	4374	0.008	2.591	0.041	0.440	0.519

Table A.2 Sampling errors, Karnataka, 1999 (contd.)

Variable/ residence	Value (R)	Standard error (SE)	Number of cases		Standard error assuming SRS (SER)	Design effect (DEFT)	Relative standard error (SE/R)	Confidence limits	
			Unweighted (N)	Weighted (WN)				R-2SE	R+2SE
Anaemic women (Ever-married women age 15–49)									
Urban	0.357	0.022	1422	1435	0.013	1.713	0.061	0.313	0.400
Rural	0.460	0.014	2699	2686	0.010	1.462	0.030	0.432	0.488
Total	0.424	0.012	4121	4121	0.008	1.623	0.029	0.399	0.449
Anaemic children (Children age 6–35 months)									
Urban	0.663	0.034	276	279	0.029	1.181	0.051	0.596	0.730
Rural	0.727	0.020	578	577	0.019	1.084	0.028	0.686	0.767
Total	0.706	0.017	854	856	0.016	1.119	0.025	0.671	0.741



Table A.2 Sampling errors, Karnataka, 1999 (contd.)					
Variable/ residence	Value (R)	Standard error (SE)	Relative standard error (SE/R)	Confidence limits	
				R-2SE	R+2SE
Total fertility rate (Women age 15–49)					
Urban	1.887	0.097	0.051	1.693	2.081
Rural	2.250	0.080	0.036	2.089	2.411
Total	2.126	0.062	0.029	2.002	2.251
Age-specific fertility rate (Women age 15–19)					
Urban	0.069	0.007	0.095	0.056	0.082
Rural	0.135	0.007	0.050	0.121	0.148
Total	0.112	0.005	0.045	0.102	0.122
Age-specific fertility rate (Women age 20–24)					
Urban	0.160	0.009	0.058	0.141	0.178
Rural	0.180	0.008	0.047	0.163	0.197
Total	0.172	0.006	0.037	0.160	0.185
Age-specific fertility rate (Women age 25–29)					
Urban	0.091	0.009	0.098	0.073	0.109
Rural	0.089	0.007	0.079	0.075	0.104
Total	0.090	0.006	0.061	0.079	0.101
Age-specific fertility rate (Women age 30–34)					
Urban	0.042	0.007	0.159	0.029	0.056
Rural	0.033	0.006	0.172	0.022	0.044
Total	0.037	0.004	0.119	0.028	0.045
Age-specific fertility rate (Women age 35–39)					
Urban	0.010	0.003	0.333	0.003	0.017
Rural	0.009	0.003	0.324	0.003	0.014
Total	0.009	0.002	0.232	0.005	0.014
Age-specific fertility rate (Women age 40–44)					
Urban	0.005	0.003	0.561	0.000	0.010
Rural	0.002	0.001	0.707	0.000	0.005
Total	0.003	0.001	0.438	0.000	0.006
Age-specific fertility rate (Women age 45–49)					
Urban	0.000	0.000	NC	0.000	0.000
Rural	0.002	0.002	1.006	0.002	0.007
Total	0.001	0.001	1.002	0.001	0.004

Table A.2 Sampling errors, Karnataka, 1999 (contd.)					
Variable/ residence	Value (R)	Standard error (SE)	Relative standard error (SE/R)	Confidence limits	
				R-2SE	R+2SE
Neonatal mortality (5-year period preceding survey)					
Urban	32.052	7.083	0.221	17.887	46.218
Rural	39.299	5.382	0.137	28.535	50.063
Total	37.089	4.293	0.116	28.503	45.675
Infant mortality ${}_1q_0$ (5-year period preceding survey)					
Urban	40.134	9.243	0.230	21.647	58.620
Rural	56.455	5.714	0.101	45.028	67.882
Total	51.460	4.854	0.094	41.751	61.169
Child mortality ${}_4q_1$ (5-year period preceding survey)					
Urban	9.029	3.204	0.355	2.620	15.438
Rural	23.925	3.555	0.149	16.816	31.034
Total	19.334	2.729	0.141	13.876	24.792
Under-five mortality ${}_5q_0$ (5-year period preceding survey)					
Urban	48.800	9.653	0.198	29.494	68.106
Rural	79.029	6.799	0.086	65.430	92.628
Total	69.799	5.650	0.081	58.498	81.100
Crude death rate (Based on Household Questionnaire)					
Urban	6.947	0.739	0.106	5.470	8.424
Rural	8.368	0.544	0.065	7.280	9.457
Total	7.875	0.455	0.058	6.965	8.785
Crude birth rate (Based on women's birth history)					
Urban	18.499	0.999	0.054	16.501	20.497
Rural	21.425	0.794	0.037	19.838	23.013
Total	20.406	0.621	0.030	19.165	21.648
NC: Not calculated because denominator is 0.000 SRS: Simple random sample					

## APPENDIX B

### DATA QUALITY TABLES

The purpose of this appendix is to provide the data user with an overview of the general quality of the NFHS-2 data. Whereas Appendix A is concerned with sampling errors and their effects on the survey results, the tables in this appendix refer to possible *nonsampling* errors: for example, rounding or heaping on certain ages or dates; omission of events occurring further in the past; deliberate distortion of information by some interviewers in an attempt to lighten their workload; noncooperation of the respondent in providing information; or refusal to have children measured for height and weight or tested for anaemia. A description of the likely magnitude of such nonsampling errors is provided in this appendix.

The distribution of the *de facto* household population by single years of age and sex is presented in Table B.1. In many (but not all) cases, the respondent was the head of the household. It is well documented that ages are poorly reported in most parts of India. Ages are of little relevance to much of the rural population in particular, and no amount of probing will ensure that ages are accurately reported. In interviewer training for NFHS-2, a great deal of emphasis was placed on obtaining as accurate information as possible on ages and dates of events. Nevertheless, it is clear that age reporting in NFHS-2 shares the same problems inherent in all Indian censuses and surveys. Heaping on ages ending in 0, 2, 5, and 8 is considerable and is particularly severe in the older age groups. Another measure of the quality of the NFHS-2 age data is the percentage of persons whose ages were recorded as not known or missing. In Karnataka, information on age was missing for only 9 persons out of 22,705 persons who stayed in the sample households the night before the interview.

Table B.2 examines the possibility that some eligible women (that is, ever-married women age 15–49) were not properly identified in NFHS-2. In some surveys, interviewers may try to reduce their workload by pushing women out of the eligible age range or recording ever-married women as never married so that they will not have to be interviewed. If such practices were being followed to a noticeable extent, Table B.2 would normally show (1) a shortage of ever-married women in the 45–49 age group and an excess in the 50–54 age group or (2) an unusually low proportion of ever-married women by age. Neither of these patterns is evident in the NFHS-2 data. It can, therefore, be concluded that there was no concerted effort to misidentify eligible women in NFHS-2 in Karnataka.

One traditional measure of the quality of data is the extent to which information is missing on key variables. Although completeness of responses does not necessarily indicate that the results are accurate, the existence of missing information for a large number of cases would suggest that data collection was not carried out with sufficient care. In NFHS-2 in Karnataka, the extent of missing information is very low for age at death, age at first marriage, woman's education, and diarrhoea in the past two weeks (Table B.3). Missing information is considerably higher for the month of birth. It is important to note, however, that the year of birth is recorded in almost every case in which the month is missing. Data on height and weight of children are available for 89–90 percent of children under three years of age. Some children could not be measured because they were not at home or they were ill at the time of the survey. In some cases when the child was at home, either the child refused to be measured or the mother refused to

Table B.1 Household age distribution

Single-year age distribution of *de facto* household population by sex (weighted), Karnataka, 1999

Age	Male		Female		Age	Male		Female	
	Number	Percent	Number	Percent		Number	Percent	Number	Percent
< 1	225	2.0	222	2.0	38	162	1.4	137	1.2
1	208	1.8	207	1.8	39	49	0.4	77	0.7
2	214	1.9	199	1.8	40	423	3.7	205	1.8
3	221	1.9	232	2.1	41	41	0.4	87	0.8
4	263	2.3	231	2.0	42	84	0.7	109	1.0
5	259	2.3	265	2.3	43	40	0.4	80	0.7
6	240	2.1	234	2.1	44	32	0.3	65	0.6
7	241	2.1	234	2.1	45	385	3.4	238	2.1
8	263	2.3	283	2.5	46	48	0.4	86	0.8
9	253	2.2	230	2.0	47	30	0.3	58	0.5
10	316	2.8	311	2.8	48	105	0.9	79	0.7
11	182	1.6	209	1.9	49	41	0.4	32	0.3
12	345	3.0	311	2.8	50	328	2.9	96	0.8
13	244	2.1	239	2.1	51	27	0.2	45	0.4
14	244	2.1	256	2.3	52	57	0.5	115	1.0
15	280	2.5	248	2.2	53	16	0.1	63	0.6
16	268	2.3	261	2.3	54	33	0.3	41	0.4
17	205	1.8	221	2.0	55	177	1.5	259	2.3
18	337	3.0	333	3.0	56	37	0.3	30	0.3
19	166	1.5	199	1.8	57	11	0.1	13	0.1
20	316	2.8	364	3.2	58	53	0.5	63	0.6
21	145	1.3	171	1.5	59	24	0.2	14	0.1
22	213	1.9	229	2.0	60	290	2.5	288	2.6
23	187	1.6	188	1.7	61	10	0.1	8	0.1
24	179	1.6	173	1.5	62	35	0.3	27	0.2
25	312	2.7	362	3.2	63	17	0.1	10	0.1
26	155	1.4	154	1.4	64	22	0.2	8	0.1
27	118	1.0	153	1.4	65	162	1.4	183	1.6
28	237	2.1	217	1.9	66	14	0.1	16	0.1
29	76	0.7	124	1.1	67	10	0.1	10	0.1
30	418	3.7	327	2.9	68	20	0.2	18	0.2
31	53	0.5	95	0.8	69	10	0.1	5	0.0
32	159	1.4	146	1.3	70+	361	3.2	382	3.4
33	76	0.7	93	0.8	Don't				
34	55	0.5	110	1.0	know/				
35	435	3.8	299	2.7	missing	5	0.0	4	0.0
36	86	0.8	116	1.0					
37	61	0.5	92	0.8	Total	11,415	100.0	11,290	100.0

Note: The *de facto* population includes both usual residents and visitors who stayed in the household the night before the interview.

allow the child to be measured. Data on haemoglobin levels are available for 94 percent of women and 84 percent of children. Before undertaking haemoglobin measurements, a separate 'informed consent' statement was read to the respondent explaining that participation in the haemoglobin testing was completely voluntary. At this point, some women declined to take part in the anaemia testing and/or to have their children participate.

Another measure of data quality is the completeness and accuracy of information on births. Table B.4 examines the distribution of births by calendar year to identify any unusual patterns that may indicate that births have been omitted or that the ages of children have been displaced. Overall, 91 percent of living children listed in the birth history had complete birth dates recorded, as did 63 percent of children who had died. The completeness of data on birth dates for surviving children is good overall and is excellent in recent years. However, the completeness of data on birth dates for dead children is unusually low for Karnataka, even for

Table B.2 Age distribution of eligible and interviewed women					
Age distribution of the <i>de facto</i> household population of women age 10–54 and of interviewed women age 15–49, and percentage of eligible women who were interviewed (weighted), Karnataka, 1999					
Age	All women	Ever-married women	Interviewed women		Percent interviewed
			Number	Percent	
10–14	1,326	17	NA	NA	NA
15–19	1,262	388	375	8.6	96.7
20–24	1,125	823	768	17.6	93.3
25–29	1,010	928	874	20.0	94.2
30–34	771	749	711	16.2	94.9
35–39	722	705	665	15.2	94.4
40–44	546	540	526	12.0	97.4
45–49	493	490	456	10.4	93.0
50–54	360	357	NA	NA	NA
15–49	5,927	4,622	4,374	100.0	94.6

Note: The *de facto* population includes both usual residents and visitors who stayed in the household the night before the interview. For all columns, the age distribution is taken from ages reported in the Household Questionnaire. The total number of interviewed women in this table differs from the total number in earlier tables because this table uses household weights rather than women's weights for the calculations.  
NA: Not applicable

Table B.3 Completeness of reporting			
Percentage of observations with missing information for selected demographic and health indicators (weighted), Karnataka, 1999			
Indicator	Reference group	Percentage missing information	Number of cases
<b>Birth date</b>	Births in past 15 years		
Month only		9.69	7,392
Month and year		0.04	7,392
Age at death	Deaths to births in past 15 years	0.48	643
Age at first marriage	Ever-married women age 15–49	0.00	4,374
Woman's education	Ever-married women age 15–49	0.00	4,374
<b>Anthropometry</b>	Living children age 0–35 months		
Height		10.57	1,218
Weight		10.32	1,218
Height or weight		10.57	1,218
Woman's haemoglobin level	Ever-married women age 15–49	5.80	4,374
Child's haemoglobin level	Living children age 6–35 months	16.42	1,021
Diarrhoea in past 2 weeks	Living children age 1–35 months	0.41	1,207

Table B.4 Births by calendar year

Number of births, percent with complete birth date, sex ratio at birth, and calendar year ratio for children still alive at the time of the survey (L), children who died by the time of the survey (D), and total children (T), by calendar year (weighted), Karnataka, 1999

Calendar year	Number of births			Percent with complete birth date <sup>1</sup>			Sex ratio at birth <sup>2</sup>			Calendar year ratio <sup>3</sup>		
	L	D	T	L	D	T	L	D	T	L	D	T
1999	184	3	187	100.0	100.0	100.0	933	2,159	945	NA	NA	NA
1998	443	27	470	98.7	92.6	98.3	904	1,706	937	NC	NC	NC
1997	406	28	433	98.5	68.3	96.6	1,090	753	1,065	102.1	119.9	103.1
1996	352	19	371	98.9	67.8	97.3	986	610	962	76.8	53.4	75.1
1995	510	44	554	96.1	72.8	94.2	875	828	871	132.9	201.0	136.6
1994	416	25	440	94.0	76.2	93.0	1,033	1,069	1,035	82.2	52.4	79.6
1993	502	50	552	94.3	69.5	92.0	919	1,063	931	119.1	145.0	121.0
1992	427	45	472	90.9	64.6	88.4	1,076	664	1,029	86.7	86.1	86.7
1991	483	53	536	89.9	66.5	87.5	937	738	915	108.6	118.3	109.5
1990	463	46	509	91.4	67.0	89.2	924	696	901	93.5	84.6	92.6
1989	508	55	563	90.5	65.5	88.1	1,013	616	966	113.3	106.8	112.6
1988	433	57	490	88.4	63.1	85.5	876	1,103	900	86.6	95.7	87.6
1993-97	2,185	166	2,350	96.2	71.0	94.4	970	883	964	NA	NA	NA
1988-92	2,314	256	2,569	90.2	65.3	87.7	963	756	940	NA	NA	NA
1983-87	2,255	282	2,537	89.4	62.0	86.4	948	870	939	NA	NA	NA
1978-82	1,778	309	2,087	88.2	63.4	84.5	1,027	1,010	1,024	NA	NA	NA
1977 or earlier	1,623	380	2,002	85.1	57.6	79.9	856	970	876	NA	NA	NA
All	10,782	1,422	12,203	90.7	63.4	87.5	951	917	947	NA	NA	NA

NA: Not applicable

NC: Not calculated because full-year data were not collected for 1999

<sup>1</sup>Both year and month of birth given

<sup>2</sup> $(B_f/B_m) \times 1000$ , where  $B_f$  and  $B_m$  are the numbers of female and male births, respectively

<sup>3</sup> $[2B_x / (B_{x-1} + B_{x+1})] \times 100$ , where  $B_x$  is the number of births in calendar year  $x$

recent years. The annual data on the number of births can be examined to see if there is an abnormally large decline in the number of births after January 1996, the cutoff point for the health questions and measurements made on young children in the survey. It is typical for the annual number of births to fluctuate somewhat, so small annual fluctuations are to be expected. However, the sharp drop in the annual number of births between 1993–95 and 1996–98 (particularly for nonsurviving children) suggests that there has been some omission of recent births or displacement of birth dates that could result in an underestimate of both fertility and infant mortality rates for recent years.

Many surveys that include both demographic information and health information for children below a specified age have been subject to a substantial amount of age displacement. In particular, there is often a tendency for interviewers to ‘age’ children out of the eligible period for asking health questions. This problem was well known before NFHS-2 began; therefore, interviewer training stressed this issue to try to reduce the extent of biases due to age displacement. Apparently, the training was not entirely successful in avoiding this type of problem, however.

Table B.5 presents information on the reporting of age at death in days. Results from the table suggest that early infant deaths have not been seriously underreported in Karnataka, because the ratios of deaths under seven days to all neonatal deaths are consistently high (a ratio of less than 25 percent is often used as a guideline to indicate underreporting of early neonatal deaths). The ratios are 70 for 0–4 years, 66 for 5–9 years, and 78 for 10–14 years preceding the survey. Although there was no substantial underreporting of early neonatal deaths in NFHS-2, there was some misreporting of age at death due to a preference for reporting the age at death at 3, 5, 8, 15, and 20 days (Table B.5).

Table B.6 shows the percentage of infant deaths that occurred during the neonatal period. These percentages are also quite high, suggesting that there is no major omission of early deaths. One problem that is inherent in most retrospective surveys is heaping of the age at death on certain digits, e.g., 6, 12, and 18 months. Misreporting of age at death will bias estimates of the age pattern of mortality if the net result of misreporting is the transference of deaths between age segments for which the rates are calculated. For example, an overestimate of child mortality relative to infant mortality may result if children dying during the first year of life are reported as having died at age one year or older. Thus, heaping at 12 months can bias the mortality estimates because a certain fraction of these deaths may have actually occurred during infancy (that is, at ages 0–11 months). In this case, heaping would bias the infant mortality rate downward and the child mortality rate upward.

Examination of the distribution of deaths under age two years during the 15 years before the survey by month of death (Table B.6) indicates that there is substantial heaping of deaths at 6, 12, and 18 months of age. The heaping at 12 months is considerable (especially for children born 10–14 years before the survey) despite the strong emphasis on this problem during the training of interviewers for the NFHS-2 fieldwork. Nevertheless, even if one-third of the deaths reported at age 12 months actually occurred at less than 12 months of age, the infant mortality rate for the 15 years before the survey would be underestimated by only 1 percent. For the most recent five-year period, there is no heaping on 12 months of age, so heaping does not cause any bias in the childhood mortality rates during that period.

Table B.5 Reporting of age at death in days				
Distribution of reported deaths under 1 month of age by age at death in days and percentage of neonatal deaths reported to occur at age 0–6 days, for births occurring during five-year periods preceding the survey (weighted), Karnataka, 1999				
Age at death (days)	Years preceding survey			
	0–4	5–9	10–14	0–14
< 1	19	24	22	65
1	26	20	31	77
2	1	8	7	16
3	8	16	10	34
4	3	4	1	8
5	0	10	11	21
6	2	3	5	10
7	0	3	3	6
8	5	9	4	18
9	1	6	0	7
10	2	1	2	5
11	3	3	1	7
12	2	6	1	9
13	0	1	1	2
14	0	1	0	1
15	6	8	7	21
16	0	1	0	1
17	0	1	0	1
18	1	0	0	1
19	0	0	0	0
20	1	2	3	6
21	0	1	1	2
22	0	0	0	0
23	0	0	0	0
24	2	1	0	3
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	1	0	0	1
29	0	0	0	0
30	1	0	1	2
0–30	84	128	111	323
Percent early neonatal <sup>1</sup>	70.3	66.0	78.4	71.4

<sup>1</sup>Deaths during the first 6 days divided by deaths during the first 30 days



**Table B.6 Reporting of age at death in months**

Distribution of reported deaths under two years of age by age at death in months and percentage of infant deaths reported to occur at age under one month, for births occurring during five-year periods preceding the survey (weighted), Karnataka, 1999

Age at death (months)	Years preceding survey			
	0-4	5-9	10-14	0-14
< 1	84	128	111	323
1	6	15	15	36
2	3	6	13	22
3	3	8	16	27
4	3	1	2	6
5	1	4	5	10
6	4	6	3	13
7	1	3	4	8
8	2	1	2	5
9	1	5	3	9
10	1	2	6	9
11	3	0	3	6
12	2	7	12	21
13	0	3	1	4
14	1	4	3	8
15	4	1	1	6
16	0	2	2	4
17	0	0	1	1
18	0	4	3	7
19	0	0	0	0
20	0	1	0	1
21	0	0	1	1
22	0	0	0	0
23	0	0	1	1
0-11 months	111	179	183	473
Percent neonatal <sup>1</sup>	75.2	71.5	60.9	68.3

<sup>1</sup>Deaths during the first month divided by deaths during the first year