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Mother's Reproduction and Pregnancy Loss in a Rural Set-up

Introduction

IN the recent period much attention has been focused on the research related to 'Reproductive health and child loss'. Researchers have identified that repeated pregnancies (Sheps 1965), curtailment of breast feeding (Singarimbun and Chair in 1976), live birth intervals (Kondel and Vandewelle 1967), birth order (Demographic Research Centre 1975), and socio-economic status of the mother (Wyon and Gordon 1971) are important factors influencing mother's health and child survival. Foetal wastage and infant mortality affect the outcome of subsequent pregnancy. Gardiner and Yerushalmy (1939) observed that the risk of late foetal loss and neonatal death is twice as high among mothers who had lost a previous child. In another study, Das (1975) found that the proportion of infant loss was consistently higher among mothers whose previous child had died in infancy than that for those mothers whose previous child had survived. The 1976 Nepal Fertility Survey, revealed that the risk of infant and child death was considerably higher among mothers whose previous child had died than among those whose previous child had survived (Gubhaju 1985). It has been argued by researchers such as Preston (1978), Kondel (1968), Adiaka (1973) and others that in communities where the incidence of pregnancy loss is high, people opt for larger families to replace this loss to safeguard against the 'fear of loss'. Repeated pregnancies lead to shorter birth-intervals and thereby increase the risk of survival of both the index and previous birth. Kondel tested the effect of infant loss on birth interval by investigating the effect of the first born child on the interval between second and third (Kondel 1968). He noticed that the interval between second and third birth was longer if the first two children survived. By using survey data of Ankara city, Adlaka observed that regardless of mother's age or parity, birth interval following an infant death was shorter when an infant was lost than in case where the previous child survived beyond infancy (Adlaka 1973). The incidence of child loss is also affected by the nutritional status of mother, which is depleted with repeated pregnancies. Based on WFS data, Hobcraft, Donald and Rusteen (1985) found that infant mortality was higher for first born children specially those born to teenage mothers. Khan's study in Uttar Pradesh revealed that girls enter the reproductive process at a very young age and this exposes both the mother and the child to a high risk of morbidity and mortality'

(Khan 1987). Alam and Wai from their analysis of Bangladesh survey describe the adverse effects of shorter birth interval on mother's reproduction which operates through three causal mechanisms: (a) the maternal depletion syndrome, (b) competition between siblings, lactation and pregnancy, and (c) exposure of young children to disease (Wai 1990). Parents with higher parity are likely to neglect unwanted children by paying little attention to their food, nutrition and health care. Such attitudes and social behaviour could also contribute to child loss. This review confirms that reproductive loss is influenced also by various biological, social and demographic facts. In this paper, an attempt is made to study the influence of pregnancy outcome by age of the mother, sex, birth order, birth interval and previous pregnancy loss and the chances of delivering first and second child on the basis of outcome by survival analysis.

Materials and Methods

This study is based on the data collected from a survey carried out by the authors in rural Andhra Pradesh. Anantapur District, during the last quarter of the year 1991 (Prakasam, *et al.* 1993). Anantapur District was selected after considering various geographical, demographic and health indicators of the districts of Andhra Pradesh State. The density of the population in this district is 166 per sq km. and the sex ratio is 946 females per 1000 males; both are below the state average. Most of the working population depends on agriculture. It has one of the highest IMR rates and has a high CBR. Both these figures exceed the state average according to the 1991 census. From this district three villages were identified by a simple random procedure using the distance of the village from the district headquarter (Anantapur) as a criterion. It is assumed that the influence of the headquarter town decreases as the distance from the village to the town increases. By considering the distance concept, one village very near the town, another located within 5-10 km. and the third at a distance of more than 10 km were selected as study villages. In this study, the sampling unit was reproductive women, in the age group of 15-49 in a household. After framing and deciding the unit of analysis, the sample size (number of households) to be studied was considered. In order to avoid any ambiguity, a complete enumeration of the three villages was done. This reduced the sample biases, so that the sample would represent the socio-economic and demographic profile of the entire District population. The present study was confined to 1306 mothers who had delivered at least once in their reproductive life and resided in 1260 households of these villages. Hazard rates were calculated using the first birth and second birth interval. The life table method was used for estimating survivorship function, discussed by Lee (1980), to estimate survivorship, density function and hazard rate. This analysis was used for the first delivery, first delivery with outcome as live birth, second delivery and second delivery with outcome as live birth. From this analysis it was possible to determine the median duration of first and second live birth deliveries from the age at marriage and the risk involved.

In demographic studies, life table is used to study longevity, orphanhood, length of married life, length of working life etc. This method has also been applied in deter-

mining the age at menarche, duration and nature of termination of pregnancies (Shapiro. *et al.* 1962; Sheps 1965) and for survival data analysis (Benkson and Gage 1950; Cutler and Ederer 1958; Gehan 1969). We calculated survival life table rates as discussed by Lee (1980). The results regarding survival rates, probability of delivery and hazard rates are shown in Appendix Tables A-1 to A-4 and the comparative rates are provided in Table 6.

Results

In the 1260 households contacted, there were 1306 eligible women who were currently married in the age group 15-49 and had experience of at least one pregnancy.

Age of Delivery and Outcome of Delivery

One of the factors influencing the outcome of the delivery is age of the mother. It is a well known fact that the pregnancy loss is higher among younger and older women. The distribution of pregnancy outcome by age of the mother is shown in Table 1. About 96.2 percent of total deliveries were live births, while about 2.8 percent were still births. The incidence of abortion was found to be about one percent. There is a strong relationship between the age of mother and her fertility performance. In our study also more births occurred to young mothers (15-19 years). They peaked at 20-24 years of age and then declined. However, still birth and abortions were more among younger women compared to the older women (Table 1).

TABLE 1: OUTCOME OF PREGNANCY BY AGE OF THE MOTHER AT DELIVERY

<i>Age at Delivery</i>	<i>Outcome of Pregnancy</i>			<i>Total</i>
	<i>Live Birth</i>	<i>Still Birth</i>	<i>Abortion</i>	
< 14	22 (66.7)	8 (24.2)	3 (9.1)	33(100.0)
15-19	1151 (94.3)	40 (3.3)	29 (2.4)	1220(100.0)
20-24	1514(97.6)	31 (2.0)	7 (0.4)	1552(100.0)
25-29	722 (92.3)	25 (3.3)	3 (0.4)	750(100.0)
30-34	258 (99.2)	2 (0.8)	*	260(100.0)
35-39	114 (97.4)	3 (2.6)	*	117(100.0)
	3781 (96.2)	109 (2.8)	42 (1.0)	3932(100.0)

Outcome of Pregnancy by Birth Order

Reproductive histories were collected from 1306 eligible women by asking questions regarding their age at delivery at each pregnancy, outcome of pregnancy etc. Of the 3932 deliveries among these women, nearly 3 percent have resulted in stillbirth and

little more than one percent in abortion. Percentage of stillbirth was high at 3rd and 8th order of birth. Percentages of abortions were more for first, second, fourth and ninth birth orders (Table 2). The analysis shows that pregnancy loss was higher for lower and higher birth orders.

TABLE 2: OUTCOME OF PREGNANCY BY BIRTH ORDER

Birth Order	Outcome of Pregnancy			Total
	Live Birth	Still Birth	Abortion	
1	1166 (96.05)	33 (2.72)	15 (1.23)	1214 (100.0)
2	958 (96.48)	23 (2.32)	12 (1.20)	993 (100.0)
3	701 (95.63)	25 (3.31)	7 (0.96)	733 (100.0)
4	443 (95.89)	13 (2.81)	6 (1.30)	462 (100.0)
5	245 (98.39)	4(1.61)	*	249 (100.0)
6	135 (96.43)	4 (2.86)	1 (0.71)	140 (100.0)
7	63 (95.45)	3 (0.50)	*	66 (100.0)
8	32 (96.97)	1 (3.03)	*	33 (100.0)
9+	38 (90.48)	3 (7.14)	1(2.38)	42 (100.0)
	3781 (96.16)	109 (2.77)	42 (1.07)	3932 (100.0)

*NA

Outcome of Pregnancy By Sex and Birth Order

Table 3 shows that there were more male live births than female live births, but there was hardly any difference for still births. The risk of still birth is high among the births of lower order in rural areas. Table 3 shows that the risk of still birth is low for higher order of births. This may be due to the reproductive experience of mother who may be more aware about maternal health care and antenatal care.

TABLE 3: OUTCOME OF PREGNANCY BY SEX AND BIRTH ORDER

Birth Order	Outcome of Pregnancy				Abortion	Total
	Live Birth		Still Birth			
	Male	Female	Male	Female		
1	642 (52.9)	524 (43.2)	16(1.3)	17(1.4)	15(1.5)	1214 (100.0)
2	506 (51.0)	452 (45.5)	14(1.4)	9 (0.9)	12(1.2)	993 (100.0)
3	354 (48.3)	347 (47.3)	16 (2.2)	9(1.2)	7(1.0)	733 (100.0)
4	219 (47.4)	224 (48.5)	6(1.3)	7(1.5)	6(1.3)	462 (100.0)
5	129 (51.8)	116 (46.6)	3 (1.2)	1. (0.4)	*	249 (100.0)
6	60 (42.9)	75 (53.6)	2 (1.4)	2 (1.4)	1(0.7)	140 (100.0)
7	36 (54.5)	27 (40.9)	1 (1.5)	2(3.1)	*	66 (100.0)
8	16 (48.5)	16 (48.5)	1 (3.0)	*	*	33 (100.0)
9+	22 (52.4)	16(38.1)	*	3(7.1)	1(2.4)	42 (100.0)
Total	1984 (50.5)	1797 (45.7)	59(1.5)	50 (1.3)	42(1.0)	3932 (100.0)

Mean Age at Delivery by Birth Order

The distribution of mother's age at child birth by order of birth is given in Table 4. The mean age of the mother at first birth was 18.6 years (standard deviation of 3.1 years), at the third birth it was 23.5 years (standard deviation 3.8 years) and at the eighth birth order it was 32.9 (Table 4). This indicates that in rural areas most of the women get married in their teen years and have had a large family by age 30 years.

TABLE 4: MEAN AGE OF MOTHER BY BIRTH ORDER

<i>Birth Order</i>	<i>Mean Age</i>	<i>S.D.</i>	<i>S.E.</i>	<i>C.V.</i>
1	18.64	3.08	0.089	16.50
2	21.11	3.13	0.100	14.83
3	23.47	3.79	0.142	16.17
4	25.64	4.04	0.190	15.75
5	27.28	4.10	0.263	15.04
6	29.46	4.57	0.393	15.06
7	31.13	4.79	0.608	15.38
8	32.90	4.01	0.732	12.19
9+	34.96	*	*	*

*Data not adequate to calculate means.

Influence of Previous Pregnancy Outcome on the Present

The loss of a previous child induces the mother to replace this loss as early as possible. In communities where infant mortality is high, the desire to replace child loss is also high. The concepts of 'fear of loss' and 'actual loss' induce the mother undergo repeated pregnancies thereby reducing the birth interval. Thus shorter birth intervals and repeated pregnancies lead to high maternal and infant mortality. We examined the influence of the outcome of the previous pregnancy on that of the present birth order. Table 5 shows that for 97.5 percent of the cases when the first pregnancy outcome was a live birth the second was also a live birth. In 27.8 percent cases, when the first pregnancy did not result in a live birth, the outcome of the second pregnancy was also not a live birth and may have been a still birth or an abortion.

The chi-square analysis revealed that previous childless influenced present childless for the second, third and higher order of birth. Hence if maternal and child health programmes are implemented properly, progressive outcome in rural communities will improve.

TABLE 5: PREVIOUS OUTCOME, PRESENT OUTCOME BY BIRTH ORDER

<i>Present birth order</i>		<i>Previous Pregnancy Outcome</i>		<i>Total</i>
		<i>Live birth</i>	<i>Not live births</i>	
Second*	Live birth	911 (97.5)	26 (72.2)	937 (96.6)
	Not live birth	23 (2.5)	10 (27.8)	33 (3.4)
		934(100.0)	36(100.0)	970 (100.0)
Third*	Live birth	659 (97.1)	22 (73.3)	681 (96.1)
	Not live birth	20 (2.9)	8 (26.7)	28 (3.9)
		679(100.0)	30(100.0)	709(100.0)
Fourth* and above	Live birth	648 (98.5)	22 (64.7)	670 (96.8)
	Not live birth	10 (1.5)	12 (35.3)	22 (3.2)
		658 (100.0)	34(100.0)	692(100.0)

* χ^2 , .01: Significant; N.S.: Not significant; χ^2 Value: 75.51, 36.63, 109.08 (with Yates correction)

+ Includes still births, abortions.

Survival Analysis

In the present analysis we encounter the survival time as interval between marriage and first delivery and first delivery to second delivery. If t' denotes the survival time, then the survivor function $S(t)$ is defined as the probability that an individual survives longer than t' . Cumulative proportion delivered is defined as $S(t)$ (Appendix Tables A-1 to A-4, Col. 6) which explains the proportion of women delivering (surviving) longer than an year. From Table 6 it is evident that .5565 proportion of women did not experience a first delivery until the end of second year of married life. This proportion was found to be higher with live births, i.e., .5713. In the case of second delivery, as large as .8794 and .8780 proportion of women did not experience a second delivery until the end of second year. Even by the end of fifth year there are more than 13 percent women who had not experienced second delivery. A larger proportion of women conceived within a 'two years' interval with regard to first delivery whereas this interval was 2 to 5 years in the case of the second delivery. This shows that the first delivery takes place within two years, and there may be a biological delay in the case of the second delivery.

The probability density curve (Figs. 1 and 2) show a pattern of births occurring to women as time progresses. The proportion of individuals in a given time interval and the peaks of high pregnancy failure can be determined from this density function. The probability density curve for the first birth (Table 6, Fig. 1) shows that the density of delivery declines fast as the time interval increases. Slight variations can be seen in the curves for all types of deliveries (ATO) and live birth deliveries (LBO).

TABLE 6: SURVIVAL DATA ANALYSIS OF FIRST AND SECOND DELIVERY

Birth Interval	Survival Analysis	First Delivery		Second Delivery	
		ATO	LBO	ATO	LBO
0-1	S	1.0000	1.0000	1.0000	1.0000
	P	0.4435	0.4287	0.1206	0.1220
	H	0.5699	0.5457	0.1283	0.1299
	M	1.1774	1.2210	1.9489	1.9354
1-2	S	0.5565	0.5713	0.8794	0.8780
	P	0.3185	0.3225	0.4033	0.4041
	H	0.8017	0.7866	0.5949	0.5979
	M	0.8734	0.8856	1.1441	1.1382
4-5	S	0.0856	0.0911	0.1315	0.1303
	P	0.0385	0.0410	0.0641	0.0635
	H	0.5806	0.5806	0.6444	0.6444
	M	1.3125	1.3125	1.0600	1.0600
8-9	S	0.0197	0.0225	0.0144	0.0136
	P	0.0051	0.0050	0.0022	0.0021
	H	0.3000	0.2500	0.1667	0.1667
	M	1.0000	1.0000	1.0000	1.0000

ATO: All types of outcomes (live birth or still birth or abortion). LBO: Live birth only S : Survival Function P: Probability function. H: Hazard Function M : Median duration Delivery (Years)

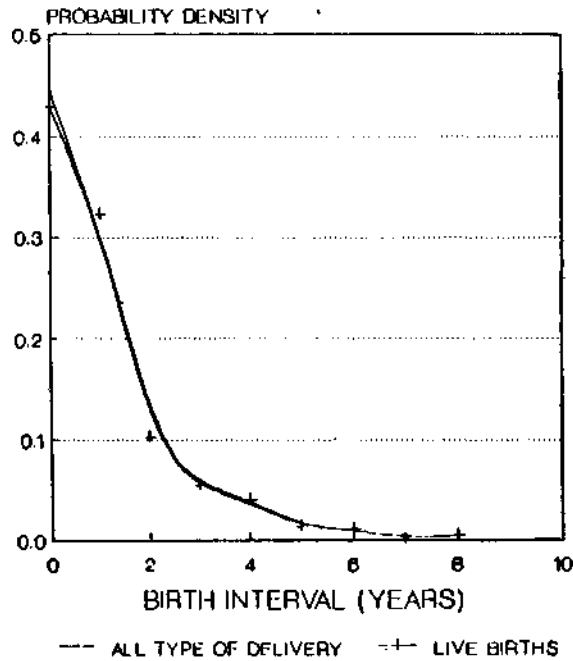


Fig. 1. Survival Analysis : First Delivery

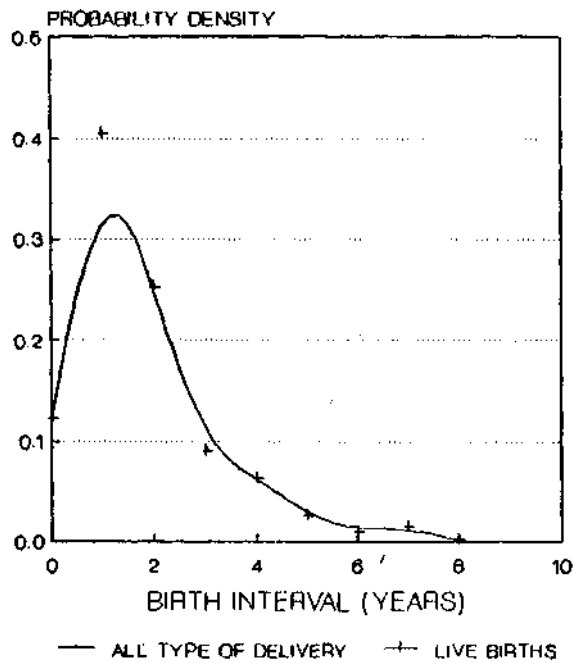


Fig. 2. Survival Analysis: Second Delivery

The probability density curve of the Second delivery increases upto 2 year and then declines steeply (Figure 2). Hence from this analysis we can say that a high proportion of women experience the first and second delivery, independent of outcome and that this proportion reduces after 2 years.

The hazard function which is also known as the instantaneous failure rate, force of mortality, conditional mortality rate etc., declined according to the first birth interval (Table 6 and Fig. 3). Rural women face greater risk of failure (delivery) when the birth interval is within two years. As the interval increases, the risk declines. In the case of second delivery, risk of delivery peaks at 2 years interval, fluctuates up to seven years and declined subsequently (Figure 4).

Summary and Conclusions

An analysis of 1306 women in the reproductive age revealed that the percentage of still births and abortions is high at 15-19 years of age and at the first birth order. Rural women by age 23 had three children and by 33 year of age they may have as many as 8 children (Table 4). About 27.8 percent women who had experienced a previous stillbirth or abortion, experienced more or less the same proportion of stillbirths and/or abortions at the subsequent delivery. This supports the argument that the survival status of the previous child has a bearing on subsequent pregnancy outcome. The survival analysis also shows that a larger proportion of women delivered their first

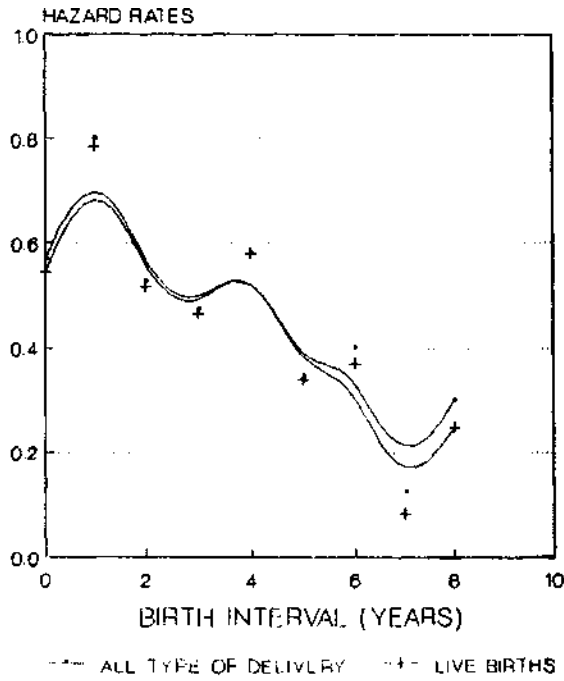


Fig. 3. Survival Analysis : First Delivery

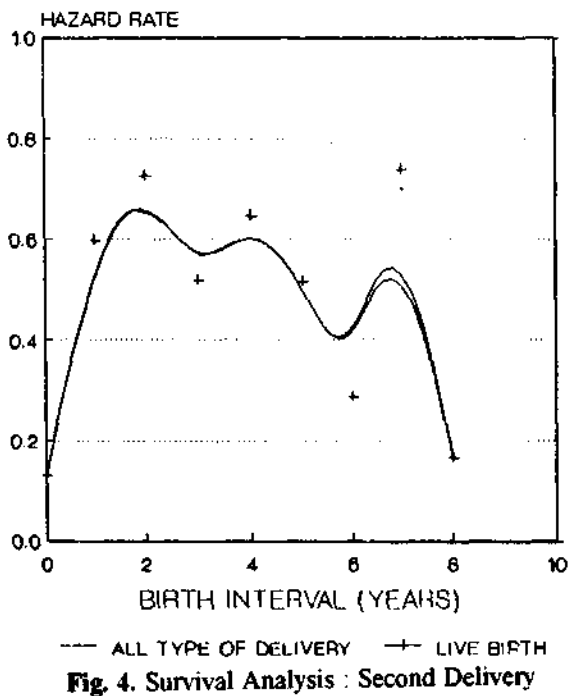


Fig. 4. Survival Analysis : Second Delivery

child within two years of marriage, whereas the proportion of women delivering a second child is high between 2 to 4 years interval. This clearly indicates that there is a 'biological' pregnancy delay and that the influence of previous pregnancy outcome plays a vital role on the outcome of the second pregnancy. Hence, if women are motivated to use spacing methods and the first delivery also receives adequate MCH services, then there would be a delay in conception which would improve the health of the mother and the child.

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TABLE A-1: LIFE TABLE ANALYSIS FOR CALCULATION OF THE RISK OF FIRST DELIVERY ACCORDING TO BIRTH INTERVAL

Birth interval (years)	No. of women at the beginning of each duration	Delivered during the interval	Number of women dropped out for reasons other than pregnancy	Number of women exposed to the risk of delivery	Proportion delivered	Proportion not delivered	Cumulative proportion not delivered	Cumulative proportion delivered	Standard error	95% Confidence limits	
										Lower limit	Upper Limit
$X, x+n$	Lx	Tx	Wx	$L'x$	Qx	Px	P_x^c	Q_x^c	$Q^s x$	L	U
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
0-1	1168	518	0	1168	0.4435	0.5565	0.5611	0.4389	0.0148	0.4099	0.4679
1-2	650	372	0	650	0.5723	0.4277	0.2399	0.7800	0.0126	0.7353	0.7847
2-3	278	116	0	278	0.4173	0.5827	0.1398	0.8602	0.0102	0.8403	0.8801
3-4	162	62	0	162	0.3827	0.0173	0.0862	0.9137	0.0083	0.8974	0.9300
4-5	100	45	0	100	0.4500	0.5500	0.0475	0.9525	0.0063	0.9402	0.9648
5-6	55	16	0	55	0.2909	0.7090	0.0337	0.9663	0.0053	0.9540	0.9767
6-7	39	13	0	39	0.3333	0.6666	0.0224	0.9776	0.0044	0.9692	0.9862
7-8	26	3	0	26	0.1154	0.8846	0.0199	0.9801	0.0041	0.9725	0.9881
8-9	23	6	0	23	0.2609	0.7391	0.0147	0.9853	0.0035	0.9784	0.9922
More than 9	17	17	0	17	1.0000	0.0000	0.0000	1.0000	0.0000	-	-

TABLE A-2: LIFE TABLE ANALYSIS FOR CALCULATION OF THE RISK OF FIRST LIVE BIRTH DELIVERY ACCORDING TO BIRTH

Birth interval (years)	Number of women at the beginning of each duration	Delivered during the interval	Number of women dropped out for reasons other than live birth delivery	Number of women exposed to the risk of live birth delivery	Proportion delivering live birth	Proportion not delivered live birth	Cumulative proportion not delivered live birth	Cumulative proportion delivered	Standard error	95% Confidence limits	
										Lower limit	Upper Limit
$X, x+n$	L_x	T_x	W_x	L^1_x	Q_x	P_x	P_0^x	Q_0^x	Q^1_x	L	U
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
0-1	1168	496	22	1157.0	0.4287	0.5713	0.5611	0.4389	0.0148	0.4099	0.4679
1-2	650	365	7	646.5	0.5646	0.4357	0.2433	0.7557	0.0127	0.7308	0.7806
2-3	278	114	2	277.0	0.4116	0.5884	0.1438	0.8562	0.0104	0.8358	0.8766
3-4	162	61	1	161.5	0.3777	0.6223	0.0895	0.9105	0.0085	0.8935	0.9272
4-5	100	45	0	100.0	0.4500	0.5500	0.0492	0.9508	0.0064	0.9383	0.9633
5-6	55	16	0	55.0	0.2909	0.7090	0.0349	0.9651	0.0055	0.9543	0.9759
6-7	39	12	1	38.5	0.3117	0.6883	0.0240	0.9760	0.0046	0.9670	0.9850
7-8	26	2	1	25.5	0.0784	0.9216	0.0221	0.9779	0.0044	0.9693	0.9865
8-9	23	5	1	22.5	0.2222	0.7777	0.0172	0.9878	0.0039	0.9802	0.9954
More than 9	17	14	3	15.5	1,0000	0.0000	0.0000	1,0000	0.0000	-	-

TABLE A-3: LIFE TABLE ANALYSIS FOR CALCULATION OF THE RISK OF SECOND DELIVERY ACCORDING TO BIRTH INTERVAL.

Birth interval (years)	No. of women at the beginning of each duration	Delivered during the interval	Number of women dropped out for reasons other than pregnancy	Number of women exposed to the risk of delivery	Proportion delivered	Proportion not delivered	Cumulative proportion not delivered	Cumulative proportion delivered	Standard error	95% Confidence limits	
										Lower limit	Upper Limit
$X, x+n$	L_x	T_x	W_x	L'_x	Q_x	P_x	$P_{\sigma x}$	$Q_{\sigma x}$	Q^b_x	L	U
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
0-1	962	116	0	116	0.1726	0.8274	0.8274	0.1726	0.0218	0.1299	0.2153
1-2	796	365	0	365	0.4585	0.5415	0.4480	0.5520	0.0188	0.5152	0.5888
2-3	431	229	0	229	0.5313	0.4687	0.2099	0.7900	0.0139	0.7628	0.8172
3-4	202	83	0	83	0.4109	0.5891	0.1237	0.8763	0.0109	0.8549	0.8977
4-5	119	58	0	58	0.4874	0.5126	0.0634	0.9366	0.0080	0.9209	0.9523
5-6	61	25	0	25	0.4098	0.5902	0.0374	0.9626	0.0062	0.9504	0.9748
6-7	36	9	0	9	0.2500	0.7500	0.0281	0.9719	0.0054	0.9613	0.9825
7-8	27	14	0	14	0.5185	0.4815	0.0135	0.9865	0.0037	0.9792	0.9938
8-9	13	2	0	2	0.1538	0.8462	0.0114	0.9886	0.0034	0.9819	0.9953
More than 9	11	11	0	11	1.0000	0.0000	0.0000	1.0000	0.0000	-	-

TABLE A-4: LIFE TABLE ANALYSIS FOR CALCULATION OF THE RISK OF SECOND LIVE BIRTH DELIVERY ACCORDING TO BIRTH INTERVAL

Birth interval (years)	Number of women at the beginning of each duration	Delivered during the interval	Number of women dropped out for reasons other than live birth delivery	Number of women exposed to the risk of live birth delivery	Proportion delivering live birth	Proportion not delivered live birth	Cumulative proportion not delivered live birth	Cumulative proportion delivered	Standard error	95% Confidence limits	
										Lower limit	Upper Limit
$X, x+n$	L_x	T_x	W_x	L^1_x	Q_x	P_x	P_0^x	Q_0^x	Q^1_x	L	U
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
0-1	962	166	22	951.0	0.1746	0.8254	0.8254	0.1746	0.0217	0.1321	0.2171
1-2	796	365	6	793.0	0.4603	0.5397	0.4455	0.5545	0.0187	0.5178	0.5912
2-3	431	229	2	430.0	0.5326	0.4674	0.2083	0.7917	0.0138	0.7647	0.8187
3-4	202	83	1	201.5	0.4119	0.5881	0.1224	0.8775	0.0109	0.8561	0.8989
4-5	119	58	0	119.0	0.4874	0.5126	0.0628	0.9372	0.0079	0.9217	0.9527
5-6	61	25	0	61.0	0.4098	0.5902	0.0370	0.9630	0.0061	0.9511	0.9749
6-7	36	9	0	36.0	0.2571	0.7429	0.0278	0.9722	0.0053	0.9618	0.9826
7-8	27	14	2	26.0	0.5385	0.4615	0.0128	0.9872	0.0037	0.9818	0.9945
8-9	13	2	0	13.0	0.1538	0.8465	0.0109	0.9891	0.0034	0.9824	-
More than 9	11	11	0	11.0	1.0000	0.0000	0.0000	1.0000	0.0000	-	-