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Distribution of Breastfeeding Duration in Peninsular Malaysia: With Reference to The Problem of Heaping

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Abstract: The aim of the study is to reduce the effect of heaping in the data of breastfeeding duration. The duration of Breastfeeding is usually determined using the retrospective records, which sometimes have the problem of heaping. Using the Malaysian Family Life Survey (MFLS), the retrospective data on breastfeeding durations is found to show heaping at 6, 12, 18 and 24 months. In some studies, multiples of five techniques are often used to reduce the effect of heaping. However, in this study we modify the multiple of five techniques to multiple of three techniques, which is particularly suitable for the data that have the heaped points for every six months periods during the duration. Based on this technique, a smooth distribution of breastfeeding durations is obtained.

Key words: Breastfeeding duration, recall bias, heaping

INTRODUCTION

Breastfeeding duration is one of the factors that has been shown in many studies to have a strong association with the healthy growth and development of infants. Breastfeeding protects babies against the risk of allergy and contribute to child spacing for the mothers (Chantry *et al*., 2006). Since 1970, the Malaysian Ministry of Health has implemented several strategies and conducted many activities to promote breastfeeding. The Malaysian National Breastfeeding Policy states that all mothers are encouraged to breastfeed their baby completely for between four to six months and continue to breastfeed and provide complementary foods until the child is two years old. The Hospital Rakan Bayi in Malaysia, which is an example of a campaign identified under the Baby Friendly Hospital Initiative (BFHI), is a program to create conducive conditions in the hospital for mothers who wish to breastfeed their babies successfully (Health, 2006).

To assess the breastfeeding duration based on the ability to recall mothers experience is sometimes difficult, since mothers could be unable to remember exactly how long the child had been breastfed. The analysis of retrospective studies may be obscured by recall bias, which is inability to recall the experience correctly. Brind (2007) and Battistin *et al*. (2003), for example have found that information gathered based on household surveys such as age are typically characterized by recall error. They have identified that the respondents are likely to round off the true measure, causing abnormal concentrations of value in the empirical distribution. Weeks (2005) and Shryock *et al*. (1976) have suggested the tendency of enumerators or respondents to report certain duration is called duration heaping, age preference or digit preference.

According to Petoussis *et al*. (2004), it is important to allow for heaping when statistical analysis is carried out on retrospective data, so that the result obtained are based on the correct assumption of the underlying distribution of the data. In the analysis of breastfeeding duration data using the retrospective information from the mothers, Bracher and Santow (1982), Haaga (1988) and Klerman (1993) among others, have found that heaping occurs at 6, 12, 18 and 24 months. These heaps are caused by mothers who are unable to remember exactly how long they have breastfeed their babies. In some studies, multiples of five technique is often used to reduce the effect of heaping. In this study we modify the multiples of five technique to multiples of three.

Identification of heaping in the data: The breastfeeding data used in this study are based on retrospective study, as reported in the Malaysian Family Life Survey (MFLS). This report is focused on the breastfeeding experience of the mothers to their youngest child who has been ever breastfed if only for a short time and up to 29 months. Based on the MFLS report, 1,591 respondents that are

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found to have satisfied certain requirements are ever married women under the age of 50 years, with at least one child under the age of seven. The data distribution is as shown in Fig. 1.

Figure 1 shows that heaping occurs at 6, 12, 18 and 24 months. Heaping in the retrospective data may occur due to recall bias or true behavior such as weaning norms. Whether the occurrence of heaping can be attributed to recall bias or not, can be decided by comparing the distributions of retrospective and current status data. The current status data is free from recall bias since it consists of the information on the breastfeeding duration at the time when the baby is still breastfeeding. We have found that less than thirty percent of the respondents satisfied the current status data. The distribution of the number of children according to the duration of breastfeeding based on the current status data is given in Fig. 2.

Klerman (1993) suggested that if the occurrence is due to the true behavior, sharp drops would be expected in the current status data after the heap point and then stays down. If no drop is observed in the current status data in the duration of breastfeeding after the heap point, then heaping is more likely to be caused by recall bias.

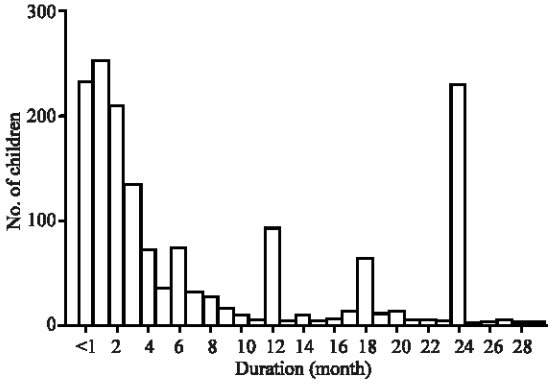

Fig. 1: Distribution of the number of children according to duration of breastfeeding

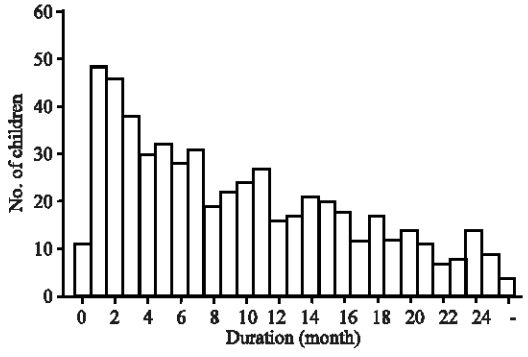

Fig. 2: Distribution of the number of children according to breastfeeding duration based on the current status data

Based on distribution of current status data, it is found that breastfeeding duration is not monotonically decreasing. For example, after heaped points of 6 and 12 months of breastfeeding duration, the number of children who has been breastfed after those particular periods are found to increase. This is more likely to happen due to recall bias.

RESULTS AND DISCUSSION

Redistributing the excess numbers to around the heaping point: To reduce the effect of heaping in this study, we introduce multiples of three technique as a modification of multiples of five technique, as suggested by Feeney (1979), for correcting heaping when studying the age distribution in the Indonesian population data. In this multiple of three technique, the excess number of children which is concentrated at certain heaping duration is distributed to four surrounding durations, two below and two above. A summary of the number of children who have experienced breastfeeding for a particular duration, say months and the total number of children who have experienced breastfeeding for the durations of x, x+1 and x+2 months is denoted as x, x+3, as shown in Table 1.

When redistributing the effect of heaping at each heaping point, say x, we transfer the number of children from a given multiples of three duration to four surrounding durations by considering an adjustment index denoted as Δ_x and defined by:

$$\Delta_x = \frac{4}{5}\left[\frac{P_{x^-} + P_x + P_{x^+}}{P_{x^-} + P_{x^+}}\right],\ x = 3, \ldots, 27 \qquad (1)$$

where, P_x is the number of children being breastfed at duration x, P_x- is the total number of children being breastfed at the two durations immediately below duration x, P_x+ is the total number at the two durations immediately above duration x. The value of one for Δ_x indicates there

Table 1: Distribution of number of children being breastfed in multiples of three months duration

	No. of children at duration of			
Duration (x)	x	x+1	x+2	x, x+3
0	233	254	210	697
3	133	72	35	240
6	75	33	27	135
9	17	10	6	33
12	92	4	9	105
15	5	7	14	26
18	64	13	14	91
21	6	6	4	16
24	229	1	4	234
27	6	4	4	14
Total	860	404	327	1591

Table 2: Redistribution of number of children using multiples of three technique

Duration (x)	P_x	P_x+	Δ_x	P^1_x	P^1_x+	Δ^1_x	P^2_x	P^2_x+	Δ^2_x	P^3_x	P^3_x+	Δ^3_x	P^4_x
0	233	464	1.0000	233	458	1.0000	233	454	1.0000	233	455	1.0000	233
3	133	107	0.9863	141	123	0.992	145	122	1.0021	144	123	0.9997	144
6	75	60	1.1593	48	68	1.0029	48	63	1.0038	47	64	0.9998	47
9	17	16	0.9789	19	53	0.9226	28	49	0.9994	28	50	0.9974	28
12	92	13	3.3379	24	42	1.003	24	37	1.0214	22	38	1.0002	22
15	5	21	0.9176	8	37	0.8782	18	33	0.9987	18	34	0.9947	18
18	64	27	1.8667	22	49	1.0084	22	41	1.0333	19	42	1.0002	19
21	6	10	0.9297	9	129	0.8387	37	109	0.9995	37	113	0.9929	38
24	229	5	13.0133	49	66	0.9999	49	55	1.0383	43	58	1.0001	43
27	6	8	1.1692	4	9	0.8404	16	8	1.0000	16	8	0.9935	16

is no heaping in the data, implying that the smoothing is perfect. The redistribution process is stopped if each value of Δ_x can be considered close to one. Based on the first order redistribution process, denoted as single prime (^{1}), we have:

$$P^1_{x^-} = P_{x^-} + (\Delta_x - 1)P_{x^-} \quad (2)$$

$$P^1_x = P_{x^-} + (\Delta_x - 1)\left[P_{(x-3)} + P_{x^+}\right], \; x = 0, \ldots, 27 \quad (3)$$

$$P^1_{x^+} = \left(\Delta_x + \Delta_{(x+3)} - 1\right)P_{x^+}, \; x = 0, \ldots, 27 \quad (4)$$

$$\Delta^1_x = \frac{4}{5}\left[\frac{P^1_{x^-} + P^1_x + P^1_{x^+}}{P^1_{x^-} + P^1_{x^+}}\right], \; x = 0, \ldots, 27 \quad (5)$$

The above redistribution process is repeated, denoted as double primes (^{2}) and so on until all values of Δ^k_x are considered close to one where the value of k is a positive integer. Application of this procedure for correcting the distribution of breastfeeding duration is as shown in Table 2.

To produce a smooth curve for the adjusted numbers at multiples of three, we first compute the estimated numbers at durations (x+1.5) using linear interpolation where the weights used are 0.7 and 0.3 for values before and after a particular multiples of three duration. As given in Table 3, correction of the first entry is obtained by calculating 0.7 x 144 + 0.3 x 47. The interpolated values of the number of children being breastfed at durations x = 4.5, 7.5, ... ,25.5 are multiplied by 3 to obtain the adjusted number of children for the durations of 3-5, 6-8, ... , 24-26, as shown in column 4 To make the resulting total of column 4 to conform to the recorded total of 1591, we multiply the values in column 4 by an adjustment factor, in this case 1591/1669, to obtain results as given in Table 3.

The corrected number of children being breastfed for a particular duration at multiples of three months and intermediate duration are provided in Fig. 3. The averages provided in column 6 of Table 3 are plotted against the duration to give us the corrected distribution of breastfeeding duration after correction for heaping is done is presented in Fig. 4.

Table 3: The correction procedure using multiples of three

Duration (x)	P_x (1)	P_x+ (2)	$f_{(x+1.5)}$ (3)	$3P^1_x$ (4)	$3P_x$ (5)	$3P_x$ (6)
0	233	455	na	697	664	221
3	144	123	115	345	329	110
6	47	63	41	123	117	39
9	28	50	26	78	74	25
12	22	38	21	62	59	20
15	18	34	18	54	52	17
18	19	42	25	74	71	24
21	38	112	39	117	112	37
24	43	57	35	105	100	33
27	16	na	na	14	14	5
Total	609			1669	1591	531

na: Not applicable

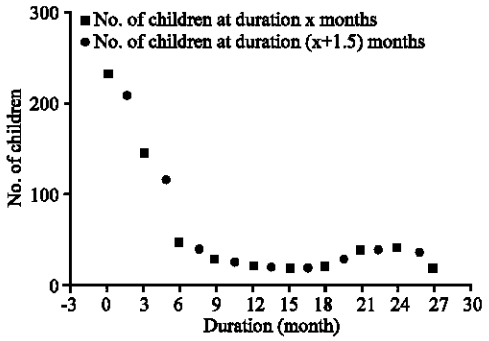

Fig. 3: Distribution of number of children at multiple of three duration of breastfeeding and intermediate duration

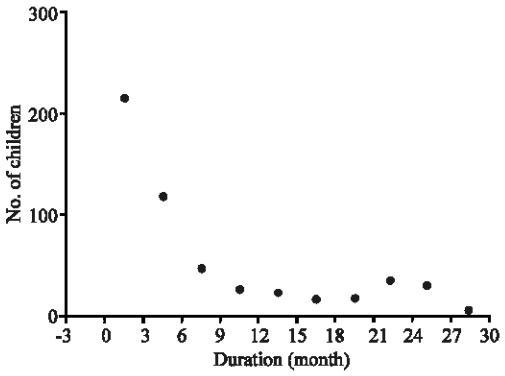

Fig. 4: Corrected distribution of breastfeeding durations

Table 4: Comparison the distribution of recorded and corrected number of children

Duration (month)	No. of children		Difference	Percentage difference
	Recorded	Corrected		
0-2	695	617	-80	-14
3-5	240	352	+120	+20
6-8	135	124	-11	-2
9-11	33	78	+45	+8
12-14	105	62	-43	-8
15-17	26	54	+28	+5
18-20	91	69	-22	-4
21-23	16	115	+99	+17
24-26	234	106	-128	-22
27-29	14	14	0	0
Total	1591	1591		

When the corrected and recorded numbers are compared, large numbers of children have been transferred between each of the three month duration groups (Table 4).

CONCLUSION

A Multiple of three technique can used to reduce the effect of heaping in the data by distributing the number of data for a particular heaping period to the period before and after it. Having corrected for heaping in the data, the distribution found is more representative of the underlying distribution. Thus, the analysis made based on these corrected data could be considered to be more reliable.

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