



Attrition in the Cebu Longitudinal Health and Nutrition Survey

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Introduction

In any longitudinal study, sample attrition or loss of study subjects over time is expected (Alderman et al., 2001). For example, the Michigan Panel Study on Income Dynamics lost about 50% of its initial sample on its 30th year from cumulative attrition (Fitzgerald et al, 1998). The Birth to Twenty Longitudinal Study in Africa reported an attrition rate of 30% after 16 years (Richter et al, 2009).

Studies have been inconsistent regarding the extent to which attrition influences the study findings. Attritors may have characteristics that are different from the retained sample reducing the representativeness of the retained sample from the original sample. Such sample selectivity or attrition bias may be detrimental to research (Hill, 2004). However, there are also studies reporting no significant bias due to attrition (Alderman et al, 2000; Eerola et al, 2007; and Falaris, 2003).

Despite these ambiguous findings, efforts to minimize attrition and document its patterns remain important tasks in managing longitudinal surveys. This report describes recruitment and sampling, attrition rates, reasons for attrition and strategies for minimizing attrition in the Cebu Longitudinal Health and Nutrition Survey (CLHNS).

Overview of the CLHNS

The CLHNS is an ongoing, community-based study of mother-child pairs in Metro Cebu, Philippines, initiated by the Carolina Population Center, University of North Carolina at Chapel Hill, USC-Office of Population Studies Foundation, Inc. (OPS), and Nutrition Center of the Philippines. The CLHNS was originally designed to study maternal-infant health and nutrition issues, or more specifically the determinants and consequences of infant feeding. Data collection for the study began with the recruitment of pregnant women in 1983-1984. The mother-infant dyads were initially followed up from birth through the first 2 years postpartum (1985-1986). Continuing interest on the CLHNS resulted in more follow-up surveys after the 2-year postpartum period. The CLHNS research collaboration has since expanded to include Northwestern University, Johns Hopkins University and other universities and institutions (Adair et al, 2010). To this date, the birth cohort and their mothers have been visited for more than twenty survey rounds, with each survey covering relevant topics across the life course of the sample. By 2012, more than half of the original mothers and children continue to participate in the CLHNS making it the largest and longest running prospective study in the Philippines. The CLHNS is described in greater detail in Adair et al (2010) and Feranil et al (2008).

Sample Recruitment

The initial goal of the project was to recruit 2,000 pregnant women who were due to give birth between May 1, 1983 and April 30, 1984 in Metropolitan (or Metro) Cebu, the largest metropolitan area in the Philippines outside of Metro Manila. Metro Cebu then consisted of the cities of Cebu, Mandaue and Lapulapu and the municipalities of Talisay, Minglanilla and Naga

in the southern part of Cebu, and the municipalities of Cordova, Consolacion, Liloan and Compostela in the north¹.

The OPS conducted a pilot study in 1982 which established that to obtain a sample size of 2,000 women required the canvassing of about 20,000 households in 33 *barangays* (or local administrative units). The final sample areas included 17 urban and 16 rural *barangays* which were randomly selected from the then 270 *barangays* composing Metro Cebu. No sample *barangays* were drawn from the municipalities of Minglanilla and Compostela. All households in the 33 *barangays* were enumerated. Information on the number of currently pregnant women and their expected dates of delivery were obtained from each household. In the course of the household canvass, 4493 women were contacted and 3711 were identified as eligible for the baseline study. Of the 3711 women, 3327 were enrolled in the study. The 384 women were not enrolled mainly because they delivered outside of the May 1, 1983 to April 30, 1984 eligibility period.

Schedule of Survey Rounds

The Baseline Survey (BS) was conducted in 1983-84. The 3327 women recruited at baseline were in their last trimester of pregnancy. For the Birth Information (BI) Survey, the goal was to collect data on the third day after the index children (ICs) were born. On average, the BI visits were conducted 4.8 days² after the birth of the IC. The mother-infant pairs were followed-up bimonthly for the first 24 months postpartum. These surveys were referred to as Longitudinal Surveys (LS) 1 thru 12 and were conducted from 1983 to 1986. Additional follow-up surveys were conducted on the mother-child pairs in 1991, 1994, 1998, 2002, 2005 and 2007. From BI to 2007, the surveys were designed in tandem where data were collected on both mothers and ICs within the same year or contiguous period.

After 2007, survey rounds were done separately on the mothers and ICs rather than as pairs. Between 2007-2008 a qualitative survey on the social context of partnerships among young people was done on an IC subsample. A cohort tracking survey was done on the ICs in 2009 where abbreviated rather than full modules were administered. A pregnancy tracking survey (simulating the BS modules) was conducted among female ICs from 2009-2014. A study focused on fatherhood was done on the male ICs in 2014.

The 2009 IC survey is the latest round covering all ICs (males and females) within the same round. A grant focused on aging collected data on the majority of CLHNS mothers in two survey rounds: 2012 and 2015.

Intervals between surveys were dictated by survey design (i.e. in the LS series), availability of funding and/or other logistical considerations.

¹ In 2005, the Metro Cebu area was extended to include San Fernando and Carcar City in the South and Danao City in the North (MCDCB, 2011)

² Mean interval calculated using Birth Information Survey raw data file.

Recruitment and Data Collection Methods

Prior to starting a new follow-up survey round, a master list of participants is prepared. This list constitutes the sampling frame for the new round and contains information such as names, addresses, phone numbers and CLHNS participation status. During the early years of the study (BS through the LS series) the names in the master list were distributed among 5 survey teams. Each team was assigned specific *barangays* where they recruited and conducted data collection. All 5 teams worked in their assigned *barangays* simultaneously. In later years, recruitment and data collection were done sequentially starting with the sample *barangays* with the most CLHNS participants. Toward the end of each round, the survey teams would go back to all the *barangays* and attempt to recruit participants who could not be reached in the first recruitment/data collection sweep in a particular *barangay*.

At each survey round, trained CLHNS field personnel visit the participants at home to conduct structured questionnaire interviews and administer various assessments. Data collection protocol for the earlier rounds usually took just one home visit to complete. Through the years, additional questionnaire modules were added to each round (to capture specific attributes of the sample) increasing the time it took to complete the survey protocol to about 2-3 home visits depending on the survey length and focus. Being a longitudinal study, core questionnaire modules are administered at each follow-up round, maintaining the same set of questions to ensure data comparability over time.

Some survey components were administered assembly style in places other than the participants' homes. In 1994, the ICs were gathered in specific schools and were administered achievement tests. For the study on aging, eligible mothers were asked to report to their health centers for the flu vaccination component in 2012, and for the ankle-brachial index measurements in 2015.

Survey Respondents

From BS through the 1994 survey, the mother was the main respondent for all questions about herself and the IC. Starting in 1998, when the ICs were old enough to respond to questions about themselves, separate IC and mother questionnaires were administered.

Caregiver Interviews

In the LS series and in the subsequent rounds, there were a few cases where the mothers were not available or have attrited from the survey. In these cases, IC caregivers (fathers, relatives or non-relatives) were the survey respondents providing information on the household and on the IC. In LS1 there were 9 such cases and by LS12 there were 66. Caregiver households were included in the 1991 (n=177), 1994 (n=204) and 1998 (n=211) surveys.

Other Respondents

In the past three decades there were individuals other than the mother-child pairs who were also interviewed for specific purposes. In 1983, 220 women from non-sample *barangays* were recruited as controls to assess the effect of behavioral contamination in the longitudinal sample.

In 1994, the survey design included the recruitment of 500 new women from the 33 BS barangays, also for the purpose of serving as a control group in some analysis. In 2005, the spouses of the mothers and ICs were interviewed. In the 2009 tracking of ICs, spouses of the male ICs were interviewed for a particular segment of the questionnaire.

A. Attrition among the CLHNS Mothers

This section describes attrition in CLHNS rounds on mothers, from BS through the 2012 survey (the 2015 survey is still ongoing as of this writing). Appendix 1 presents a summary of all the reasons for attrition among the mothers.

Of the 3327 baseline women, 3120 (94 %) had BI survey data³. Of these, 3080 had single births, 38 had stillbirths and 4 had miscarriages/ abortions. Table 1 reveals that attrition from the baseline sample gradually increased over time, from about 6% at the BI survey to about 45% in 2012. The highest percentage of between-survey attrition (12.72%) was observed between the 1994 and 1998 surveys (see explanation on attrition by sampling design below). The negative attrition rate in LS12 was a result of 50 mothers being in LS11 but not in LS12, and 53 mothers not in LS11 but in LS12. This illustrates an attribute of attrition where mothers could be in and out of surveys (mostly the outmigrants and unlocated).

Table 1. Attrition status of the sample mothers, by survey round

Survey round (inclusive years)	Number (%) enrolled	No. (%) attrited from baseline sample	Number (%) attrited in survey
BS (1983-84)	3327 (100.00)	0	0
BI (1983-84)	3120 (93.78)	207 (6.22)	207 (6.22)
LS1 (1983-84)	2875 (86.41)	452 (13.59)	245 (7.85)
LS2 (1983-84)	2792 (83.92)	535 (16.08)	83 (2.89)
LS3 (1983-84)	2713 (81.54)	614 (18.46)	79 (2.83)
LS4 (1984)	2675 (80.40)	652 (19.60)	38 (1.40)
LS5 (1984-85)	2661 (79.98)	666 (20.02)	14 (0.52)
LS6 (1984-85)	2661 (79.98)	666 (20.02)	0 (0.00)
LS7 (1984-85)	2654 (79.77)	673 (20.23)	7 (0.26)
LS8 (1984-85)	2622 (78.81)	705 (21.19)	32 (1.20)
LS9 (1984-85)	2605 (78.30)	722 (21.70)	17 (0.65)
LS10 (1985-86)	2601 (78.18)	726 (21.82)	4 (0.15)
LS11 (1985-86)	2562 (77.01)	765 (22.99)	39 (1.50)
LS12 (1985-86)	2565 (77.10)	762 (22.90)	-3 (-0.12)
1991	2395 (71.99)	932 (28.01)	170 (6.63)
1994	2279 (68.50)	1048 (31.50)	116 (4.84)
1998	1989 (59.78)	1338 (40.22)	290 (12.72)
2002	2102 (63.18)	1225 (36.82)	-113 (-5.68)
2005	2018 (60.66)	1309 (39.34)	84 (4.00)
2007	1977 (59.42)	1350 (40.58)	41 (2.03)
2012	1818 (54.64)	1509 (45.36)	159 (8.04)

³The BI survey file actually has 3122 records. The BI records of the 2 singletons who died did not have data on the mothers.

A.1 Reasons for Attrition among CLHNS Mothers

Sampling design. The overall recruitment goal in any longitudinal survey is to retain as much of the baseline sample in subsequent surveys. However, at the start of each follow-up survey, decisions on the set of inclusion criteria or the sampling frame to use in recruitment are often determined by the new survey's research focus as well as logistical limitations. Thus, there were CLHNS participants excluded in survey rounds mainly due to sampling design.

Of the 3327 baseline mothers, 26 gave birth to multiples (25 pairs of twins and 1 set of triplets). One of these mothers died shortly after delivery. In the BI survey, a decision was made to limit the birth cohort to singletons. Thus, the 25 surviving mothers of multiples were dropped from the BI survey.

There were 11 baseline mothers who had miscarriages and 38 who had stillbirths. Except for 7 mothers who miscarried, all of these women had BI survey data despite the index pregnancy outcome. These mothers were eventually dropped from the study by LS1. Mothers of ICs who died early in the LS series were also dropped from the study.

As earlier described, the surveys from BI through 2007 were designed as tandem surveys collecting data from both mothers and ICs. While mother-child paired data were crucial, particularly in the earlier years, important information was also derived from the mothers alone. Thus, midpoint the LS series, a decision was made to re-recruit mothers who were dropped from the study because of miscarriages, stillbirths, IC deaths or ICs relocating outside of sample area. In 1991, mothers of multiples were recruited back into the study (take note however that the IC multiples themselves were included only in the 1994 survey – see section on IC attrition below).

However, in 1998, only mother-child pairs were included in the sampling frame. Aside from logistical considerations, this inclusion criterion was used because among the survey's focus was to compare certain mother-child behaviors. This explains the 13 % attrition rate between 1994 and 1998. Most of the mothers excluded in the 1998 survey were recruited back in 2002. Thus there were more mothers in 2002 than in the 1998 survey, resulting in a negative attrition rate (see Table 1).

It was through the Northwestern University collaboration that blood specimen collection was introduced in the CLHNS. In 1998, blood specimen collection was piloted in the CLHNS on a subsample of low birth weight ICs. In the 2005 survey, venous blood samples were collected from the mother-child pairs. These specimens were analyzed at Northwestern University for chronic disease risk biomarker data such as lipids, fasting blood glucose, C-reactive protein, etc. In subsequent surveys, having 2005 biomarker baseline data became an important selection criterion in mother and IC surveys, particularly those with a focus on chronic diseases.

The 2007 mothers' survey was designed to be a brief tracking survey (only abbreviated versions of questionnaire modules were administered), mainly to assess how many women were now grandmothers and collect basic information on their grandmotherhood experiences. The 2012 and 2015 surveys are focused on grandmotherhood and aging. The sampling frame for the 2012 survey consisted of mothers who were in the 2005 and/or 2007 surveys.

Outmigration. Mothers who moved outside of the Metro Cebu area (using the 1983 Metro Cebu definition) were categorized as outmigrants and dropped from each survey. As shown in Table 2, outmigration accounted for half of the attrition rate between BS and the BI survey. The between-survey outmigration rates increased steadily over the years, reaching its peak at 81% in the 1991 and 1994 surveys. In 1998 survey and in the following surveys, the proportion of attrition due to outmigration went down as the mothers became more residentially stable. There were also a number of outmigrants who returned to Metro Cebu and rejoined the study. By 2012, 31% of the baseline mothers were lost due to outmigration. There are two types of outmigrants in the CLHNS study: the permanent (meaning permanently living outside Metro Cebu) and the temporary outmigrants (those who move in and out of Metro Cebu). Temporary outmigrants were re-included in the sample whenever they were available and eligible for the specific survey round.

Table 2. Number and percent of outmigrant mothers, by survey round

Survey	Number of outmigrants	Percent of outmigrants from baseline sample	Percent of outmigrants in survey
BS	0		
BI	113	3.40	54.59
LS1	227	6.82	50.22
LS2	296	8.90	55.33
LS3	357	10.73	58.14
LS4	389	11.69	59.66
LS5	420	12.62	63.06
LS6	438	13.17	65.76
LS7	461	13.86	68.50
LS8	494	14.85	70.07
LS9	501	15.06	69.39
LS10	504	15.15	69.42
LS11	537	16.14	70.20
LS12	542	16.29	71.13
1991	759	22.81	81.44
1994	852	25.61	81.30
1998	910	27.35	68.01
2002	930	27.95	75.92
2005	973	29.25	74.33
2007	990	29.76	73.33
2012	1026	30.84	67.99

For mothers who have outmigrated, information on where they moved was obtained from responsible adults most knowledgeable about them (e.g., household members, relatives, neighbors). Table 3 presents data on the destinations of outmigrants by the 2012 survey. No destination data were available for about 13% of the outmigrants. Of the 895 outmigrants with known destinations, about 34% stayed within Cebu province. Of those who moved out of Cebu,

about 16% moved to Metro Manila, about 43% to other regions outside of Metro Manila and about 7% to other countries.

Table 3. Number and percent of outmigrant mothers by place of destination (2012).

Place of Destination	Number (%) of total outmigrants	Number (%) of outmigrants with known destination
Within Cebu Province (outside Metro Cebu)	305 (29.73)	305 (34.08)
Outside Cebu Province (but not Metro Manila)	381 (37.13)	381 (42.57)
Metro Manila	142 (13.84)	142 (15.86)
Outside the Philippines	67 (6.53)	67 (7.49)
Unknown destination	131 (12.77)	---
TOTAL	1026 (100.00)	895 (100.00)

For the 67 mothers who moved outside the Philippines, the United States was the top destination, followed by Japan and Saudi Arabia (Table 4). The earliest case of overseas outmigration among the CLHNS mothers was reported in LS5 (1984-85).

Table 4. Number and percent of outmigrant mothers by place of destination abroad, 2012 survey

Country	Number (%)
USA	38 (56.72)
Japan	6 (8.96)
Saudi Arabia	5 (7.46)
Canada	3 (4.48)
Australia	3 (4.48)
Taiwan	2 (2.98)
Iceland	2 (2.98)
Malaysia	1 (1.49)
Kuwait	1 (1.49)
Norway	1 (1.49)
Germany	1 (1.49)
Sweden	1 (1.49)
England	1 (1.49)
Singapore	1 (1.49)
Mexico	1 (1.49)
Total	67 (100.00)

Deaths. As of the 2012 survey, 250 (8%) of the baseline mothers were reported to have died (Table 5). Reported deaths increased as the mothers got older. The most number of deaths (78) were reported between the 2007 and 2012 surveys.

Table 5. Number and percent of deaths of sample mothers, by survey round

Survey	Number of deaths	Percent of deaths from BS sample	Percent of deaths in survey
BS	0		
BI	6	0.18	2.90
LS1	8	0.24	1.77
LS2	9	0.27	1.68
LS3	12	0.36	1.95
LS4	13	0.39	1.99
LS5	14	0.42	2.10
LS6	14	0.42	2.10
LS7	14	0.42	2.08
LS8	14	0.42	1.99
LS9	15	0.45	2.08
LS10	16	0.48	2.20
LS11	16	0.48	2.09
LS12	16	0.48	2.10
1991	51	1.53	5.47
1994	62	1.86	5.92
1998	86	2.58	6.43
2002	110	3.31	8.98
2005	136	4.09	10.39
2007	172	5.17	12.74
2012	250	7.51	16.57

Table 6 presents the distribution of cause of death of these mothers as reported by responsible adults in their households. These data have not been verified against death certificate data, and thus may not be accurate. From BI through the 2012 survey, cancer appeared to be leading cause of death among the mothers (31 %). The top 3 reported types of cancers were breast, liver and uterus/ovary, in this order. Hypertension and heart diseases ranked second and third respectively. Tuberculosis came next followed by diabetes. These data are consistent with the Philippine Department of Health report that heart and vascular diseases and malignant neoplasm are the leading causes of mortality in the Philippines (DOH 2011). It is important to note that 5 mothers were reported to have committed suicide.

Table 6. Number and percent of deaths of sample mothers by cause of death, 2012 survey

Cause of death	Number (%)
Cancer	78 (31.20)
Hypertension	39 (15.60)
Heart disease	34 (13.60)
Tuberculosis	18 (7.20)
Diabetes	13 (5.20)
Accident	10 (4.00)
Birth- related (inc. eclampsia)	9 (3.60)
Relapse	7 (2.80)
Suicide	5 (2.00)
Asthma	5 (2.00)
Appendicitis	3 (1.20)
Hepatitis	3 (1.20)
Toxic goiter	3 (1.20)
Typhoid fever	2 (.80)
Hemorrhage	2 (.80)
Complications of acute renal failure	2 (.80)
Combination of hypertension and diabetes	2 (.80)
Sorcery	1 (.40)
Anemia	1 (.40)
Ulcer	1 (.40)
Acute pancreatitis	1 (.40)
Leptospirosis	1 (.40)
Nervous breakdown	1 (.40)
Pneumonia	1 (.40)
Combination of ulcer and pneumonia	1 (.40)
Chronic obstructive pulmonary disease	1 (.40)
Don't know	6 (2.40)
TOTAL	250 (100.00)

Refusal. Only a small percentage of attrition in the CLHNS sample is due to refusals. Table 7 shows that the most number of reported refusals in between surveys were during the bi-monthly LS visits. Refusal rates ranged from 9-10 % between LS2 to LS12. There was a substantial decline in the number of refusals in the 1991 and 1994 surveys. However, between 2007 and 2012, an almost 3% increase in attrition due to refusals was noted. By 2012, on the 29th year since the baseline study, a total of 121 mothers have refused.

While there were women who, once they refused participation in a survey, refused all subsequent surveys (permanent refusals), there were a few who refused to be interviewed only in a particular survey. For example, of the 72 who refused in LS12, 40 were back in the study by 1991. Similarly, of the 86 who refused in 2005, 14 were back in 2007. Among the common reasons

given by mothers for refusing participation were that they were busy or they found the interview sessions too long.

Table 7. Number and percent of refusals of sample mothers, by survey round

Survey	Number of refusals	Percent of refusals from BS sample	Percent of refusals in survey
BS	0		
BI	17	.51	8.21
LS1	37	1.11	8.19
LS2	51	1.53	9.53
LS3	60	1.80	9.77
LS4	64	1.92	9.82
LS5	63	1.89	9.46
LS6	65	1.95	9.76
LS7	69	2.07	10.25
LS8	69	2.07	9.79
LS9	71	2.13	9.83
LS10	71	2.13	9.78
LS11	73	2.19	9.54
LS12	72	2.16	9.45
1991	32	0.96	3.43
1994	35	1.05	3.34
1998	52	1.56	3.89
2002	76	2.28	6.20
2005	86	2.58	6.57
2007	72	2.16	5.33
2012	121	3.64	8.02

Other Reasons. Table 8 shows that there were also a few mothers who were lost to follow-up because they were difficult to schedule (not available, too busy to pin down for home visits, always not at home during scheduling visits), hard to locate (particularly those who changed residences and the new location information obtained from relatives or neighbors were inaccurate) or hard to contact (mostly the working mothers). A few mothers could not be interviewed due to mental or serious illness, or incarceration. Table 8 also shows data on the mothers who were earlier excluded from the survey due to sampling design: mothers who had miscarriages, stillbirths, multiple births and those whose ICs died.

There were also a few LS interviews which were invalidated because survey audits established the data as unreliable. In the 2007 survey, 10 completed questionnaires were lost and not encoded.

Table 8. Number and percent of mothers attrited due to other reasons, by survey round

Survey Round	Difficult to schedule	Unlocated	Mentally /seriously ill or imprisoned	IC died	Multiple births	Stillbirths/ Miscarriages (Index pregnancy)	Invalid data*/lost questionnaires	Total	Percent attrited from BS sample	Percent attrited in survey round
BS										
BI	0	23	1	1	25	7	14	71	2.13	34.30
LS1	12	41	1	36	25	47	18	180	5.41	39.82
LS2	4	45	1	38	25	45	21	179	5.38	33.46
LS3	8	52	1	37	25	40	22	185	5.56	30.13
LS4	9	56	1	42	25	32	21	186	5.59	28.53
LS5	8	59	1	34	25	21	21	169	5.08	25.38
LS6	6	58	1	22	25	13	24	149	4.48	22.37
LS7	7	60	2	7	25	7	21	129	3.88	19.17
LS8	7	58	3	6	25	6	23	128	3.85	18.16
LS9	9	63	2	9	25	6	21	135	4.06	18.70
LS10	13	62	2	7	25	6	20	135	4.06	18.60
LS11	19	59	2	8	25	6	20	139	4.18	18.17
LS12	14	57	2	8	25	6	20	132	3.97	17.32
1991	7	50	6	1	2	4	20	90	2.71	9.66
1994	12	53	7	1	2	4	20	99	2.98	9.45
1998	196	58	9	1	2	4	20	290	8.72	21.67
2002	16	56	10	1	2	4	20	109	3.28	8.90
2005	22	57	11	0	0	4	20	114	3.43	8.71
2007	17	56	9	0	0	4	30	116	3.49	8.59
2012	18	56	14	0	0	4	20	112	3.37	7.42

*Invalid data includes manufactured, late BI, erroneous BI dates, births outside BS barangay

A.2 Survey Participation Patterns among CLHNS Mothers

Participation patterns. Table 9 provides a breakdown of the mothers' participation patterns from baseline through the 2012 survey. About 39% of the baseline mothers were present in all 21 surveys.

Table 9 also shows that among the mothers with incomplete data, there are those with contiguous data for a significant stretch of time (e.g 117 mothers with BS through 2007 data) or who have skipped 1 to 3 surveys (394 mothers or 12% of baseline sample).

Table 9. Number and percent of mothers, by survey participation pattern

Survey Participation Pattern	Number (%)
Baseline survey only	185 (5.56)
Baseline – Birth interview only	80 (2.40)
Baseline – LS1	48 (1.44)
Baseline – LS2	36 (1.08)
Baseline – LS3	20 (.60)
Baseline – LS4	19 (.57)
Baseline – LS5	17 (.51)
Baseline – LS6	18 (.54)
Baseline – LS7	13 (.39)
Baseline – LS8	23 (.69)
Baseline – LS9	17 (.51)
Baseline – LS10	18 (.54)
Baseline – LS11	10 (.30)
Baseline – LS12	233 (7.00)
Baseline – 1991	75 (2.25)
Baseline – 1994	78 (2.34)
Baseline – 1998	45 (1.35)
Baseline – 2002	44 (1.32)
Baseline – 2005	47 (1.41)
Baseline – 2007	117 (3.52)
Baseline – 2012	1302 (39.13)
With non-contiguous data (in 20 out of 21 surveys)	239 (7.18)
With non-contiguous data (in 19 out of 21 surveys)	104 (3.13)
With non-contiguous data (in 18 out of 21 surveys)	51 (1.53)
With non-contiguous data (in 3-17 out of 21 surveys)	488 (14.67)
TOTAL	3327 (100.00)

B. Attrition in the CLHNS Index Children

This section of the report describes attrition among the ICs from BI through the 2009 survey which covered all ICs. Subsequent surveys were done only on IC subsamples.

As earlier explained, only the 3080 singletons were considered as the birth cohort primarily because multiple births had distinct characteristics (e.g. higher risk of low birth weight) compared to single births. In 1994, however, a decision was made to recruit the multiples back into the study. There were 53 multiples (25 twin pairs and 1 set of triplets) born of the baseline mothers. Of these 28 were tracked and included in the 1994 survey. In this section attrition rates are presented separately for 3080 singletons and the 53 multiple births. Appendix 2 presents the singletons' attrition profile.

B.1 Reasons for Attrition among Singleton Index Children

Of the 3080 singletons, 19 actually died within the BI survey period. Relevant information on these 19 infants were however recorded in the BI survey. Thus, these 3080 singletons were considered to comprise the birth cohort. Table 10 shows that in the postpartum period (LS series) the between survey attrition rates ranged from 1-6%. The most number of ICs lost to follow-up were between LS12 (1985-86) and the 1991 survey at about 8%.

Table 10. Attrition status of the Index Children (singletons), by survey round

Survey round	Number (%) interviewed	Number (%) attrited of total singletons	Number (%) attrited in survey
BI	3061 (99.38)	19 (.62)	19 (.62)
LS1	2884 (93.64)	196 (6.36)	177 (5.78)
LS2	2807 (91.14)	273 (8.86)	77 (2.67)
LS3	2720 (88.31)	360 (11.69)	87 (3.10)
LS4	2667 (86.59)	413 (13.41)	53 (1.95)
LS5	2630 (85.39)	450 (14.61)	37 (1.39)
LS6	2600 (84.42)	480 (15.58)	30 (1.14)
LS7	2554 (82.92)	526 (17.08)	46 (1.77)
LS8	2515 (81.66)	565 (18.34)	39 (1.53)
LS9	2513 (81.59)	567 (18.41)	2 (.08)
LS10	2510 ((81.49)	570 (18.51)	3 (.17)
LS11	2475 (80.36)	605 (19.64)	35 (1.39)
LS12	2462 (79.94)	618 (20.06)	13 (.52)
1991	2264 (73.51)	816 (26.49)	198 (8.04)
1994	2186 (70.97)	894 (29.03)	78 (3.44)
1998	2089 (67.82)	991 (32.18)	97 (4.44)
2002	2023 (65.68)	1057 (34.32)	66 (3.16)
2005	1888 (61.30)	1192 (38.70)	135 (6.67)
2007	1817 (58.99)	1263 (41.01)	71 (3.76)
2009	1709 (55.49)	1371 (44.51)	108 (5.94)

Sampling design. As earlier described, inclusion criteria specific to a survey round also contributed to attrition among the ICs. In the 1998 survey, only ICs with mothers (whether ICs and mothers were in the same household or not) were recruited. The unpaired ICs excluded in 1998 were recruited back in subsequent surveys.

Outmigration (as defined above). Just as with the mothers, outmigration contributed the most to attrition among the ICs. As presented in Table 11, the number of outmigrants consistently increased over time. At LS1, a little more than half of the attrited were outmigrants. It should be noted that, in the earlier surveys, outmigration among the ICs generally reflected the outmigration patterns of their mothers since the children moved along with the mothers. The highest between survey outmigration rates (at about 72%) were between the 2005-2007 and 2007-2009 surveys. By 2009, about 32% of the singleton ICs have outmigrated.

Table 11. Number and percent of outmigrant ICs (singletons), by survey round

Survey	Number	Percent of outmigrants of total singletons	Percent of singleton outmigrants in survey
BI	0		
LS1	109	3.54	55.61
LS2	169	5.49	61.90
LS3	227	7.37	63.06
LS4	259	8.41	62.71
LS5	288	9.35	64.00
LS6	302	9.81	62.92
LS7	331	10.75	62.93
LS8	356	11.56	63.01
LS9	347	11.27	61.20
LS10	343	11.14	60.18
LS11	373	12.11	61.65
LS12	381	12.37	61.65
1991	555	18.02	68.01
1994	619	20.10	69.24
1998	695	22.56	70.13
2002	744	24.16	70.39
2005	838	27.21	70.30
2007	914	29.68	72.37
2009	987	32.05	71.99

Table 12 shows where the outmigrants were reported to have moved. Of those with known destinations, about 29% remained in Cebu province, about 16 % moved to Metro Manila, about 40% to areas outside Cebu province and Metro Manila, and about 14 % went abroad. One IC was reported to have outmigrated overseas as early as LS1.

Table 12. Number (%) of outmigrant ICs (singletons), by place of destination, 2009 survey

Place of destination	Number (%) of total outmigrants	Number (%) of outmigrants with known destination
Within Cebu province (outside Metro Cebu)	270 (27.36)	270 (28.91)
Outside Cebu province (excluding Metro Manila)	377 (38.20)	377 (40.36)
Metro Manila	154 (15.60)	154 (16.49)
Outside the Philippines	133 (13.48)	133 (14.24)
Unknown destination	53 (5.37)	---
TOTAL	987 (100.00)	934 (100.00)

Like their mothers, the United States, Saudi Arabia and Japan were among the top most popular destinations outside the Philippines for the ICs as shown in Table 13. Dubai was their second overseas destination. The ICs also appeared to have ventured to more countries (24 known country destinations) than their mothers (15 countries).

Table 13. Number and percent of outmigrant ICs (singletons) by place of destination abroad, 2009 survey

Country	Number (%)
USA	37 (27.82)
Dubai	17 (12.78)
Saudi Arabia	13 (9.77)
Japan	9 (6.77)
Singapore	9 (6.77)
Australia	7 (5.26)
Canada	6 (4.51)
Taiwan	5 (3.76)
Malaysia	5 (3.76)
Qatar	5 (3.76)
Kuwait	3 (2.26)
Bahrain	2 (1.50)
New Zealand	2 (1.50)
Hongkong	2 (1.50)
Norway	1 (.75)
Germany	1 (.75)
Sweden	1 (.75)
England	1 (.75)
Iceland	1 (.75)
India	1 (.75)
Jordan	1 (.75)
Cambodia	1 (.75)
Thailand	1 (.75)
Oman	1 (.75)
Unknown	1 (.75)
Total	133 (100.00)

Deaths. There were 19 singleton ICs who died within the BI survey and about 5% did not survive their second birthday (Table 14). By 2009, 250 ICs were reported to have died.

Table 14. Number and percent of deaths among ICs (singletons), by survey round

Survey	Number of deaths	Percent of deaths of total singletons	Percent of singleton deaths in survey
BI	19	.62	100.00
LS1	37	1.20	18.88
LS2	41	1.33	15.02
LS3	50	1.62	13.89
LS4	62	2.01	15.01
LS5	74	2.40	16.44
LS6	85	2.76	17.71
LS7	100	3.25	19.01
LS8	114	3.70	20.18
LS9	123	3.99	21.69
LS10	131	4.25	22.98
LS11	134	4.35	22.15
LS12	144	4.68	23.30
1991	209	6.79	25.61
1994	217	7.05	24.27
1998	219	7.11	22.10
2002	226	7.34	21.38
2005	234	7.60	19.63
2007	245	7.95	19.40
2009	250	8.12	18.23

Table 15 shows the causes of death among the ICs. The leading causes of death were measles (20%) followed by diarrhea (10%) and pneumonia (7%). Accidents as cause of death include drowning, vehicular accidents, poisoning and electricution. It is also sad to note that 4 of the ICs committed suicide and 4 died of gunshot wounds. No information on cause of death could be obtained for 38 ICs.

Table 16 shows the survey rounds when IC deaths were reported. There were 27 deaths due to measles in the first two years postpartum. Had these infants received the measles vaccine, these deaths could have been prevented.

Table 15. Number and percent of deaths among ICs (singletons) by cause of death, 2009 survey

Cause of death	Number of deaths (%)
Measles	50 (20.00)
Diarrhea	24 (9.60)
Pneumonia	17 (6.80)
Fever	14 (5.60)
Meningitis	12 (4.80)
Congenital Anomalies	10 (4.00)
Sorcery	9 (3.60)
Accident	9 (3.60)
Heart disease	8 (3.20)
Sudden infant death	8 (3.20)
Birth related	7 (2.80)
Digestive system	6 (2.40)
Tetanus	4 (1.60)
Suicide	4 (1.60)
Gunshot	4 (1.60)
Dengue fever	2 (.80)
Cough	2 (.80)
Dengue fever	2 (.80)
Heart and lung	2 (.80)
Leukemia	2 (.80)
Asphyxia	2 (.80)
Malnutrition	2 (.80)
Typhoid fever	1 (.40)
Cancer	1 (.40)
Other skin rashes	1 (.40)
Severe headache	1 (.40)
Brain tumor	1 (.40)
Hemoptysis	1 (.40)
Eclampsia	1 (.40)
Cancer of the bone	1 (.40)
Hepatitis	1 (.40)
Kidney	1 (.40)
Complication	1 (.40)
Diphtheria	1 (.40)
Medicine overdose	1 (.40)
Relapse	1 (.40)
Don't know	38 (15.20)
Total	250 (100.00)

Table 16. Causes and timing of deaths among ICs (singletons)

Cause of Death	Survey Round									Total deaths (%)
	LS1-LS6	LS7-L12	1991	1994	1998	2002	2005	2007	2009	
Measles	9	18	22	1						50 (20.00)
Diarrhea	8	7	9							24 (9.60)
Pneumonia	7	4	5			1				17 (6.80)
Fever/febrile convulsion	3	5	5	1						14 (5.60)
Meningitis	2	3	4				1	2		12 (4.80)
Congenital anomalies	8	2								10 (4.00)
Sorcery/witchcraft/evil spirits	3	2	3						1	9 (3.60)
Accident			2		1	3	2	1		9 (3.60)
Sudden infant death	8									8 (3.20)
Heart disease	3	1	2	1		1				8 (3.20)
Premature	7									7 (2.80)
Disease/Disorder in the digestive system		1	4	1						6 (2.40)
Tetanus	3		1							4 (1.60)
Suicide							2	1	1	4 (1.60)
Gun shot								3	1	4 (1.60)
Cough/severe cough	1			1						2 (.80)
Birth asphyxia and other respiratory conditions	2									2 (.80)
Malnutrition/nutritional deficiencies	1	1								2 (.80)
Dengue fever			2							2 (.80)
Leukemia				1		1				2 (.80)
Heart and lung disease								2		2 (.80)
Complication during delivery	1									1 (.40)
Other skin rashes			1							1 (.40)
Diphtheria			1							1 (.40)
Typhoid fever			1							1 (.40)
Cancer			1				1			2 (.80)
Severe headache (of unknown cause)					1					1 (.40)
Brain tumor						1				1 (.40)
Hemoptysis (vomit blood)							1			1 (.40)
Eclampsia							1			1 (.40)
Hepatitis								1		1 (.40)
Relapse from surgery or major illness									1	1 (.40)
Medicine overdose									1	1 (.40)
Kidney failure								1		1 (.40)
Don't know	19	15	2	2						38 (15.20)
Total	85	59	65	8	2	7	8	11	5	250 (100.00)

Refusal. Table 17 shows that highest rate of refusals among the ICs were in the LS series obviously reflecting the refusal rates among the mothers. In later surveys where the ICs themselves were the respondents, a smaller proportion of attrition due to refusals was observed compared to that of their mothers. As of their last survey rounds, 4 % of the mothers and 1 % of the ICs have refused.

Like the mothers, there were also some ICs who refused to be interviewed only in a particular survey. For example, of the 42 who refused in the 2005 survey, 12 were back in the study by 2007.

Table 17. Number and percent of refusals among ICs (singletons), by survey round

Survey round	Number	Percent refusals of total singletons	Percent refusals in survey (singletons)
BI	0		
LS1	18	0.58	9.18
LS2	33	1.07	12.09
LS3	41	1.33	11.39
LS4	46	1.49	11.14
LS5	45	1.46	10.00
LS6	48	1.56	10.00
LS7	49	1.59	9.32
LS8	50	1.62	8.85
LS9	50.	1.62	8.82
LS10	49	1.59	8.60
LS11	51	1.66	8.43
LS12	51	1.66	8.25
1991	13	0.42	1.59
1994	16	0.52	1.79
1998	21	0.68	2.12
2002	22	0.71	2.08
2005	42	1.36	3.52
2007	30	0.97	2.38
2009	36	1.17	2.63

Other Reasons. Other factors that contributed to attrition among the ICs included difficulty in locating their households (due to inaccurate or incomplete addresses and contact details), unavailability for interviews (particularly for those who were working), poor health (e.g. mentally ill) and imprisonment (Table 18). A few interviews of ICs were dropped or not included because of erroneous information.

Table 18. Other reasons for attrition among ICs (singletons), by survey round

Survey	Unlocated/ not available	Imprisonment	Mentally ill/ Bedridden	Erroneo us*	Total	Percent	
						Attrited in survey	Total singletons
BI	0	0	0	0			
LS1	28 (14.28)	0	0	4 (2.04)	32	17.95	1.04
LS2	23 (8.42)	0	0	7 (2.57)	30	10.99	.97
LS3	34 (9.44)	0	0	8 (2.23)	42	11.67	1.36
LS4	39 (9.44)	0	0	7 (1.69)	46	11.14	1.49
LS5	36 (8.00)	0	0	7 (1.55)	43	9.56	1.40
LS6	36 (7.50)	0	0	9 (1.88)	45	9.38	1.46
LS7	39 (7.41)	0	0	7 (1.33)	46	8.75	1.49
LS8	36 (6.37)	0	0	9 (1.59)	45	7.96	1.46
LS9	40 (7.05)	0	0	7 (1.24)	47	8.29	1.53
LS10	41 (7.19)	0	0	6 (1.05)	47	8.25	1.53
LS11	41 (6.78)	0	0	6 (0.99)	47	7.77	1.53
LS12	36 (5.82)	0	0	6 (0.97)	42	6.80	1.36
1991	31 (3.80)	2 (.25)	0	6 (0.74)	39	4.78	1.27
1994	33 (3.69)	3 (.34)	0	6 (0.67)	42	4.70	1.36
1998	36 (3.63)	6 (.61)	8 (0.81)	6 (0.60)	56	5.65	1.82
2002	46 (4.35)	7 (.66)	6 (0.57)	6 (0.57)	65	6.15	2.11
2005	50 (4.19)	14 (1.17)	8 (0.67)	6 (0.51)	78	6.54	2.53
2007	50 (3.96)	9 (.71)	9 (0.71)	6 (0.48)	74	5.86	2.40
2009	70 (5.10)	13 (.95)	9 (0.66)	6 (0.44)	98	7.15	3.18

* Reasons: manufactured data, late BI, BS after BI)

B.2 Participation patterns of Singleton ICs

Table 19 shows that 1324 or about 43% of the singleton ICs had data in all 20 surveys from BI through 2009. About 22% have non-contiguous data between said survey periods.

Table 19. Number and percent of ICs (singletons), by survey participation pattern

Survey Participation Pattern	Number (%)
BI only	102 (3.31)
BI - LS1	47 (1.53)
BI - LS2	44 (1.43)
BI - LS3	39 (1.27)
BI - LS4	28 (.91)
BI - LS5	32 (1.04)
BI - LS6	27 (.88)
BI - LS7	25 (.81)
BI - LS8	25 (.81)
BI - LS9	18 (.58)
BI - LS10	16 (.52)
BI - LS11	18 (.58)
BI - LS12	247 (8.02)
BI - 1991	69 (2.24)
BI - 1994	44 (1.43)
BI - 1998	62 (2.01)
BI - 2002	51 (1.66)
BI - 2005	85 (2.76)
BI - 2007	113 (3.67)
BI - 2009	1324 (42.99)
With non-contiguous data (with BI)	664 (21.56)
TOTAL	3080 (100.00)

B.3 Attrition Among Multiples

Of the 53 multiples born to the baseline mothers (25 twins and 1 set of triplets) 28 were tracked and re-enrolled starting in the 1994 survey. Table 20 shows their attrition story.

Table 20: Attrition status of multiple births, by survey and reason for attrition

Survey	Number interviewed	Attrited Not interviewed	Out-migrated	Died	Mother mentally ill	Not located/ not available	In prison	Attrited due to sampling design
BI	0	53						53
LS1	0	53						53
LS2	0	53						53
LS3	0	53						53
LS4	0	53						53
LS5	0	53						53
LS6	0	53						53
LS7	0	53						53
LS8	0	53						53
LS9	0	53						53
LS10	0	53						53
LS11	0	53						53
LS12	0	53						53
1991	0	53						53
1994	28	25	10	9	2	4		0
1998	28	25	10	8		7		0
2002	28	25	10	8		7		0
2005	24	29	14	8		7		0
2007	25	28	12	9		7		0
2009	22	31	14	9		7	1	0

The destinations of the outmigrant multiples are shown in Table 21. Only one of the multiples were reported to have gone abroad in 2009.

Table 21. Number of outmigrant multiples by place of destination, 2009 survey

Place of destination	Number
Within Cebu province	4
Outside Cebu province (excluding Metro Manila)	5
Metro Manila	2
Japan	1
Unknown destination	2
TOTAL	14

Table 22 shows the causes of death among the multiples. The lack of reported deaths between LS1 through 1991 may be due to unavailable data.

Table 22. Number and cause of death among the multiple births, by survey

Survey	Cause of death								Total
	Don't know reason	Congenital anomalies	Measles	Pneumonia	Accident	Diarrhea	Sudden infant death	Gun shot	
BI	1								1
LS1									
LS2									
LS3									
LS4									
LS5									
LS6									
LS7									
LS8									
LS9									
LS10									
LS11									
LS12									
1991									
1994		1	1	2	1	1	1		7
1998									
2002									
2005									
2007								1	1
2009									
Total	1	1	1	2	1	1	1	1	9

C. Minimizing attrition

The effects of attrition on specific outcomes are discussed in individual CLHNS papers and in greater depth in Adair (unpublished). While the extent of the bias due to attrition on research outcomes may be debatable, maintaining as much of the original sample unquestioningly remains a valuable goal of any longitudinal study. It is true that attrition is mostly inevitable in longitudinal surveys. However, through the years, the CLHNS has taken great efforts not to lose study participants because of reasons that could potentially be avoided. For instance, refusals are likely prevented by making sure that participants' concerns are taken care of. Failure to locate participants for a follow-up round can be minimized through careful planning.

The key to high follow-up retention rates is keeping the participants' experience at each survey round satisfactory to ensure their willingness to cooperate in future surveys. The CLHNS core of interviewers and field supervisors have been largely instrumental in making this possible. Through proper training and good interpersonal skills, the CLHNS staff has managed to establish good rapport with the study participants. Interviewers are most often warmly welcomed by the participants during home visits.

Other strategies that were effective in minimizing attrition were:

a) Cohort tracking strategies. Retention rates also reflect the level of success in tracking down the sample, survey after survey. When possible, the CLHNS hires interviewers who have worked in previous survey rounds. Having interviewers who know where the participants live have made it relatively easy to locate the sample in follow-up rounds. Starting with the baseline survey, the CLHNS has maintained a master list of detailed and accurate contact information on each participant. At each survey, interviewers record the participants' complete addresses and phone numbers when available. Field notes include landmarks, sketches and directions to participants' houses. All these come in handy especially when the participants live in areas without street names or house numbers. Participants who frequently transfer residences present a particular challenge and this is where the perseverance and clever strategies of experienced interviewers and field supervisors are essential.

Telephone or cellular phone numbers are also helpful in tracking participants. While only a few participants have landlines, most of them now own or have access to cell phones. However, since it does not cost much to get a new cell phone number, most participants often change phone numbers or maintain several phone numbers at a time making home visit scheduling by cell phone somewhat challenging. Participants who agree to join the survey are also asked to provide phone numbers of their nearest relatives as alternate contact persons. In turn, the participants are also provided CLHNS phone numbers so they could contact the interviewers/supervisors on when they are available for home visits.

b) Flexibility and creativity in home visit scheduling. While CLHNS interviews are mostly done in the daytime, from Monday through Saturday, Sunday or evening interviews have been scheduled to accommodate participants who are not available during the day or on weekdays. Participants who leave their homes during the week to either work or study (e.g. rural participants who work in the city) are the most difficult to pin down for interviews. Such cases often require numerous follow-up calls and visits, and some creative scheduling. In the CLHNS, interviewers and supervisors do not give up easily, even with participants who are most difficult to find or schedule home visits with. It is to this kind of dedication and persistence that the CLHNS has managed to retain half of the sample in over three decades.

c) Carefully designed consenting process. Explaining the survey objectives and procedures clearly to the CLHNS participants at recruitment also influences their decision whether to join the survey or not. Each CLHNS round begins with a consenting process using forms approved by the Institutional Review Board (IRB). These consent forms contain pertinent information on the survey such as the objectives, procedures and risks involved. The interviewers read the consent forms to the participants. The consent forms use terms that can be easily understood by someone with elementary-level education. Being informed on what is expected of them and given the chance to discuss their concerns with the study team have increased the participants' likelihood of joining the survey.

d) Tokens to participants. As a way of showing appreciation for participating in the survey, the CLHNS provides gifts or cash to the participants for completing the survey protocol. Each participant receives the same gift or cash amount. The amount of cash given is based on what the participant would have earned for the duration of an average home visit. The non-agriculture minimum wage rate for Cebu at the time of the survey is used as basis for determining the cash amount. During the LS series, the mothers were given house dresses, infant clothes and laundry soap. Cash gifts were given in subsequent surveys. The 2014 study on fatherhood which collected data on the male ICs and their young children provided a doctor's visit paid for by the study. The ICs who did not avail of the doctor's visit were given a health kit (first aid supplies and children's vitamins) which cost the equivalent of the doctor's visit fee. Such small tokens were found to be really appreciated by the participants, making them look forward to future visits.

e) Giving back useful survey information. Blood pressure readings were taken on the mothers and ICs starting in 1998. Copies of these results were provided to the participants after the home visit. In 2005, venous blood specimens were collected from the pairs. Soon after collected, the specimens were blood typed for the participants' information. In the 2012 survey on mothers, point of care equipment for HbA1c and lipid tests were used and results were immediately shared with the mothers. In the same survey, a component examining inflammation and immune factors included administering flu vaccinations to the mothers which they very well appreciated. The 2015 survey included the measurement of the Ankle Brachial Index (ABI), which screens for peripheral arterial disease, on a subsample of mothers. Fact sheets and referral letters to the *barangay* health centers were handed out to the participants along with their blood pressure, lipids, HbA1c and ABI readings. This practice has significantly increased the participants' interest in the study.

f) Cases of refusals are reported by the interviewers to their supervisors, who sometimes visit the participants themselves to convince the latter to participate in the study. This strategy was found to be successful in many cases. Only when all else fails, is a case considered a clear refusal.

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Appendix 1. Number and Percent of Mothers Enrolled and Attrited, by Survey

Survey Round	Number (%) Enrolled	Number (%) Attrited	Reasons for Attrition									
			Outmigrated	Refused	Died	Had Stillbirth/Miscarriage	Had Multiple Births	Index Child Died	Moved w/in MC but Unlocated	Not Contacted/ Not Available	Other Reasons*	
BS	3327 (100.0)	0										
BI	3120 (93.78)	207 (6.22)	113 (54.59)	17 (8.21)	6 (2.90)	7 (3.38)	25 (12.08)	1 (0.48)	23 (11.11)	0	15 (7.25)	
LS1	2875 (86.41)	452 (13.59)	227 (50.22)	37 (8.19)	8 (1.77)	47 (10.40)	25 (5.53)	36 (7.96)	41 (9.07)	12 (2.65)	19 (4.20)	
LS2	2792 (83.92)	535 (16.08)	296 (55.33)	51 (9.53)	9 (1.68)	45 (8.41)	25 (4.67)	38 (7.10)	45 (8.41)	4 (0.75)	22 (4.11)	
LS3	2713 (81.54)	614 (18.46)	357 (58.14)	60 (9.77)	12 (1.95)	40 (6.51)	25 (4.07)	37 (6.03)	52 (8.47)	8 (1.30)	23 (3.74)	
LS4	2675 (80.40)	652 (19.60)	389 (59.66)	64 (9.82)	13(1.99)	32 (4.91)	25 (3.83)	42 (6.44)	56 (8.59)	9 (1.38)	22 (3.37)	
LS5	2661 (79.98)	666 (20.02)	420 (63.06)	63 (9.46)	14 (2.10)	21 (3.15)	25 (3.75)	34 (5.10)	59 (8.86)	8 (1.20)	22 (3.30)	
LS6	2661 (79.98)	666 (20.02)	438 (65.76)	65 (9.76)	14 (2.10)	13 (1.95)	25 (3.75)	22 (3.30)	58 (8.71)	6 (0.90)	25 (3.75)	
LS7	2654 (79.77)	673 (20.23)	461 (68.50)	69 (10.25)	14 (2.08)	7 (1.04)	25 (3.71)	7 (1.04)	60 (8.92)	7 (1.04)	23 (3.42)	
LS8	2622 (78.81)	705 (21.19)	494 (70.07)	69 (9.79)	14 (1.99)	6 (0.85)	25 (3.55)	6 (0.85)	58 (8.23)	7 (0.99)	26 (3.69)	
LS9	2605 (78.30)	722 (21.70)	501 (69.39)	71 (9.83)	15 (2.08)	6 (0.83)	25 (3.46)	9 (1.25)	63 (8.72)	9 (1.25)	23 (3.18)	
LS10	2601 (78.18)	726 (21.82)	504 (69.42)	71 (9.78)	16 (2.20)	6 (0.83)	25 (3.44)	7 (0.96)	62 (8.54)	13 (1.79)	22 (3.03)	
LS11	2562 (77.01)	765 (22.99)	537 (70.20)	73 (9.54)	16 (2.09)	6 (0.78)	25 (3.27)	8 (1.04)	59 (7.71)	19 (2.48)	22 (2.88)	
LS12	2565 (77.10)	762 (22.90)	542 (71.13)	72 (9.45)	16 (2.10)	6 (0.79)	25 (3.28)	8 (1.05)	57 (7.48)	14 (1.84)	22 (2.89)	
1991	2395 (71.99)	932 (28.01)	759 (81.44)	32 (3.43)	51 (5.47)	4 (0.43)	2 (0.21)	1 (0.11)	50 (5.36)	7 (0.75)	26 (2.79)	
1994	2279 (68.50)	1048 (31.50)	852 (81.30)	35 (3.34)	62 (5.92)	4 (0.38)	2 (0.19)	1 (0.10)	53 (5.06)	12 (1.14)	27 (2.58)	
1998	1989 (59.78)	1338 (40.22)	910 (68.01)	52 (3.89)	86 (6.43)	4 (0.30)	2 (0.15)	1 (0.07)	58 (4.33)	196 (14.65)	29 (2.17)	
2002	2102 (63.18)	1225 (36.82)	930 (75.92)	76 (6.20)	110 (8.98)	4 (0.33)	2 (0.16)	1 (0.08)	56 (4.57)	16 (1.31)	30 (2.45)	
2005	2018 (60.66)	1309 (39.34)	973 (74.33)	86 (6.57)	136 (10.39)	4 (0.31)	0	0	57 (4.35)	22 (1.68)	31 (2.37)	
2007	1977 (59.42)	1350 (40.58)	990 (73.33)	72 (5.33)	172 (12.74)	4 (0.30)	0	0	56 (4.15)	17 (1.26)	39 (2.89)	
2012	1818 (54.64)	1509(45.36)	1026 (67.99)	121 (8.02)	250 (16.57)	4 (0.27)	0	0	56 (3.71)	18 (1.19)	34 (2.25)	

*Other reasons: Mentally/seriously ill, incarcerated, manufactured data, and dropped because mom gave birth outside Metro Cebu, erroneously reported as SB, late BI or baseline after mom gave birth

Appendix 2. Number and Percent of Index Children Enrolled and Attrited, by Survey Round (Singletons only)

Survey Round	Number (%) Enrolled	Number (%) Attrited	Outmigrated	Refused	Died	Moved w/in MC but Unlocated	Not Available	Other Reasons*
Total	3080							
BI	3061 (99.38)	19 (0.62)	0	0	19 (100.00)	0	0	0
LS1	2884 (93.64)	196 (6.36)	109 (55.61)	18 (9.18)	37 (18.88)	17 (8.67)	11 (5.61)	4 (2.04)
LS2	2807 (91.14)	273 (8.86)	169 (61.90)	33 (12.09)	41 (15.02)	21 (7.69)	2 (0.73)	7 (2.56)
LS3	2720 (88.31)	360 (11.69)	227 (63.06)	41 (11.39)	50 (13.89)	28 (7.78)	6 (1.67)	8 (2.22)
LS4	2667 (86.59)	413 (13.41)	259 (62.71)	46 (11.14)	62 (15.01)	32 (7.75)	7 (1.69)	7 (1.69)
LS5	2630 (85.39)	450 (14.61)	288 (64.00)	45 (10.00)	74 (16.44)	35 (7.78)	1 (0.22)	7 (1.56)
LS6	2600 (84.42)	480 (15.58)	302 (62.92)	48 (10.00)	85 (17.71)	34 (7.08)	2 (0.42)	9 (1.88)
LS7	2554 (82.92)	526 (17.08)	331 (62.93)	49 (9.32)	100 (19.01)	36 (6.84)	3 (0.57)	7 (1.33)
LS8	2515 (81.66)	565 (18.34)	356 (63.01)	50 (8.85)	114 (20.18)	34 (6.02)	2 (0.35)	9 (1.59)
LS9	2513 (81.59)	567 (18.41)	347 (61.20)	50 (8.82)	123 (21.69)	37 (6.52)	3 (0.53)	7 (1.23)
LS10	2510 (81.49)	570 (18.51)	343 (60.18)	49 (8.60)	131 (22.98)	35 (6.14)	6 (1.05)	6 (1.05)
LS11	2475 (80.36)	605 (19.64)	373 (61.65)	51 (8.43)	134 (22.15)	34 (5.62)	7 (1.16)	6 (0.99)
LS12	2462 (79.94)	618 (20.06)	381 (61.65)	51 (8.25)	144 (23.30)	32 (5.18)	4 (0.65)	6 (0.97)
1991	2264 (73.51)	816 (26.49)	555 (68.01)	13 (1.59)	209 (25.61)	25 (3.06)	6 (0.74)	8 (0.98)
1994	2186 (70.97)	894 (29.03)	619 (69.24)	16 (1.79)	217 (24.27)	26 (2.91)	7 (0.78)	9 (1.01)
1998	2089 (67.82)	991 (32.18)	695 (70.13)	21 (2.12)	219 (22.10)	28 (2.82)	8 (0.81)	20 (2.02)
2002	2023 (65.68)	1057 (34.32)	744 (70.39)	22 (2.08)	226 (21.38)	38 (3.60)	8 (0.76)	19 (1.80)
2005	1888 (61.30)	1192 (38.70)	838 (70.30)	42 (3.52)	234 (19.63)	38 (3.19)	12 (1.01)	28 (2.35)
2007	1817 (58.99)	1263 (41.01)	914 (72.37)	30 (2.38)	245 (19.40)	38 (3.01)	12 (0.95)	24 (1.90)
2009	1709 (55.49)	1371 (44.51)	987 (71.99)	36 (2.63)	250 (18.23)	37 (2.70)	33 (2.41)	28 (2.04)

*Other reasons: Late BI, dropped (manufactured), BS after BI, and mentally ill