

Challenges in Recruiting Older Twins for the Sri Lankan Twin Registry

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The National Twin Registry of Sri Lanka was established in 1997 as a volunteer register. To extend it to a population-based register, we examined the effectiveness of tracing older twins by inspecting birth records and recruiting them by postal invitation and in-person contact. Birth records at a divisional secretariat reported from 2 maternity hospitals between the years of 1954–1970 were scrutinised to identify a random sample of twins. These hospitals had the highest twin delivery rates for the whole country. We identified 620 twins and a questionnaire was mailed to them. Research assistants visited a cohort of non-respondents (71) in the postal survey. These 620 twins were identified after perusing 20,700 birth records. The twinning rate was estimated at $29.95 \text{ ([}620/20700\text{)]} \times 1000$ twins per 1000 registered births (CI 27.63–32.27). In the postal survey, 37 (12%) responded and 62 letters were returned (20%). Both twins were still alive in 20 pairs, one was still alive in 15 pairs, and both twins were dead in 2 pairs. During field visits, 42 (59.2%) addresses were located. Information was available on 16 twin pairs. Both twins were alive in 8 pairs, one each in 4 pairs, and both were dead in 4 pairs and at least one twin was traced in 10 pairs (14%). Both the postal and the field survey gave a low yield. This finding is different from tracing younger twins born between 1985–1997 by using the same methods. Migration, urbanization and development in the country might have affected tracing older twins from the birth record addresses, which were decades old.

Background

The National Twin Registry of Sri Lanka was established in 1997 (Sumathipala et al., 2000). We have previously reported on the feasibility of using different methods to recruit younger twins up to 15 years of age (Sumathipala et al., 2001). We found that both community surveys and systematic inspection of birth records either at the hospital or birth registration office was effective to trace younger twins. Once traced, in-person contact was more effective than a postal invitation for recruitment of younger twins (Sumathipala et al., 2001).

The present study aimed firstly, to test the feasibility of tracing older twins by systematic inspection of birth records at the birth registration office; secondly, to compare the effectiveness of in-person contact and postal invitation for recruitment of older twins; and thirdly, to estimate the costs of each method.

In Sri Lanka, births are registered at the place where they occur, and not necessarily in the area of the mother's residence. Details of the birth registration process and the infrastructure for that is described elsewhere (Sumathipala et al., 2001).

Traditionally in Sri Lanka, families are believed to occupy the same address for many generations. We therefore hypothesized that we would be able to identify twins by contacting their ancestral home.

We scrutinized the available data on the singleton and twin deliveries for the whole country. In 1998 a total of 289,474 deliveries occurred in the whole country and there were 2397 twin deliveries (4794 twins) giving an overall rate of 16.6 twins for 1000 deliveries ($[4794/289,474] \times 1000$). The details of the available data are shown in Table 1.

There was a wide variation in twin deliveries according to the type of institution. The highest rates of twin deliveries occurred in the major hospitals, teaching, maternity hospitals namely De Soyza Maternity Hospital (DMH) and the Castle Street Hospital for Women (CSHW), provincial, and base hospitals. Smaller institutions from district hospitals downward had negligible rates of twin deliveries. The two maternity hospitals DMH and CSHW had the highest rates of twin deliveries for the whole country. Hence we decided to trace the records of twin deliveries reported from these two hospitals. The Divisional Secretariat (DS), to

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Table 1

Details of Singletons and Twins Delivered in Sri Lanka for 1998 Categorised by the Type of Institution

Type of institution	Number of institutions	Total deliveries	Twins	Twins per 1000 deliveries per Institution	Average number of twins
Teaching hospital	13	66,459	1398	1.62	107.54
Maternity hospital	2	26,740	452	8.46	226.00
Provincial hospital	5	39,380	870	4.42	174.00
Base hospital	33	76,995	1308	0.52	39.64
District hospital	150	53,518	514	0.06	3.42
Peripheral units	101	15,742	164	0.15	1.62
Rural hospitals	148	7653	68	0.06	0.46
Maternity homes	69	2987	20	0.15	0.28
Total		28,9474	4794		

which the births from these two hospitals were reported, was comprised of 11 sub-divisions. The 2 sub-divisions, to which DMH and CSHW belong, had 29,393 births for the year 1994. The remaining 9 sub-divisions had recorded only 9246 births. Due to the above reasons, we expected a higher yield of twins from these two sub-divisions of the Divisional Secretariat.

Methods

Tracing of Birth Records of Older Twins

We obtained permission to inspect birth records from the Registrar General of Births and Deaths. Records were available from 1940 onwards. The form, which was used to record births from 1940 to 1954, did not include the address of the parents. The present form, which includes this information, came into use in 1954. Therefore the survey covered births registered during 1954–1970 inclusive.

The birth records were available in bundles of 100, which are maintained in chronological order. These bundles were randomly selected until 500 birth records for a particular year were found. Multiple births have their registration certificates adjacent to each other because they are registered together on the same day irrespective of any significant difference in the time and the place of the birth. These were scrutinized for pairs of individuals with the same surname, the same name and address of the mother or father, date of birth, and place of birth to identify twins.

Postal Survey

A letter with a brief description of the National Twin Registry of Sri Lanka and the objective of this study was sent to each set of twins detected, with a questionnaire and a self-addressed envelope. We requested information on whether twins were alive or dead; whether they were living in Sri Lanka; and to give their new address if they had moved. If the twins were not living at the same address, we requested information on their whereabouts from the present occupant.

By perusing the birth records we identified a total of 310 twin pairs. Out of these, 126 twin pairs were born in CSHW and 184 twin pairs were born in DMH. We dispatched three separate batches of letters to these 310 twin

pairs. The first batch was dispatched to 85 pairs of twins born at DMH. These were the first 5 pairs of twins detected for each year from the DMH (5 × 17 years). The remaining twin pairs 99 (184–85) of the DMH were sent letters later, as the response to the first 85 letters was low. The third batch was the entire group of twin pairs (126) born at CSHW.

Field Survey

The research assistants visited the non-respondents from the first DMH cohort of 85 twin pairs, with an address in the Western Province. This was to see whether the twins were still living in the same postal address given at the time of the birth even though they did not respond. During these visits, verification of information regarding addresses and twins was carried out by the postman, inhabitants of the area, and “Grama Niladaries”. Grama Niladaries evolved from the traditional Village Headman and are retained in the current administrative structure. A Grama Niladari Division is the smallest administrative unit in Sri Lanka, headed by the Grama Niladari. He or she is also responsible for reporting all births in a village to the corresponding Registrar of Births and Deaths.

We did not carry out a field survey for the remaining 99 twin pairs from the DMH and the third cohort of 126 twins from CSHW due to financial limitations.

Results

A total of 620 twins (310 twin pairs) were identified after perusing 20,700 randomly selected birth records. These 20,700 records were randomly selected from a total of 446,100 registered births and reported from DMH and CSHW from 1954 to 1970.

Out of these 620 twins, 252 were from CSHW and the remaining 368 were from DMH. Therefore the registered twinning rate for these two hospitals taken together can be estimated as 29.95(CI 27.63–32.27), $([620/20700] \times 1000)$ twins per 1000 registered births

Postal Survey of the First DMH Cohort

Of 85 letters, 9 twin pairs responded (10.6%) and 3 letters were returned. Out of these 9 twin pairs, both were alive in

5 pairs, one each was alive in 3 pairs and both were dead in one pair.

Field Survey of the First DMH Cohort

Out of the 73 non-respondents the research assistants visited 71. Two were not visited as these addresses were outside the Western Province. The results are given in Figure 1. Out of 71 houses visited information was available on 16 twin pairs. Among these, both were dead in 4 pairs, both were alive in 8 pairs (in two pairs one twin each has gone abroad for employment and in another two pairs all 4 had migrated) and one each was alive in 4 pairs. Therefore information on 25 twin pairs (9 + 16) was available from the DMH group of 85 (29.4%).

Interestingly, during these visits, the research assistants received information on 15 additional twin pairs living in the neighborhoods.

Outcome of the Postal Survey of Remaining Two Cohorts From DMH and CSHW

Out of 225 pairs of twins (99 DMH second cohort + 126 CSHW), 28 responded (12.4%). They included 15 pairs both alive, 12 pairs in which one twin was alive and 1 pair in which both twins were dead. Fifty-nine letters were returned, as the twins were not living at the postal address given at the time of birth.

Extrapolating from the DMH (first cohort of 85) field survey, we estimate that 31 more twin pairs $(16/71) \times (225 - [28 + 59])$ would have been found if we had carried out a similar field survey in the second and the third cohorts (DMH cohort of 99 and CSHW cohort of 126).

Total Outcome of the Study

Information was available on 53 twin pairs from 310 twin pairs (17%). These were 25 (9 + 16) pairs from the first DMH cohort, and 28 from the other two cohorts. Out of these 53 pairs, 37 pairs (9 + 28) were known from the postal survey (11.94% $[37 \times 100/310]$). Among these both are alive in 28 twin pairs, one each is living in 19 pairs and both are dead in 6 twin pairs. Had we carried out a field survey in the other two cohorts, we estimate we would have gained information on 31 more twin pairs, giving a follow up rate of 84/310 (27.1%).

Cost of Tracing Twins

The time spent for tracing twins at the divisional secretariat and the relevant groundwork took 30 days (5 day week) and the cost was rupees 18,000. Postal costs for the letters with the questionnaire and a reply paid envelope amounted to rupees 4200 and two days work by the research assistant costing rupees 800. Therefore the total cost for the postal survey was rupees 5000. Transport costs for personal visits were rupees 5800. The visits were covered in 10 days. The costs for the research assistant for 10 days were rupees 4000. Therefore the total cost for the in-person contacts were rupees 9800. Therefore Rupees 26,800 were spent on tracing 53 twins. A breakdown of costs for each component is given in Table 2.

Discussion

The findings of this study have shed light on many issues relevant to the tracing of older twins in comparison to younger twins and also on the trends in twin deliveries in Sri Lanka. During the period of 1954–1970 there were 29.95 twin births per 1000 registered births. The twinning rate per 1000 deliveries in DMH and CSHW for 1998 was 16.90 (Table 1). The twinning rate at Sri Jayewardenepura General Hospital was 18.92 per 1000 births during the period of 1985–1997 (Sumathipala et al., 2001). The drop in the rate could be due to fewer referrals to maternity hospitals, due to increased availability and improvement of maternity services in other major hospitals in Colombo and its suburbs. On the other hand it could be due to a true decline in twinning rate, similar to the declining trends in twinning rates witnessed in the other parts of the world (Derom et al., 1995).

The twins traced by postal questionnaire (12%) and field visits (23%) gave a relatively low yield. This finding is significantly different from the outcome of using the same methods to trace younger twins in Sri Lanka, which were 59% and 71% respectively (Sumathipala et al., 2001). During the field survey, we were unable to locate a larger number of addresses in this older cohort (29/71–40.8%). These addresses, given decades before, have changed. Since then, roads have been renamed and new roads and properties have been built. Out of the 42 addresses located, we

Table 2

Cost of Tracing Twins

Detecting one pair of twins through birth record	= 18,000/310 = Rs 58.06
Contacting one twin through postal invitation	= Rs 5000/ 37 = Rs 135.13
Therefore the total cost of detecting through birth records and then tracing through post	= Rs 135.13 + 58.06 = Rs 193.19
For contacting a twin pair through field visits	= Rs 9800/16 = Rs 612.50
Therefore the total cost of detecting a pair of twins through birth records and tracing through field visit	= Rs 612.50+58.06 = Rs 670.56

Note: \$US 1 = 96 Sri Lankan Rupees

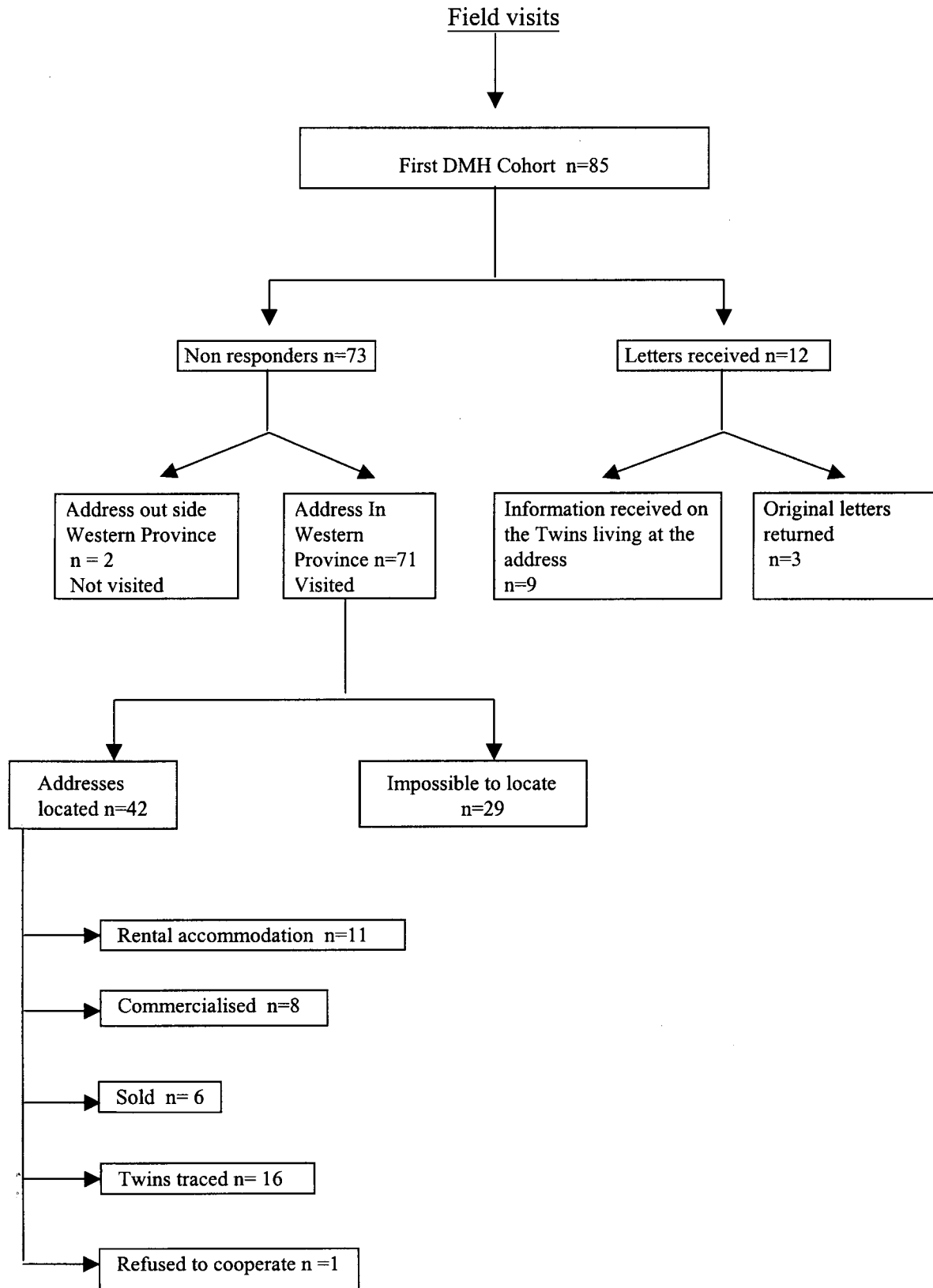


Figure 1
Flowchart 1 – DMH Group.

could trace only 16 twin pairs (38.1%). Some twins, who had been in rental accommodation at the time of registration, had re-located and others who owned houses had sold their properties. Both these groups (17/42–40%) left without supplying any forwarding address, which is a usual practice in Sri Lanka. In eight cases the addresses were located but the original properties had been converted to commercial establishments. Out of 16 twin pairs traced during the field survey, two pairs had migrated and one twin each in two pairs has gone abroad for employment. This reflects recent trends in external migration. However, in the younger cohort only one address out of 25 (4%) could not be located. Out of the 24 addresses located 17 (70.8%) pairs were still residing in the same place, only four had been on rented accommodation (23.5%) and one family had migrated (Sumathipala et al., 2001).

The neighborhood changes over the years are likely to have affected the tracing of older twins. The reliability of the given addresses, due to poor quality of record keeping many years ago, may have affected the tracing of twins. The DMH and the CSHW cohorts may be from different social class from the Sri Jayewardenepura General Hospital cohort as that hospital is a partial fee levying institution and the older cohorts from DMH and CSHW were from non-fee levying public hospital. The lower social class is less likely to have a permanent residence, thus are more migratory.

There was a high death rate among the twins; that is, both twins in 6 pairs and one twin each in 19 pairs (29.2%) were dead. In the younger cohort (Sumathipala et al., 2001) only one pair of twins had died (5.8 %). We are unable to report the exact age and the causes of death. However these are unlikely to be neonatal deaths because birth registration can occur up to 42 days after delivery. The infant mortality rate (IMR) per 1000 live births was 72.7 and neonatal mortality rate (NMR) 45.3 per 1000 live births in 1955 but in 1996 IMR fell down to 17.3 and NMR to 12.9 for Sri Lanka (Ministry of Health, 1998; De Silva, 1997).

It is clear from these findings that tracing of older twins through addresses in the birth records was greatly affected by the internal migration and rapid urbanization during the last few decades. However, tracing of older twins through stepped search approach by tracing birth records and following them up by postal invitations as well as through field visits remains an option. Postal invitations were comparatively less expensive than field visits following detection through birth record. It appears that a comprehensive community survey is the best option to develop a population-based register for older twins.

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References

- De Silva, W. I. (1997). *Population projections for Sri Lanka 1991–2041*. Colombo, Sri Lanka: Institute of Policy Studies.
- Derom, R., Orlebeke, A., Eriksson, A., & Thiery, M. (1995). The epidemiology of multiple births in Europe. In L. G. Keith, E. Papiernik, & D. M. Keith (Eds.), *Multiple pregnancy: Epidemiology, gestation and perinatal outcome* (p. 33). Carnforth: Parthenon Publishing Group.
- Ministry of Health. (1998). *Annual health bulletin*. Colombo, Sri Lanka: Ministry of Health.
- Sumathipala, A., Siribaddana, S. H., De Silva, N., Abeysingha, M. R. N., Sivayogam, S., & Fernando, D. J. S. (2001). Feasibility of using different approaches for recruiting twins to establish a population based twin register in Sri Lanka. *Twin Research*, 4, 450–463.
- Sumathipala, A., Fernando, D. J. S., Siribaddana, S. H., Abeysingha, M. R. N., Jayasekera, R. W., Dissanayake, V. H. W., et al. (2000). Establishment of a National Twin Registry in Sri Lanka. *Twin Research*, 3, 202–204.