
 METHODOLOGIC ISSUES

Estimation of age specific incidence rates of childhood burns from a prevalence survey of burn scars

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Abstract

Objectives—This paper describes two methods of estimating the age specific incidence rates of childhood burns from a prevalence survey of burn scars.

Methods—A prevalence survey of burn scars was carried out in 1992 on 15 742 Ghanaian children aged 5 years or less. Nine hundred and fifty five (6.1%) of these children had scars from burn, and for 630 (66%) of these children, additional information about the burn incident, including the child's age at the time of the burn, was obtained from the mother two to three months later. Thirty four per cent of mothers of children with burn scars were not interviewed due to absence, relocation, or inaccessibility. Age specific incidence rates of burns were estimated for eight age groups using two methods. In method I, the number of incident cases of burns for each age group were estimated from the burn scars by subtracting the estimated contribution of scars from burns that had occurred at earlier ages. In method II, the estimate was based on the mother's recall of the age of the child at the time of the burn.

Results—Slightly different results were obtained with the two methods, and problems were noted with both methods.

Conclusion—We recommend the use of these methods for estimating age specific incidence rates from retrospective population surveys for health conditions which result in long term residual markers.

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Keywords: childhood burn scars; Ghana; incidence rates; methods.

Population surveys are commonly used to study health problems, including injuries, in many parts of the world. Through such surveys, burns have been recognized as an important public health problem.^{1–4} Like other causes of injury and most common 'third world' diseases, such as malaria and schistosomiasis, burns are not random events and are, therefore, preventable. However, information on risk factors, including the age groups most at risk, is needed to formulate preventive strategies in any geographic areas.

While information on some risk factors are

collected in population surveys, age specific incidence rates usually cannot be estimated from most surveys because they are cross sectional. The cost of conducting prospective studies for such purposes is prohibitive, particularly for most developing countries. However, for health problems that leave visible, distinctive, long term residual effects, it is possible to estimate age specific incidence rates from prevalence data.

When a child is burned, there are three possible outcomes. First, the burn may be serious enough to kill the child. Second, it may be so trivial as not to leave any visible scar. Third, it may result in a permanent scar. This scar is especially visible in dark skinned people, such as Ghanaians. Thus, a child who survives a non-trivial burn carries a permanent record of his or her burn experiences—the burn scar. This unique feature can be used to estimate age specific incidence rates of childhood burns, much in the same way as lameness, a distinctive sequela of poliomyelitis, has been used to estimate the incidence of residual paralytic poliomyelitis⁵ or 'leopard skin', a unique feature of African onchocerciasis, to estimate the endemicity of this disease.⁶ An earlier version of this method of estimating the age specific incidence rates of childhood burns using burn scars has been previously reported.⁷ The results that were obtained are slightly different from those in this report, because 34% of the sample who could not be interviewed to ascertain details about the burn incident were excluded in the present analyses in order to compare the two methods using the same sample. Alternatively, age specific incidence rates of childhood burns can be estimated if the number of incident cases can be generated through maternal recall of the ages of children at the time of the burn.

In this report, we describe the application of these two methods of estimating the age specific incidence rates of childhood burns from a prevalence survey of burn scars. Our aim was to compare the results of the two methods in a Ghanaian population of children aged 0–5 years who had scars from previous burns.

Methods

The data source for this study was a population based survey of childhood burns conducted in Ghana in 1992. Ghana is a developing country with a population of about 16.5 million and is

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Table 3 Comparison of two methods of estimating the age specific incidence rates of childhood burns, Ashanti Region, Ghana, July–December, 1992

Age group (i)	Age at time of the survey (months)	Method I: using burn scars (per 1000 person years)	Method II: using maternal recall (per 1000 person years)
1	0–5	4.69	3.41
2	6–11	21.07	11.77
3	12–17	37.36	16.4
4	18–23	30.29	22.91
5	24–35	59.62	25.69
6	36–47	*	28.02
7	48–59	*	26.81
8	60–71	*	34.25

*Unable to compute.

AGE SPECIFIC INCIDENCE OF BURNS

The estimated age specific incidence of burns calculated using each method are shown in table 3. Using method I, children aged 24–35 months had the highest estimated incidence (59.6 per 1000 person years) followed by those aged 60–71 months, with infants 0–5 months old having the lowest. The incidence of burns in children aged 24–35 months was about 13 times the rate for those aged 0–5 months and twice the rate for those aged 18–23 months. No rates could be computed for children 36 months or older using method I due to the calculation of a negative number of incident cases, resulting from an overestimation of the number of scars in those age groups that were attributed to burns occurring at younger ages.

Using method II, the maternal recall matrix technique, children aged 60–71 months had the highest incidence (34.3 per 1000 person years), followed by those aged 36–47 months, with those 0–5 months old again having the lowest. The estimated incidence of burns in children aged 60–71 months was about 10 times the rate for those aged 0–5 months and one and half times the rate for those aged 18–23 months. In general, rates tended to increase with age using this method.

Discussion

Two methods for estimating the age specific incidence rates of childhood burns from prevalence data using burn scars as a proxy and maternal recall are described in this paper. Method I was motivated by a technique used by LaForce *et al* to estimate the annual incidence of poliomyelitis from prevalence data on the premise that the clinical sequelae of paralytic poliomyelitis are so distinctive that, when observed, they can be attributed to poliomyelitis with a high degree of probability.⁵ Assuming a stable endemic situation, LaForce *et al* considered that paralysis due to poliomyelitis in the age group 5 years and above should reflect all the non-fatal cases with residual paralysis that occurred in this cohort between 0–4 years. Surveys of residual paralysis in children 5–10 years old, adjusted with a factor to make up for fatal cases were, therefore, assumed to reflect the incidence of paralytic cases that had occurred one to 10 years earlier.⁵ Similarly, in this study we considered burn scars in children aged 0–5

years to reflect the incidence of burns that had occurred 0–5 years before.

Different results were obtained using the two methods. However, the absence of a gold standard in this study by which to compare these two methods makes it difficult to decide which is the more reliable method. Based on the descriptive epidemiology of childhood burns in the study setting,⁹ coupled with the fact that no rates could be computed for the last three age groups using method I, the results obtained from method II may appear more plausible. In this study setting, the occurrence of burns in very young children is much lower than that in older children because the former are usually carried on the backs of their mothers most of the time. In addition, because older children 'play with fire' in the house yard, they may be more prone to burns.⁹

There were some limitations with this investigation that must be considered in the interpretation of the results. First, computation of the age specific incidence rates of burns from the prevalence of burn scars is based on the assumption that burns to children occur uniformly in each age interval. This assumption may not be true. Second, the data, particularly the age of the child at the time of burn, is based on recall, and the data suggest a preference for reporting that the burn occurred at 12, 24, 36, 48, or 60 months, that is at 1, 2, 3, 4, and 5 years. This problem is similar to that reported by Lesthaeghe and Page.¹⁰ In addition, this recall bias may favor recent burns. Finally, although all burns share a single etiology—impact of thermal energy to the body—the mechanism of transmission of this energy may differ from case to case, and this method would not capture this level of detail.

Despite these limitations, we have demonstrated the use of two different methods for computing the age specific incidence rates of childhood burns from a prevalence survey. This information is essential to determining which particular age groups are at the greatest risk. The importance of identifying high risk groups is based on the premise that interventions are most effective and possibly most efficient when they target such groups. For this purpose, the precise age specific incidence may be less important than knowing which age groups have the highest rates, and this, in turn, assumes the interventions themselves are, in a sense, age specific.

We recommend the use of these methods in different populations to compare and refine the methods for estimating the age specific incidence rates of childhood burns from retrospective population based surveys. In addition, these methods are recommended for incidence studies of other health problems with long term residual effects. However, a caution is given about the issue of recall and digit preference, both of which should be taken into consideration in the design and analysis of future studies.

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In-line skater injured

A teen in-line skater was seriously injured after taking a midnight ride on a bus bumper. The 15 year old who was not wearing any protective gear, suffered multiple fractures when he crashed head-on with another bus travelling in the opposite direction (E Collister, *Gazette*, 1 August 1996).

A litany of fatal or near fatal injuries

- 16 year old drowning in a hot tub has prompted consideration of laws requiring emergency shut-off switches
- Fall into family swimming pool results in severe brain injury to 3 year old
- 14 year old drowned after falling off a makeshift raft
- Child left in hot car prompts a bill in Massachusetts to make this a crime (it is a criminal offense to leave a dog in a hot car)
- A Rottweiler mauled an 11 year old so badly she required 100 stitches. Her mother blames the dog, not its owners
- Another child was mauled to death, also by a Rottweiler, after the chained dog grabbed the infant from a woman's arms
- Playing 'chicken' (sitting on the tracks) a teenager was killed by a commuter train travelling at 50 mph
- A 10 year old died after being run over by the family car. It appears he tried to move the car from the garage so he could play inside and was crushed under it as it rolled down the driveway
- Tot dies after fall in 5 gallon bucket filled with cleaning solution.