

# Research

## Timing of mortality among internally displaced persons due to the tsunami in Sri Lanka: cross sectional household survey

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### Abstract

**Objective** To describe the distribution of mortality among internally displaced persons during two and a half months after the Indian Ocean tsunami, 2004.

**Design** Cross sectional household survey with retrospective cohort analysis of mortality.

**Setting** Camps for internally displaced persons due to the tsunami in an eastern coastal district of Sri Lanka.

**Participants** 3533 people from 859 households accommodated in 13 camps.

**Main outcome measures** All cause death and number of missing people.

**Results** 446 deaths and 11 missing people were reported after the 2004 tsunami, of which most (99%) occurred on the day of the tsunami or within three days thereafter. No deaths were reported for the two and a half month period starting one week after the tsunami.

**Conclusions** Most mortality after the 2004 tsunami occurred within the first few days of the disaster and was low in the study area.

### Introduction

On 26 December 2004, the most devastating tsunami in recorded history hit the countries around the Indian Ocean. Sri Lanka was the second most affected country, with more than 30 000 deaths and half a million people displaced. We carried out a cross sectional household survey in an eastern coastal district of Sri Lanka to describe the distribution of mortality during and after the disaster among internally displaced people.

### Methods

We carried out our survey from 13 to 18 March 2005. Internally displaced people were highly mobile, making it difficult to define the sampling framework, thus we included all households in 13 camps in three administrative divisions of Ampara district. After written informed consent was obtained, a householder was asked to provide information on all family members as of 25 December 2004 (the day before the tsunami) and any subsequent deaths and missing events. Information on the family was verified by referring to the household registration card, issued by the local government for food rations.

### Results

The study sample consisted of 3533 people from 859 households that gave consent to be surveyed. Of a total of 446 deaths and 11 missing people, most (99%) occurred on the day

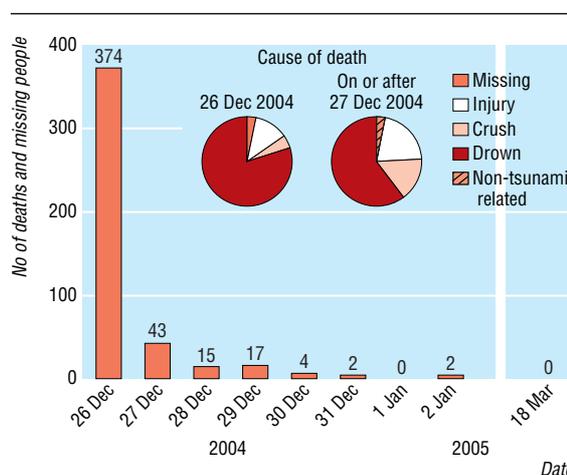
of the tsunami or within three days thereafter (figure). No death was observed after 2 January 2005, the seventh day after the tsunami, indicating low mortality for a displaced population after such a massive disaster. Most deaths were due to drowning, followed by tsunami related injury and crush. Only four cases were assumed to be non-tsunami related—three due to cardiovascular events and one to injury unrelated to the tsunami.

### Discussion

Mortality related to the Indian Ocean tsunami in 2004 was concentrated in the first few days of the disaster and no death was reported from one week after the tsunami up to two and a half months of the study period. At least six deaths could have been expected among the 3076 survivors and the recall period of 80 days in our study, on the basis of an assumed crude mortality of 0.25 per 10 000 person days, a benchmark for displaced populations in South Asia.<sup>1</sup> The massive additional mortality due to infectious diseases, as warned by the World Health Organization,<sup>2</sup> was not substantiated.

Our finding can be partly explained by the phenomenon of the “harvesting” effect—that is, decreased mortality after a large number of deaths as a result of an adverse health event among a vulnerable population. This effect has been documented in other disaster settings, such as the earthquake in Taiwan<sup>3</sup> and the heat waves in the Czech Republic.<sup>4</sup>

The low mortality may also indicate successful aid activities. Prompt international responses were started with sufficient



Distribution of 446 deaths and 11 missing people by date among 3533 displaced people in Ampara district, Sri Lanka on 26 December 2004, day of the tsunami, and subsequent days

**What is already known on this topic**

Massive additional mortality among survivors of the 2004 tsunami was a concern, especially due to infectious diseases

**What this study adds**

Mortality due to the 2004 tsunami was concentrated in the first few days of the disaster

Increased mortality among displaced persons was not observed

funds. Moreover, the Sri Lankan government functioned sufficiently to coordinate the influx of aid by using its well structured administrative and public health systems.

If this low level of mortality was primarily due to the nature of the disaster, however, then the use of the vast available funds may be questioned. How effective these activities and funds were in relieving the crisis is important in view of, for example, the massive humanitarian crisis that continued at a 10-fold or higher crude mortality among the displaced population in Darfur, Sudan.<sup>5</sup>

The argument may be circular because the mortality could have been minimised by the extensive relief effort of the international community. Nevertheless it can be speculated that the fund raised for the tsunami was disproportionate to need, especially in the context of other ongoing humanitarian crises and global health issues that are continuously costing millions of lives.

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