

## Years of life lost and productivity loss due to tsunami in India

Tsunami, consequent to a powerful earthquake under the seabed in Sumatra, measuring 9.0 on the Richter scale slammed into coastal villages in South East Asia on 26 December 2004. There was an estimated death toll of about 280,000 in eight countries, with 5 million people being affected. Extensive damage occurred in India due to the giant waves 3–10 m in height, affecting the coastal districts of Tamil Nadu (TN), Kerala and Andhra Pradesh (AP), and the Union Territories of Pondicherry and Andaman and Nicobar Islands. Approximately 2260 km of the coast-line, besides all the islands in the Nicobar district of Andaman and Nicobar Islands was affected by seawater that penetrated up to 3 km inland<sup>1</sup>. Fisherfolk staying within the first few hundred metres from the sea were the main victims, besides pilgrims and tourists. Death affected all the age groups and was disproportionately high amongst children. Though the number of deaths indicates the burden, yet in mere numbers, it is an underestimate of the loss. Lifetime lost due to premature death is considered here to measure the real impact of tsunami disaster in India. We present in this report the loss due to tsunami in terms of years of life lost (YLL) and productivity due to earnings forgone in the tsunami-hit areas of India.

According to the latest report<sup>1</sup> and websites of the respective states, 10,273 people in India lost their lives in the disaster and 5823 people were reported missing and feared to be dead. As many as 157,393 dwelling units were affected, 10,260 cattle lost, 11,827 hectares of cropped area and 74,025 boats were damaged in the calamity<sup>1</sup>; 529 children lost their relatives and have become orphans. TN was the worst affected, with 8010 reported deaths. The number of people reported dead and missing was 7159 in Andaman and Nicobar Islands, 630 in Pondicherry, 180 in Kerala and 116 in AP.

YLL either alone or as a component of Disability Adjusted Life Years (DALY)<sup>2</sup> is used as a measure of population health. While YLL considers fatal outcome, DALY also considers non-fatal outcomes of diseases. These measures are applied to express the burden and compare across diseases as well as to assess the cost-effectiveness of interventions. YLL due to tsunami in India was estimated according to the burden of disease methodology<sup>2</sup>, without age weighting and discounting. For expected years of life remaining at the

age of death, we used the national life expectancy in India<sup>3</sup> for the estimation. State-wise data on dead and missing (assumed dead) individuals were compiled and distributed in different age groups (<1, 1–4, 5–9, ...) of each gender. The number of cases in each age group was multiplied by the life expectancy in that age group for computation of YLL. For TN and AP, details of age and gender of victims were not available. Hence we used the distribution in the adjoining state of Pondicherry for estimates related to TN and AP. For Andaman and Nicobar Islands, age and gender information available for the missing cases was used for distributing the cases.

Tsunami in India has caused a total loss of 722,264 years, i.e. YLL. The loss of life years is about 45 times the number of individuals dead. Comparison of YLL (Figure 1) between states showed that TN recorded the maximum loss of 368,926 YLL (51% to total national loss), followed by Andaman and Nicobar (311,923 YLL) and Pondicherry (28,789 YLL). Kerala and AP recorded the least with respective YLL of 7333 and 5292. Comparison between genders showed that the number of women killed by tsunami was 1.42 times the number of men, while the number of girls killed was 1.65 times the number of boys among children (<15 years of age) (Figure 2). As most of the male population in the working age group was away fishing, the number of the females killed was more. There was no death of fishermen in the sea, and this could be because of the fact that tsunami travelled calmly in the sea, passing under the fishing boats without affecting the boats and the fishermen. Children were the most affected, constituting about 39%

of the total male victims, and 46% of the females. The reason for greater death toll among girls may be the lack of skills such as swimming and climbing up tall buildings and trees compared to those among boys. This higher number together with higher life years younger age had resulted in substantial contribution of YLL by the children compared to adults. Children contributed about 60% of the total 722,264 YLL caused by tsunami in India (male = 55.9%; female = 62.4%; Figure 3). The burden due to tsunami was calculated using total population of the given state. The maximum was 875.8 YLL per 1000 population in Andaman and Nicobar Islands, followed by Pondicherry (29.5) and TN (11.8). It was the least in Kerala and AP, with 0.23 and 0.07 per 1000 population respectively. This analysis may be useful to plan relief, rehabilitation and livelihood measures.

Years Lived with Disability (YLD) is a measure of non-fatal outcomes of health states. Injury was common at the sites of the disaster. Health workers have reported that virtually everyone affected is suffering from some degree of psychological trauma, with profound effects on children. It is the consequence of normal grief associated with loss of kith and kin, and is aggravated by loss of home, livelihood and entire community networks that normally help one recover from loss. For want of information on the duration and severity of these health states, computation of YLD could not be done for DALY. YLL due to tsunami (0.72 million) in India is higher than annual burden of malaria for the year 1998 (0.58 million DALY) and about one-tenth that of tuberculosis (7.56 million

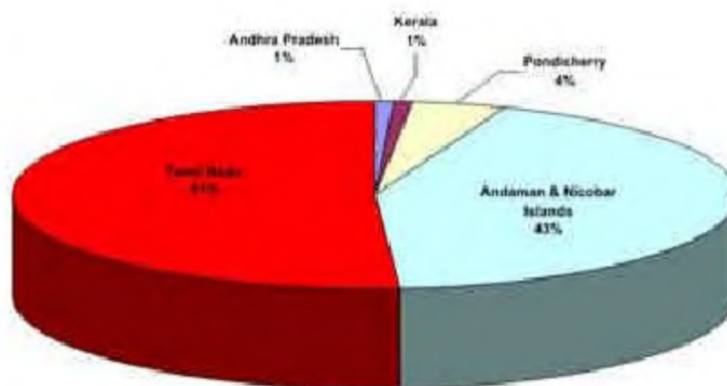


Figure 1. Distribution of YLL (722,264) due to tsunami.

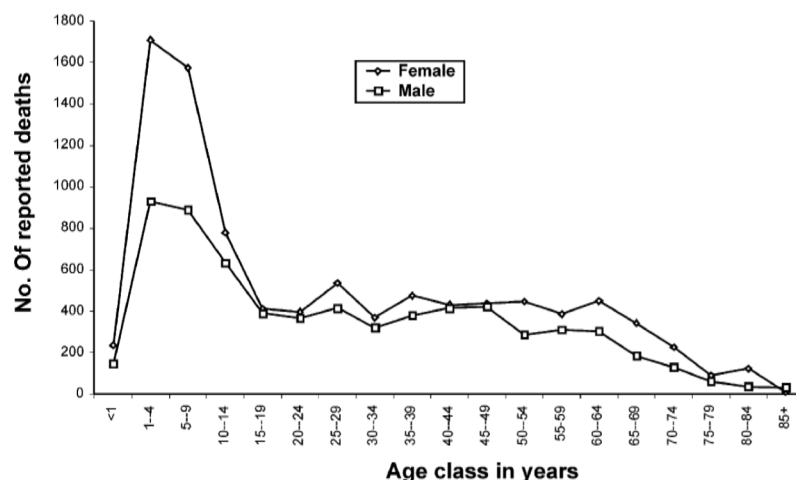


Figure 2. Number of deaths reported due to tsunami in India.

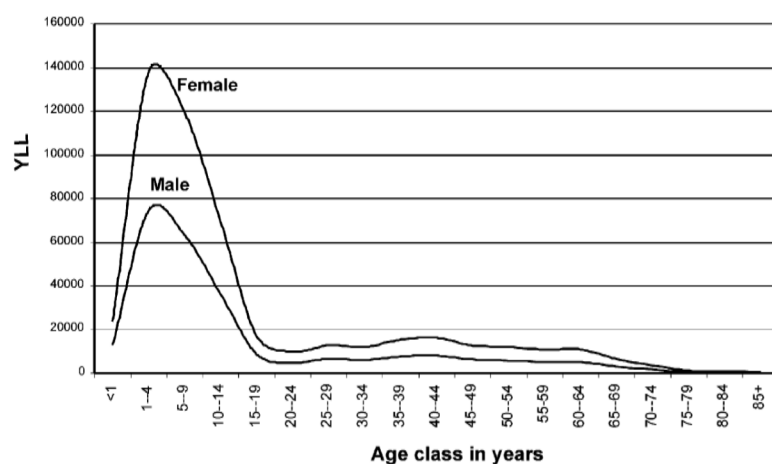


Figure 3. Age- and gender-specific distribution of YLL due to tsunami in India.

DALY)<sup>4</sup>. Disproportionate loss of women and children brought out in the analysis, could lead to change in the family structure along with traditional gender roles of men. In the absence of womenfolk, men have to shoulder new domestic roles. One of the long-term impacts of the disaster is that surviving elders may be left without support and care in their old age, which in traditional Indian households is generally guaranteed. These issues should also be considered while planning and implementing rehabilitation programmes in the tsunami-hit areas. Relief measures, including compensation should consider the need of the survivors rather than the deceased.

Estimates have shown that tsunami affected the livelihoods of about 645,000

families (about 3.2 million persons), directly or indirectly in the tsunami-hit states in India. Observations on the impact of salinity due to sea-water intrusion on coastal crop husbandry have already been reported<sup>5</sup>. The damage to different crops in the tsunami-hit areas of Nagapattinam in TN was reported to be 5150 ha<sup>5</sup>. An action plan has been suggested for the management of problem soils, but to restore the original situation, long-term efforts are required. In addition to the economic loss due to the damages caused to the affected community, the livelihood of the fisherfolk in particular is in perplexity. The loss and destruction of productive assets (fishing equipment) and infrastructure, psychological impact and fear of venturing into the sea

are the causes of refraining from work. This also affects the womenfolk who associate themselves in marketing the fish catch. In this context, the productivity loss in terms of earnings foregone was estimated. The number of individuals in the working age group between 15 and 59 years of age (distributed according to population age distribution) in the relief camps as on 14 January 2005 and the minimum official wage fixed by the respective state governments were used for estimation of productivity loss for a period of one month. The monthly productivity loss was calculated to be Rs 4110.26 lakhs. The highest loss was in TN (Rs 3097.75 lakhs) followed by Andaman and Nicobar Islands (Rs 642.85 lakhs). It was lower in Kerala (Rs 316.95 lakhs) and least in Pondicherry (Rs 52.7 lakhs). Considering this loss, development of livelihood package deserves top priority in the post-disaster rehabilitation in fisherfolk-dominated areas. The current situation also offers an opportunity to plan a comprehensive livelihood package offering alternatives during the lean period of fishing activity, especially during spawning season of fishes.

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K. KRISHNAMOORTHY\*  
K. T. HARICHANDRAKUMAR  
A. KRISHNA KUMARI  
P. K. DAS

Vector Control Research Centre,  
Indira Nagar,  
Pondicherry 605 006, India  
\*For correspondence.  
e-mail: kkrishn\_3@yahoo.com