

# Have we really decreased mortality due to severe burn injury in children?

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**Abstract:** In developed countries, in the twenty-first century, severe, large total body surface area (TBSA) burn injuries in children are rare. Prevention campaigns, education and public health interventions have significantly decreased the number of children sustaining burn injuries as well as the severity of such injuries. Many technological medical and surgical advances have been developed in burn care over the past several decades, increasing survival. Despite these interventions, long-term survival post burn injury may still be significantly reduced.

**Keywords:** Burns; children; mortality

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Up until recent decades, survival rates for children whom sustained severe, large percentage total body surface area (TBSA) burns were abysmal. In the 1950s, in a major burns unit in a developed country, it was documented that the mortality rate for children ( $\leq 15$  years) whom sustained burns affecting  $\geq 50\%$  TBSA was  $\geq 50\%$ , increasing exponentially with increasing TBSA affected (1). In twenty-first century, developed countries, with access to technological resources, and the funding to sustain intensive public health inventions, prevention campaigns, and to provide extensive widespread community education, both the number of severe burn injuries and mortality from such injuries have significantly decreased (2-4). Mortality from burn injury in developed countries has more than halved since the 1950s (4). Recent literature suggests that children whom sustain burns to approximately 96% TBSA have a  $\geq 50\%$  survival rate unlike decades ago during which they most certainly would have not survived (5). A recent Australian study by Duke and colleagues, however, highlights that whilst 30 day mortality rates have significantly decreased, especially in those children who sustain large surface area burns, children who sustain burn injuries of any percentage TBSA may have a significantly greater long-term mortality rate compared to

non-injured children (6).

Duke *et al.*'s large retrospective population based study seems to be the first of its kind, comparing over 10,000 burn injured children with a similarly matched population of over 40,000 non-injured children, with a median follow-up period of approximately 18 years (6). After adjusting for sociodemographic features and pre-existing medical histories of individuals, the authors determined that burn-injured children had a 1.6 times greater long-term mortality rate than non-injured children (6).

Injuries were the predominant cause of death in both groups, yet there was no significantly different cause of death in either group. Interestingly the median age of death also was similar in both groups (19 *vs.* 22 years of age in the non-injured group) (6). All mortalities occurred, prematurely, at a young age, however the authors, were restricted by their relatively short follow-up period. Traumatic deaths secondary to injury in adolescence or early adulthood could be accounted for persons whom undertake risk-taking behaviors, a factor not analyzed by Duke *et al.* (6,7). This could potentially be a confounder: children whom have survived such burn injuries may partake in future risky activities on the basis that they have

survived a severe injury once and therefore conclude that because of this they are likely to survive again. The present study concluded that 38% of deaths in their burn injured population would have been prevented if the burn had not occurred (6). They have not accounted for the potential that these individuals may have the same personality determinates that predispose them to burns as well as other forms of traumatic injury.

The physiological and psychological effects of burn injury have been well established (8). It is unclear, however, how long these effects persist. There remains a paucity of evidence to support the notion that the physiological effects of burn injury persist for more than a few years post-injury (8). Psychological effects may potentially persist for much longer (9,10). One potential confounder of Duke *et al.*'s study that has not been accounted for is the potentially high prevalence of smoking and substance abuse in the psychologically vulnerable burn injured population (6). Perhaps targeting this would reduce the mortality rate in the burn injured group.

Burn injured children from this study were shown to be from low socioeconomic, disadvantaged and indigenous backgrounds (6). Whilst the authors accounted for these factors at the time of injury, they do not account for the potential significant impact burn injuries have on families. Such injuries may lead to, for example, the loss of family income, parental unemployment, social isolation and potentially parental and adolescent/young adult mental health problems and substance misuse (11). The impact is not only upon the child, but the whole family.

It is likely that the long-term mortality of children suffering from severe burn injury remains high. This study again highlights the importance of burns prevention, although perhaps there are health interventions that could be implemented for those children affected by burn injury that may reduce their potential increased long-term mortality risk. Interventions that may be beneficial may include childhood and adolescence education in regards to smoking, drug and alcohol abuse prevention, and ongoing psychosocial support of the child and their family throughout childhood and into adult life.

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## Footnote

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## References

1. Bull JP, Fisher AJ. A study of mortality in a burns unit: a revised estimate. *Ann Surg* 1954;139:269-74.
2. Tompkins RG. Survival of children with burn injuries. *Lancet* 2012;379:983-4.
3. Jeschke MG, Herndon DN. Burns in children: standard and new treatments. *Lancet* 2014;383:1168-78.
4. Church D, Elsayed S, Reid O, et al. Burn wound infections. *Clin Microbiol Rev* 2006;19:403-34.
5. Wolf SE, Rose JK, Desai MH, et al. Mortality determinants in massive pediatric burns. An analysis of 103 children with > or = 80% TBSA burns (> or = 70% full-thickness). *Ann Surg* 1997;225:554-65; discussion 565-9.
6. Duke JM, Rea S, Boyd JH, et al. Mortality after burn injury in children: a 33-year population-based study. *Pediatrics* 2015;135:e903-10.
7. Smith AR, Chein J, Steinberg L. Impact of socio-emotional context, brain development, and pubertal maturation on adolescent risk-taking. *Horm Behav* 2013;64:323-32.
8. Jeschke MG, Chinkes DL, Finnerty CC, et al. Pathophysiologic response to severe burn injury. *Ann Surg* 2008;248:387-401.
9. Van Loey NE, Van Son MJ. Psychopathology and psychological problems in patients with burn scars: epidemiology and management. *Am J Clin Dermatol* 2003;4:245-72.
10. Wiechman SA. Psychosocial recovery, pain, and itch after burn injuries. *Phys Med Rehabil Clin N Am* 2011;22:327-45, vii.
11. Sheridan RL, Lee AF, Kazis LE, et al. The effect of family characteristics on the recovery of burn injuries in children. *J Trauma Acute Care Surg* 2012;73:S205-12.