Hurricanes and child health: lessons from Cuba

Deybis Sánchez Miranda,1 Imti Choonara2

HURRICANES
A hurricane is a large rotating storm with a central area of very low pressure and strong winds greater than 74 mph (118 km/h).1 The hurricane is graded 1–5 in relation to the strength of the winds, which can be greater than 155 mph (249 km/h, category 5).2 Hurricanes arise from warm, moist air from tropical oceans, and with global warming, hurricanes are occurring more frequently and with greater severity.3 Tropical storms originating in the Atlantic (ie, the Northern hemisphere) are termed hurricanes, whereas those that originate from the Pacific Ocean are known as typhoons and those from the Indian Ocean as cyclones.1 Hurricanes are a major problem for countries in the Caribbean and Central and Latin America. The word ‘hurricane’ is thought to be derived from the Carib god ‘Huricon’ or the Mayan god ‘Hurakan,’ who caused a great storm and flood by blowing his breath across the ocean.4

HEALTH EFFECTS
It has been estimated that almost two million people worldwide have died from tropical storms (hurricanes, typhoons and cyclones) in the last two centuries.1 In the 20th century alone, there have been 75 000 deaths from hurricanes in North America and the Caribbean, including almost 10 000 deaths from hurricane Mitch, which affected Central America in 1998.5

The impact of hurricanes on health can be divided into immediate and during the recovery phase. Drowning during the hurricane used to account for the majority of the deaths. The use of warning systems combined with evacuation has, however, dramatically reduced drowning deaths.1 3 During hurricane Katrina, however, two-thirds of the fatalities were thought to be due to the direct physical effects of the flood, and the majority of the deaths were thought to be due to drowning.6 The high number of deaths due to drowning following hurricane Katrina was probably associated with the inadequate evacuation and preparation of the population.7 Hurricanes also cause death by physical damage to buildings and trees, which may result in direct trauma. The most frequent injuries following hurricanes are cuts, lacerations, puncture wounds and blunt trauma caused by flying glass and other debris.1 8

There are significant health effects after the hurricane when there may be a lack of clean water, food and housing as well as access to healthcare. The lack of provision of these essential items undoubtedly contributed to the significant mortality following hurricane Katrina.9 10 Infectious diseases may increase dramatically following a tropical storm. This increase in infectious diseases is more likely to occur in low- and lower-middle income countries. Damage to water and sanitation networks, alongside pools of stagnant water following flooding, may result in a significant increase in cases of gastroenteritis and other infectious diseases. Hurricane Mitch resulted in increases in the number of cases of cholera, leptospirosis, dengue and malaria in several of the affected countries.5 Shelter for families who have been evacuated or whose homes have been destroyed is critical for survival. Fatalities following the cyclone in Bangladesh in 1991 were significantly higher in areas where shelter was not provided.11

There is increasing recognition that following hurricanes and other natural disasters, there may be significant mental health problems.12 The most frequent psychological disorder following natural disasters is post-traumatic stress disorder (PTSD).13 Children appear to be more prone to PTSD than adults following natural disasters.12 The prevalence of PTSD appears to be related to the severity of the natural disaster and the proximity of the child or adolescent to the event.12 Studies in children following hurricanes have shown the prevalence rate of PTSD has ranged from 7% to 90% in severely affected regions in Nicaragua following hurricane Mitch.14 The symptoms of PTSD can be present for a long period after the hurricane; 12% children had severe symptoms of PTSD 10 months after hurricane Andrew.15 It is important therefore to recognise that the health effects of hurricanes can last well beyond the initial period of impact.

CUBA
In the summer of 2008, over a period of 3 weeks, two category 4 hurricanes (Gustav and Ike) caused over 200 deaths in the Caribbean and the USA.16 17 The two hurricanes were at their greatest intensity (category 4) in Cuba and caused widespread destruction to buildings, livestock and crops. Hurricane Ike alone damaged over 300 000 homes in Cuba.17 Extensive damage to crops has been reported, and the economic cost to Cuba has been estimated as US$3–4 billion.17 The two hurricanes were of far lower intensity (categories 1 and 2) when they passed through Haiti and the USA.

Despite the fact that Cuba experienced the hurricanes at their greatest intensity, there were only seven deaths throughout Cuba.16 17 In contrast, there were over 100 deaths in Haiti and over 30 in the USA.16 17 Over the last 50 years, Cuba has managed to reduce significantly the number of deaths following hurricanes.18 19 Hurricane Flora in 1963 resulted in the deaths of over 1200 people in Cuba.19 Since then, Cuba has introduced early warning systems alongside evacuation. Hurricane Ike passed directly through the Province of Camagüey, and the steps taken to protect the health of children and adults are important for other countries.

WARNING AND PREPARATION
Because hurricanes originate in the middle of oceans, it is several days before the hurricane reaches land, and this allows governments to take action to protect human life. Cuba has an excellent meteorological institute which, in conjunction with US scientists, projects

---

1Children’s Hospital, Camagüey, Cuba
2Academic Division of Child Health, University of Nottingham, Derbyshire Children’s Hospital, Derby, UK
Correspondence to Professor Imti Choonara, Academic Division of Child Health, The Medical School, University of Nottingham, Derbyshire Children’s Hospital, Uttoxeter Road, Derby DE22 3DT, UK; imti.choonara@nottingham.ac.uk

This paper is freely available online under the BMJ Journals unlocked scheme, see http://adc.bmj.com/info/unlocked.dtl
the likely paths of hurricanes. The benefits of universal education and eradica-
tion of illiteracy are that the population is aware of the risks associated with
hurricanes and understands government warnings. The importance of issuing
early warnings to the population cannot be overemphasised and has been shown
to be effective in reducing deaths for a variety of extreme weather events. It is
important to recognise that Cuba has a population with a very high level of civil
participation. The majority of the population are members of different mass
organisations, and there is a strong sense of community spirit.

Hurricane awareness is taught in schools, and 72 h prior to a hurricane, national
media issue alerts are given while civil protection committees check evacuation
plans and shelters. Following hurricane Dennis in 2005, which resulted in
17 deaths within Cuba, a greater awareness of the risks associated with hurri-
canes has been emphasised to the Cuban population. Forty-eight hours prior to
the hurricane, authorities inform high-risk areas and evacuation commences.
Prior to hurricane Ike, 2.6 million people (23% of the population of Cuba) were
evacuated and housed in shelters.

**PREPARATION IN CAMAGÜÉY PROVINCE**

Prior to the hurricane reaching Camagüey province, which has a population of just under 800,000,
senior health professionals identified groups that were at the greatest risk.
This included approximately 300 children with significant medical problems,
8000 infants and 4000 pregnant women. Children were discharged from
the hospital where appropriate, and the emergency departments were prepared
for admissions. Paediatric health professionals were allocated to each of the evacuation centres.
In the 24 h following hurricane Ike, there were over 500 emergency cases presenting to
the Children’s Hospital in Camagüey. Ninety-six of these children required
admission, and four required surgery.

**RECUPERATION STAGE**

Healthcare following the hurricane is essential. In particular, the importance of hygiene and sanitation was
emphasised to minimise the increase in acute gastroenteritis. Following the hurricane, there was a 10% increase in gastroen-
teritis. Within a week of the hurricane, all 8000 infants in Camagüey Province
were visited in their homes by the family doctor, nurse or other health profession-
als. This was only possible because Cuba has one of the best primary healthcare systems in the world with the
highest ratio of doctors per capita worldwide. Each family doctor and nurse is responsible for between 120 and
160 families. Health professionals kept a special lookout for mental health problems in children following the hur-
rricane, as it is recognised that these are significant problems.

**CONCLUSIONS**

The economic damage caused by hurricanes Gustav and Ike (two category four hurricanes) to Cuba was substan-
tial. However, by a combination of early warnings and preparation along-
side the evacuation of almost a quarter of the population of Cuba, only seven lives were lost (box 1). Both Jamaica and
the Dominican Republic have used the mass media in a similar manner to Cuba to try and increase awareness among individuals of the dangers associated
with hurricanes and how appropriate preparation can reduce casualties. Equally important as preparation prior to the hurricane is ensuring the provi-
sion of shelter, food and water alongside healthcare after the hurricane for all individuals in affected areas (box 1). This should be provided by the gov-
ernment of the affected country and is easier to provide if there is universal healthcare. As extreme weather events are likely to increase with climate change, it is important that other countries take on board the Cuban experi-
ence in order to minimise the loss of human lives.

**Box 1 Measures to minimise casualties for hurricanes**

**Before the hurricane**
- Early warning and preparation of population
- Organised evacuation
- Identification of groups at risk

**After the hurricane**
- Provision of shelter, food and water
- Provision of healthcare, especially to groups at risk

**REFERENCES**

19. Reed G. You can’t stop the rain: José Betancourt, MD, *MEDICC Review 2010* 10:14–16

**Competing interests** None. Provenance and peer review Commissioned; externally peer reviewed. Accepted 28 July 2010.
Hurricanes and child health: lessons from Cuba

Deybis Sánchez Miranda and Imti Choonara

Arch Dis Child published online September 22, 2010

Updated information and services can be found at: http://adc.bmj.com/content/early/2011/02/24/adc.2009.178145

References
This article cites 18 articles, 4 of which you can access for free at: http://adc.bmj.com/content/early/2011/02/24/adc.2009.178145#BIBL

Open Access
This paper is freely available online under the BMJ Journals unlocked scheme, see http://adc.bmj.com/info/unlocked.dtl

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections
Articles on similar topics can be found in the following collections

- Open access (206)
- Anxiety disorders (including OCD and PTSD) (28)
- Child and adolescent psychiatry (paediatrics) (683)
- Injury (437)
- Trauma (434)
- Epidemiologic studies (1818)
- Foodborne infections (92)
- Infection (gastroenterology) (83)
- Travel medicine (100)
- Tropical medicine (infectious diseases) (119)

Notes

To request permissions go to: http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to: http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to: http://group.bmj.com/subscribe/