

# Regulating construction to save lives



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# Background

- Deaths and injuries from natural disasters and climate change can be reduced or prevented
- Building regulations and their implementation and enforcement help reduce and prevent such harm
- Global 749,000 earthquake deaths (1996-2015)



# Background

Focus on two New Zealand major earthquakes:

- 1931 Hawke's Bay (population under 50,000)
  - 2011 Christchurch (pop: 450,000)
- NZ earthquakes of over 7.5 Richter from 1848 and before
  - Up to 1931, fire regulations encouraged masonry walls for shops & large buildings



# Aims

- To contrast the severe injury and mortality impacts of the earthquakes
- Explore the health implications of:
  - Building construction
  - Building regulation

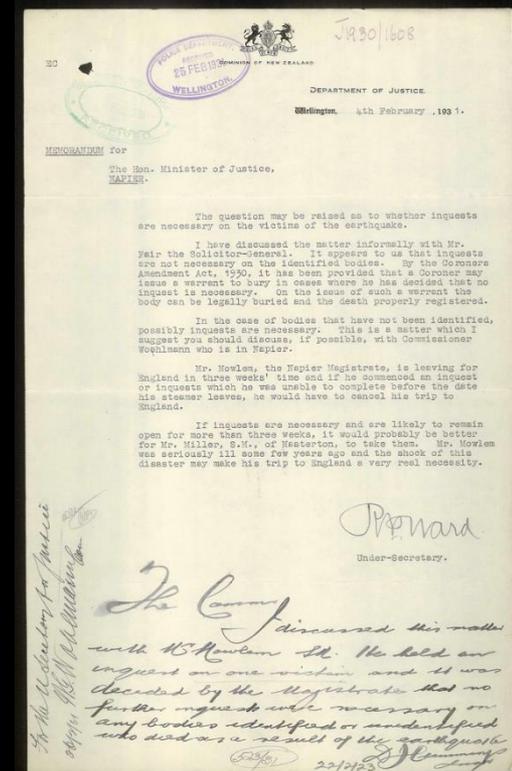
Post 2011 Christchurch earthquake



# Methods

## Compilation and analysis of hospitalisations and deaths from:

- Archival data for the 1931 earthquake



- Published data for the 2011 earthquake

# Results: Hospitalisation

## Hawkes Bay 1931

- 662 plus hospitalisations
- Hospitalisation injury rate: 8.2 per 1000 population



## Christchurch 2011

- 141 hospitalisations (other than ED)
- Hospitalisation injury rate: 0.32 per 1000 pop.



# Results: Deaths

## Hawkes Bay 1931

- 256 earthquake-attributable deaths – 5.6/1000

## Christchurch 2011

- 185 deaths – a death rate of 0.41/1000



# Results: Multi-death buildings



## Hawkes Bay

- 7 buildings with 10+ deaths (from collapse and fire)
- 17 buildings associated with 3+ deaths (accounting for 64% of all deaths)

## Christchurch

- 114 of 185 deaths (62%) occurred in or because of one commercial building previously damaged in a 2010 earthquake

# Results: Multi-death buildings

## Hawkes Bay

- Many of these buildings were multi-story and involved unreinforced masonry
- 18% of deaths from masonry falling into streets (also a primary cause/death in Christchurch streets)
- 35% of deaths occurred in government buildings (central/local – eg a hospital and schools)
- Deaths in homes (more wood construction and single stories) were uncommon (4% of deaths)

## Discussion: Methods

- The definitions for hospitalisations and deaths vary slightly for 1931 and 2011
- Different contexts of geography, geology and emergency medicine

## Discussion: Results

In 1931 quake, compared to 2011:

- Deaths per 1000 were at least **13** times greater
- Hospitalised injury rate at least **25** times greater

# Discussion: Policy implications

- Higher risks from some construction materials – unreinforced brick/stone vs wood
- Christchurch experience, *even with regulations*:
  - need for the proper implementation of regulations
  - appropriate caution about buildings weakened by previous earthquakes
- Politics of regulation
  - Short term v long term cost-saving
  - Transparency & independence of law *implementation*

# Discussion: Policies and policymaking

- Regulations involve trade-offs (building costs +)
- Regulations can be very cost-effective:
  - to stabilise brick chimneys
  - minimise unreinforced masonry above streets
- Risk management tools: eg, **pre-mortem**
  - Imagines a decision *now* has led to unforeseen failure, and works backwards to see what could lead to that result

