Abstract
Children need to understand and be prepared for natural hazard events as much as adults. Children are vectors of hazard education, having the ability to educate those around them. This study investigated natural hazard risk perceptions, levels of preparedness and participation in education programmes of children from a school in Christchurch, New Zealand. Although hazard education programmes had been attended by a majority of the children hazard awareness was only fair and reported levels of household preparedness were low. Continuing hazards education is needed to increase understanding of hazards and to improve household preparation in the Christchurch community.

Introduction
This is a study of children’s natural hazard risk perceptions, levels of preparedness and participation in education programmes. Children have influence on their community and their communities have influence on them. Children can educate those around them about civil defence preparedness through involving them with homework exercises or assignments, or general discussion. Studies evaluating the effectiveness of using student-to-parent communication of school curriculum to increase awareness and/or promote behavioural change among both the students and their families (Crawford et al., 1990; McDevitt and Chaffee, 2000; Ronan and Johnston, 2001b; Saphir and Chaffee, 2002) have proven this method to be successful. The community’s influence on children may primarily come from their parents and the media. Children’s level of fear towards a natural hazard can be biased by their parents’ fear. Muris et al. (1996) found that children of mothers who often express their fears exhibit high fear levels, children of mothers who never express their fears have low fear levels, while children of mothers who sometimes express their fears fall in between. Following a disaster, children look to their parents’ reactions to determine its seriousness and by witnessing a parent distressed by the situation the child will likely become fearful (Deering, 2000). Fearful children following a disaster have parents who tend also to report (Allen & Rosse 1998, Ronan et al. 2000) and be perceived by children (Ronan, 1997) as more fearful.

Educating children on civil defence matters through hazard education programmes is intended to decrease the child’s vulnerability and promote personal, family and community resilience. Knowing the types of hazards, their recurrence intervals and appropriate protective behaviour should help mentally prepare a child for a hazard event, helping them understand what happens and that they have the power to help themselves. Knowledge of protective behaviour will decrease a child’s vulnerability if alone or unsupervised and will decrease a family’s vulnerability as the child can act independently and, depending on age, can help others who are unaware of the correct actions to take. Some protective behaviours will increase resilience, such as closing doors in a fire and shutting windows in a volcanic eruption, as they are intended to prevent damage to a house, reducing loss and destruction and enabling faster rehabilitation. Not only does this facilitate resilience in a child and their family, as they can more easily return to a familiar lifestyle, but it also increases the resilience of their community by reducing the drainage of resources and helping the community to return to its prior level of functioning more quickly.

This study supplements other investigations recently undertaken in New Zealand and Washington State that have measured community risk perceptions, hazard awareness and preparedness and identified factors contributing to vulnerability in communities (Johnston and Benton, 1998; Johnston et al., 2001; Johnston and Houghton, 1995; Ronan and Johnston, 2001b; Ronan and Johnston, 2003).
Method

Participants and setting

The 102 participating students were from Cobham Intermediate School in Christchurch (54 boys, 47 girls, and one did not report gender). The ages of the children ranged from 10 to 12 years (Mean age = 10.9; SD = 0.4; Modal age = 11). Rather than ‘ethnicity’, the children were asked if they had always lived in Christchurch; a majority (n=54) of the children have always lived in Christchurch, whereas other children have lived in other parts of New Zealand (n=15), Asia (n=14), North America (n=5), Europe (n=5), Australia (n=3), other places (n=5) and 1 did not report.

Survey

The questionnaire, based on one developed for an Auckland study (Ronan and Johnston, 2001a) was designed to assess children’s level of awareness, risk perceptions, factual knowledge and physical preparedness for hazards and mass emergencies (i.e. floods, storms with high winds, fires, earthquakes, volcanic eruptions, tsunami, heavy snow storms and tsunami). It also assessed children’s prior exposure to a) specific hazards and b) education programmes designed to increase awareness, knowledge and preparedness that were provided either by Emergency Management or by school teachers.

Procedure

The survey was administered within four classes by their teachers between the 18th and 21st June, 2003. Children were encouraged to ask questions if they did not understand a particular item. Questionnaires were returned to the teachers and forwarded to the researchers.

Results

Hazard awareness and risk perceptions

The children were asked to identify the two most likely hazards that could affect them in Christchurch. Table 1 shows that the hazards children felt most likely to affect them were storms with high winds, and earthquakes; these were followed in order of decreasing likelihood by grass or forest fires then floods. Perceived as least likely were volcanic eruptions, tsunami, heavy snow storms and tsunami. It also assessed children’s prior exposure to a) specific hazards and b) education programmes designed to increase awareness, knowledge and preparedness that were provided either by Emergency Management or by school teachers.

Children ranked the likelihood of future hazard occurrence and perceived physical risk in the event of each hazard on a 3-point scale (likely = 1, a chance = 2, unlikely = 3). The ranked order of hazards most likely to occur in the future reflected that of the hazards most likely to affect Christchurch with the exceptions of a) heavy snow storms endorsed as more likely to occur than volcanic eruptions, and b) tornados endorsed more than tsunami (both incorrect). The hazards perceived as most likely to cause injury were tornados, by over half the children, followed by earthquakes and volcanic eruptions. Most of the hazards were perceived as having better than ‘a chance’ (mean < 2.0) of causing injury except for floods and heavy snow storms.

A significant majority of children correctly identified that the Christchurch area does not have any active volcanoes (Table 3). However 11% of the children did perceive there to be active volcanoes in the area which accounts for volcanic eruptions not being the hazard least considered likely to affect Christchurch. Less than a quarter of the children know what the Alpine Fault is, but of those who do two-thirds are aware that Christchurch could be affect by an earthquake caused by the fault. Large earthquakes (~ Magnitude 8) occur on the central Alpine Fault at roughly on average 500 year intervals with the last event approximately 550 years ago. Shaking intensities in Christchurch generated by a central Alpine Fault event would be MMVII to MMVIII. Not only would there be direct damage caused by the event, but the activity of the nearby active faults in the Canterbury foothills and mountain areas may be increased in the following years (Christchurch Engineering Lifelines Group, 1997).

Table 1. Rank order of the two hazards perceived to be the most likely in Christchurch

<table>
<thead>
<tr>
<th>Hazard</th>
<th>% (n = 102)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm with high winds</td>
<td>54.4</td>
</tr>
<tr>
<td>Earthquake</td>
<td>53.4</td>
</tr>
<tr>
<td>Grass or forest fires</td>
<td>37.9</td>
</tr>
<tr>
<td>Flood</td>
<td>27.2</td>
</tr>
<tr>
<td>Volcanic eruption</td>
<td>6.8</td>
</tr>
<tr>
<td>Large sea wave (tsunami)</td>
<td>2.9</td>
</tr>
<tr>
<td>Tornado</td>
<td>1.0</td>
</tr>
<tr>
<td>Heavy snow storm</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Hazard exposure and factual knowledge of risk mitigation and safety behaviours

Earthquakes are the hazard reported to have been experienced by the most children (Table 4). A majority also report to having been in a storm with high winds, seen a volcanic eruption on television or seen a house or building on fire. Fortunately, only a minority (<20%) have had first hand experience with a fire in their home or had their house flooded.

Table 2. Hazards perceived as likely to occur and likely to cause injury (likely = 1, a chance = 2, unlikely = 3) (n = 102) % endorsing likely to occur in future Mean SD % endorsing likely to cause injury Mean SD

<table>
<thead>
<tr>
<th>Hazard</th>
<th>% endorse</th>
<th>Mean</th>
<th>SD</th>
<th>% endorse</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storm with high winds</td>
<td>54.4</td>
<td>1.5</td>
<td>0.6</td>
<td>28.2</td>
<td>1.9</td>
<td>0.7</td>
</tr>
<tr>
<td>Earthquake</td>
<td>48.5</td>
<td>1.6</td>
<td>0.6</td>
<td>46.6</td>
<td>1.6</td>
<td>1.0</td>
</tr>
<tr>
<td>Grass or forest fires</td>
<td>48.5</td>
<td>1.6</td>
<td>0.7</td>
<td>33.0</td>
<td>1.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Flood</td>
<td>19.4</td>
<td>2.0</td>
<td>0.7</td>
<td>24.3</td>
<td>2.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Heavy snow storm</td>
<td>9.7</td>
<td>2.4</td>
<td>0.7</td>
<td>19.4</td>
<td>2.1</td>
<td>0.7</td>
</tr>
<tr>
<td>Volcanic eruption</td>
<td>6.8</td>
<td>2.7</td>
<td>0.6</td>
<td>44.7</td>
<td>1.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Tornado</td>
<td>5.8</td>
<td>2.6</td>
<td>0.6</td>
<td>51.5</td>
<td>1.7</td>
<td>0.8</td>
</tr>
<tr>
<td>Large sea wave (tsunami)</td>
<td>5.8</td>
<td>2.6</td>
<td>0.6</td>
<td>37.9</td>
<td>1.8</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Table 3. Volcano and Alpine Fault awareness

<table>
<thead>
<tr>
<th>Question</th>
<th>% endorsing “Yes”</th>
<th>% endorsing “No”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the Christchurch area have any active volcanoes?</td>
<td>11</td>
<td>84</td>
</tr>
<tr>
<td>Do you know what the Alpine Fault is?</td>
<td>20</td>
<td>75</td>
</tr>
<tr>
<td>If yes, would an earthquake caused by the Alpine Fault affect Christchurch?</td>
<td>67</td>
<td>33</td>
</tr>
</tbody>
</table>

Tables 5 through 11 present the children’s reported knowledge of risk mitigation and safety behaviours for floods, volcanic eruptions, earthquakes, storms with high winds, storms with heavy snowfalls and house fires. The items highlighted in dark yellow are the safety-related responses encouraged by Civil Defence and the items highlighted in light yellow are the other responses considered correct. For all hazards asked nearly three-quarters of the children knew at least one safety-related response encouraged by Civil Defence for each hazard. For volcanic eruptions and earthquakes there is a second encouraged response; these were known by 44% and 66% of children respectively. Other actions considered correct were not as well known, ranging between 20%–55% of the children choosing the action. Incorrect actions were chosen by less than 20% of the children with the exceptions of closing all windows in storms with high winds, which was selected by 71%, and finding something to hold on to when outside during an earthquake, selected by 32%. Table 12 shows that tsunami and storms with heavy snowfalls were the hazards that had a majority of the children choosing only the correct actions for (i.e. knew what to do and what not to do). A third of the children selected only the correct responses for earthquakes and house fires. Correct actions for volcanic eruptions, floods and storms with high winds were poorly known (by 17% of children or less). Only one child consistently chose the correct actions for all the hazards.
Table 5. Correct actions knowledge for floods (dark yellow are the safety-related responses encouraged by Civil Defence, light yellow are the other responses considered correct)

<table>
<thead>
<tr>
<th>FLOODES % endorsed (n=102)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Move to area higher than flood level</td>
<td>85</td>
</tr>
<tr>
<td>Listen to the radio</td>
<td>53</td>
</tr>
<tr>
<td>Stay inside and wait to be told what to do</td>
<td>26</td>
</tr>
<tr>
<td>Go outside and look at the rising water</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 6. Correct actions knowledge for volcanic eruptions

<table>
<thead>
<tr>
<th>VOLCANIC ERUPTION % endorsed (n=102)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>If building is in immediate danger, evacuate at once</td>
<td>83</td>
</tr>
<tr>
<td>If building is not in immediate danger, stay inside</td>
<td>44</td>
</tr>
<tr>
<td>Close all the windows and doors</td>
<td>54</td>
</tr>
<tr>
<td>Listen to the radio</td>
<td>55</td>
</tr>
<tr>
<td>Open all windows and doors</td>
<td>6</td>
</tr>
<tr>
<td>Go outside and look at the eruption</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7. Correct actions knowledge for house fires

<table>
<thead>
<tr>
<th>HOUSE FIRE % endorsed (n=102)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Leave by the shortest route</td>
<td>95</td>
</tr>
<tr>
<td>Close any doors that you pass through</td>
<td>41</td>
</tr>
<tr>
<td>Listen to the radio</td>
<td>12</td>
</tr>
<tr>
<td>Open all doors and windows</td>
<td>8</td>
</tr>
<tr>
<td>Stay inside and wait to be told what to do</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 8. Correct actions knowledge for earthquakes

<table>
<thead>
<tr>
<th>EARTHQUAKE % endorsed (n=102)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay inside and take cover in a doorway, under beds or tables</td>
<td>89</td>
</tr>
<tr>
<td>Curl into a turtle shape and protect your head (Duck, cover, hold)</td>
<td>66</td>
</tr>
<tr>
<td>If you are outside, find a tree or something sturdy to grab on to</td>
<td>32</td>
</tr>
<tr>
<td>Stay right where you are and wait for it to be over</td>
<td>3</td>
</tr>
<tr>
<td>Run outside</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 9. Correct actions knowledge for storms with high winds

<table>
<thead>
<tr>
<th>STORM WITH HIGH WINDS % endorsed (n=102)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay inside</td>
<td>79</td>
</tr>
<tr>
<td>Open window on side of house away from the wind (sheltered side)</td>
<td>20</td>
</tr>
<tr>
<td>Close all windows</td>
<td>71</td>
</tr>
<tr>
<td>Do nothing, just wait for it to be over</td>
<td>11</td>
</tr>
<tr>
<td>Run outside and take cover</td>
<td>6</td>
</tr>
<tr>
<td>Open window on side of house closest to wind (unsheltered side)</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 10. Correct actions knowledge for tsunami

<table>
<thead>
<tr>
<th>TSUNAMI % endorsed (n=102)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Go at least 1km inland or 35m above sea level</td>
<td>92</td>
</tr>
<tr>
<td>Stay inside</td>
<td>18</td>
</tr>
<tr>
<td>Run outside and take cover</td>
<td>7</td>
</tr>
<tr>
<td>Watch for the sea wave to come</td>
<td>1</td>
</tr>
<tr>
<td>Go to the beach to inspect the effects of the tsunami</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 11. Correct actions knowledge for storm with heavy snowfalls

<table>
<thead>
<tr>
<th>STORM WITH HEAVY SNOWFALLS % endorsed (n=102)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay inside and listen to the radio</td>
<td>74</td>
</tr>
<tr>
<td>Prepare for electrical failures</td>
<td>74</td>
</tr>
<tr>
<td>Run outside and play in the snow</td>
<td>15</td>
</tr>
<tr>
<td>Encourage your family to go driving in the snow to see how bad it is</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 12. Percentages of children who chose only correct actions

<table>
<thead>
<tr>
<th>HAZARD % children choosing completely correct actions (n=102)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsunami</td>
<td>70</td>
</tr>
<tr>
<td>Storm with heavy snowfall</td>
<td>53</td>
</tr>
<tr>
<td>House fire</td>
<td>34</td>
</tr>
<tr>
<td>Earthquake</td>
<td>33</td>
</tr>
<tr>
<td>Volcanic eruption</td>
<td>17</td>
</tr>
<tr>
<td>Flood</td>
<td>15</td>
</tr>
<tr>
<td>Storm with high winds</td>
<td>9</td>
</tr>
</tbody>
</table>
Hazard education

Table 13 presents information on the proportions of children who participated in education programmes aimed at hazard awareness and preparedness, and follow-up behaviours of these programmes. Approximately three-quarters of the children reported participating in a hazard education programme. These programmes were generally carried out in school by Civil Defence personnel or a teacher. The majority of children reported participating in a programme before 2001 and in 2002 and with just over a quarter participating in a programme in 2003. The mean number of hazard education programmes participated in was 2.9 (SD 1.4). The majority of children have been encouraged to discuss hazards/emergencies with their parents and virtually the same proportion have discussed what they learned in the programme with their parents. Following these discussions nearly two-thirds of the parents wanted to discuss further how to be prepared.

Table 13. Information on hazard education programme participation

| % endorsed (n=102) | Participated in hazard education 75 | In School 95 | Outside School 22 | Education by teacher 53 | Education by civil defence 71 | Education by other 19 | Participated in education in 2003 30 | Participated in education in 2002 52 | Participated in education in 2001 47 | Participated in education before 2001 55 | Encouraged to discuss hazards with parents 59 | Discussed education programme with parents 58 | Parents want to discuss how to be prepared 63 |

Preparedness

Unsurprisingly, most of the children have participated in emergency practices at school (Table 14), as fire drills are compulsory in schools. In general, less than a third of the children have participated in emergency practices at home and know of emergency plans. Table 15 lists preparedness measures and hazard adjustment adoptions recommended by Civil Defence and the Fire Service. A majority of the children reported having key items such as torches, first aid kits, smoke detectors, a store of emergency equipment, radio and spare batteries and someone who knows how to provide first aid. Key earthquake hazard adjustments such as strapping water heaters, latching cabinet doors, adding lips to shelves etc. are reported by the children to be less adopted (35% or less). This may be a reflection of the children’s age and knowledge/awareness of such items in the home, but does reflect a trend found in surveys of older children and adults (e.g. Johnston et al., 2001; Milet and Darlington, 1995; Russell et al., 1995). The essential emergency kit Civil Defence encourages all households to have consists of a torch, food and water for three days, transistor radio and batteries, and a first-aid kit all stored together ready for an emergency. Less that 15% of children reported having all the requirements for an emergency kit.

Table 14. Information on preparedness plans and practices

<table>
<thead>
<tr>
<th>Preparedness plans and practices</th>
<th>% yes responses (n=102)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family emergency plan</td>
<td>37</td>
</tr>
<tr>
<td>Practice for an emergency at home</td>
<td>30</td>
</tr>
<tr>
<td>Practice for an emergency at school</td>
<td>86</td>
</tr>
<tr>
<td>Plan showing exits, assembly areas, utility switches</td>
<td>16</td>
</tr>
<tr>
<td>Plan where to meet or leave a message in an emergency</td>
<td>23</td>
</tr>
<tr>
<td>Plan for collection from school in an emergency</td>
<td>32</td>
</tr>
</tbody>
</table>

Nearly three-quarters of the children knew at least one safety-related response encouraged by Civil Defence.
### Table 15. Preparedness measures and hazard adjustment adoptions

<table>
<thead>
<tr>
<th>Preparedness Measures</th>
<th>% endorsed (n=102)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have a torch</td>
<td>85</td>
</tr>
<tr>
<td>Have a first aid kit</td>
<td>80</td>
</tr>
<tr>
<td>Have a smoke detector</td>
<td>78</td>
</tr>
<tr>
<td>Someone in family has learned to provide first aid</td>
<td>68</td>
</tr>
<tr>
<td>Store emergency equipment (e.g. torches, fire extinguisher, first-aid kit)</td>
<td>57</td>
</tr>
<tr>
<td>Have a transistor radio and spare batteries</td>
<td>55</td>
</tr>
<tr>
<td>Someone in family has learned how to put out fires</td>
<td>49</td>
</tr>
<tr>
<td>Store hazardous materials safely</td>
<td>44</td>
</tr>
<tr>
<td>Stockpile water and food for three days</td>
<td>36</td>
</tr>
<tr>
<td>Strap water heater</td>
<td>35</td>
</tr>
<tr>
<td>Find out if you are in an area particularly vulnerable to a natural or other kind of hazard (e.g. earthquake, flood)</td>
<td>34</td>
</tr>
<tr>
<td>Put strong latches on cabinet doors</td>
<td>31</td>
</tr>
<tr>
<td>Pick an emergency contact person outside your area</td>
<td>31</td>
</tr>
<tr>
<td>Have a fire extinguisher</td>
<td>27</td>
</tr>
<tr>
<td>Rearrange breakable household items</td>
<td>20</td>
</tr>
<tr>
<td>Bolt house to foundation</td>
<td>20</td>
</tr>
<tr>
<td>Install flexible piping to gas appliances</td>
<td>16</td>
</tr>
<tr>
<td>Brace house walls</td>
<td>13</td>
</tr>
<tr>
<td>Put spanner or wrench by gas turn-off valve</td>
<td>12</td>
</tr>
<tr>
<td>Add lips to shelves to keep things from sliding off</td>
<td>12</td>
</tr>
<tr>
<td>Arranged bracing for pile foundation</td>
<td>5</td>
</tr>
<tr>
<td>Have “Emergency Kit”</td>
<td>15</td>
</tr>
</tbody>
</table>

### Table 16. Correct actions knowledge for floods (dark yellow are the safety-related responses encouraged by Civil Defence, light yellow are the other responses considered correct)

<table>
<thead>
<tr>
<th>FLOODS</th>
<th>Christchurch % (n=102)</th>
<th>Auckland % (n=409)</th>
<th>WA % (n=327)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move to area higher than flood level</td>
<td>85</td>
<td>75</td>
<td>83</td>
</tr>
<tr>
<td>Listen to the radio</td>
<td>53</td>
<td>61</td>
<td>41</td>
</tr>
<tr>
<td>Stay inside and wait to be told what to do</td>
<td>26</td>
<td>39</td>
<td>18</td>
</tr>
<tr>
<td>Go outside and look at the rising water</td>
<td>0</td>
<td>10</td>
<td>21</td>
</tr>
</tbody>
</table>

### Table 17. Correct actions knowledge for volcanic eruptions

<table>
<thead>
<tr>
<th>VOLCANIC ERUPTION</th>
<th>Christchurch % (n=102)</th>
<th>Auckland % (n=409)</th>
<th>WA % (n=327)</th>
</tr>
</thead>
<tbody>
<tr>
<td>If building is in immediate danger, evacuate at once</td>
<td>83</td>
<td>62</td>
<td>79</td>
</tr>
<tr>
<td>If building is not in immediate danger, stay inside</td>
<td>44</td>
<td>56</td>
<td>54</td>
</tr>
<tr>
<td>Close all the windows and doors</td>
<td>54</td>
<td>75</td>
<td>56</td>
</tr>
<tr>
<td>Listen to the radio</td>
<td>55</td>
<td>68</td>
<td>51</td>
</tr>
<tr>
<td>Open all windows and doors</td>
<td>6</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Go outside and look at the eruption</td>
<td>1</td>
<td>8</td>
<td>29</td>
</tr>
</tbody>
</table>

### Table 18. Correct actions knowledge for house fires

<table>
<thead>
<tr>
<th>HOUSE FIRE</th>
<th>Christchurch % (n=102)</th>
<th>Auckland % (n=409)</th>
<th>WA % (n=327)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leave by the shortest route</td>
<td>95</td>
<td>79</td>
<td>93</td>
</tr>
<tr>
<td>Close any doors that you pass through</td>
<td>41</td>
<td>50</td>
<td>32</td>
</tr>
<tr>
<td>Open all doors and windows</td>
<td>8</td>
<td>29</td>
<td>14</td>
</tr>
<tr>
<td>Stay inside and wait to be told what to do</td>
<td>3</td>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

### Schools Comparison

Schools in Auckland and Washington State, USA have participated in similar studies (Johnston et al., 2001; Ronan and Johnston, 2001a). Following is a comparison of the results of the three regions (Tables 16 through 24) to see how Christchurch children’s awareness, preparedness and education compare to the other regions’ children. Only correlated questions have been included as the survey questions varied due to the regions’ different hazard environments.

### Hazard exposure and factual knowledge of risk mitigation and safety behaviours

The Christchurch children generally have better knowledge of vital safety behaviours (dark yellow) than the children from the other regions. Auckland children had better knowledge of the other safety behaviours (light yellow) compared with Christchurch and Washington children. Christchurch children, however, consistently chose fewer incorrect responses than the other children.
Table 19. Correct actions knowledge for earthquakes

<table>
<thead>
<tr>
<th>EARTHQUAKE</th>
<th>Christchurch % (n=102)</th>
<th>Auckland % (n=409)</th>
<th>WA % (n=327)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay inside and take cover in a doorway, under beds or tables</td>
<td>89</td>
<td>86</td>
<td>64</td>
</tr>
<tr>
<td>Curl into a turtle shape and protect your head (Duck, cover, hold)</td>
<td>66</td>
<td>58</td>
<td>67</td>
</tr>
<tr>
<td>Stay right where you are and wait for it to be over</td>
<td>3</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Run outside</td>
<td>1</td>
<td>5</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 20. Correct actions knowledge for storms with high winds

<table>
<thead>
<tr>
<th>STORM WITH HIGH WINDS</th>
<th>Christchurch % (n=102)</th>
<th>Auckland % (n=409)</th>
<th>WA % (n=327)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay inside</td>
<td>79</td>
<td>78</td>
<td>78</td>
</tr>
<tr>
<td>Open window on side of house away from the wind (sheltered side)</td>
<td>19</td>
<td>37</td>
<td>9</td>
</tr>
<tr>
<td>Close all windows</td>
<td>71</td>
<td>58</td>
<td>50</td>
</tr>
<tr>
<td>Do nothing, just wait for it to be over</td>
<td>11</td>
<td>21</td>
<td>30</td>
</tr>
<tr>
<td>Run outside and take cover</td>
<td>6</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Open window on side of house closest to wind (unsheltered side)</td>
<td>3</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 21. Correct actions knowledge for tsunami

<table>
<thead>
<tr>
<th>TSUNAMI</th>
<th>Christchurch % (n=102)</th>
<th>Auckland % (n=409)</th>
<th>WA % (n=327)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Go at least 1km inland or 35m above sea level</td>
<td>92</td>
<td>76</td>
<td>88</td>
</tr>
<tr>
<td>Stay inside</td>
<td>18</td>
<td>29</td>
<td>14</td>
</tr>
<tr>
<td>Run outside and take cover</td>
<td>7</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>Watch for the sea wave to come</td>
<td>1</td>
<td>5</td>
<td>14</td>
</tr>
</tbody>
</table>

Hazard education

A higher percentage of Christchurch children have participated in hazard education programmes than children from the other regions (Table 22). The majority of this education was provided by civil defence personnel, compared to a nearly equal share of CD and teachers in Auckland and primarily teachers in Washington State. More Christchurch children were encouraged to discuss hazards with their parents, and did so, compared to those from Auckland, but less than the children from Washington State. Less Christchurch parents were reported to want to discuss further how to be prepared than Washington State parents.

Table 22. Information on hazard education programme participation across the three regions

<table>
<thead>
<tr>
<th></th>
<th>Christchurch % (n=102)</th>
<th>Auckland % (n=409)</th>
<th>WA % (n=327)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participated in hazard education</td>
<td>75</td>
<td>70</td>
<td>65</td>
</tr>
<tr>
<td>In School</td>
<td>95</td>
<td>n/a</td>
<td>97</td>
</tr>
<tr>
<td>Outside School</td>
<td>22</td>
<td>n/a</td>
<td>21</td>
</tr>
<tr>
<td>Education by teacher</td>
<td>53</td>
<td>49</td>
<td>93</td>
</tr>
<tr>
<td>Education by civil defence</td>
<td>71</td>
<td>47</td>
<td>9</td>
</tr>
<tr>
<td>Education by other</td>
<td>20</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Encouraged to discuss hazards with parents</td>
<td>59</td>
<td>43</td>
<td>77</td>
</tr>
<tr>
<td>Discussed education programme with parents</td>
<td>58</td>
<td>29</td>
<td>61</td>
</tr>
<tr>
<td>Parents want to discuss how to be prepared</td>
<td>63</td>
<td>n/a</td>
<td>82</td>
</tr>
</tbody>
</table>

Preparedness

Christchurch children have reported similar to lower numbers of plans and practices than the other children. Preparedness measures could only be compared with those of Washington State Children. For every measure consistently fewer Christchurch children reported having the item.
### Table 23. Information on preparedness plans and practices across the three regions

<table>
<thead>
<tr>
<th>Preparedness plans and practices</th>
<th>Christchurch % (n=102)</th>
<th>Auckland % (n=409)</th>
<th>WA % (n=327)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family emergency plan</td>
<td>37</td>
<td>29</td>
<td>33</td>
</tr>
<tr>
<td>Practice for an emergency at home</td>
<td>30</td>
<td>26</td>
<td>32</td>
</tr>
<tr>
<td>Practice for an emergency at school</td>
<td>86</td>
<td>~80</td>
<td>93</td>
</tr>
<tr>
<td>Plan showing exits, assembly areas, utility switches</td>
<td>16</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td>Plan where to meet or leave a message in an emergency</td>
<td>23</td>
<td>34</td>
<td>36</td>
</tr>
<tr>
<td>Plan for collection from school in an emergency</td>
<td>32</td>
<td>52</td>
<td>55</td>
</tr>
</tbody>
</table>

### Table 24. Comparison of preparedness measures and hazard adjustment adoptions

<table>
<thead>
<tr>
<th>Preparedness measures</th>
<th>Christchurch % (n=102)</th>
<th>WA % (n=327)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have a torch</td>
<td>85</td>
<td>94</td>
</tr>
<tr>
<td>Have a first aid kit</td>
<td>80</td>
<td>88</td>
</tr>
<tr>
<td>Have a smoke detector</td>
<td>78</td>
<td>95</td>
</tr>
<tr>
<td>Someone in family has learned to provide first aid</td>
<td>68</td>
<td>75</td>
</tr>
<tr>
<td>Have a transistor radio and spare batteries</td>
<td>55</td>
<td>73</td>
</tr>
<tr>
<td>Someone in family has learned how to put out fires</td>
<td>50</td>
<td>62</td>
</tr>
<tr>
<td>Store hazardous materials safely</td>
<td>44</td>
<td>48</td>
</tr>
<tr>
<td>Stockpile water and food for three days</td>
<td>36</td>
<td>48</td>
</tr>
<tr>
<td>Strap water heater</td>
<td>35</td>
<td>36</td>
</tr>
<tr>
<td>Find out if you are in an area particularly vulnerable to a natural or other kind of hazard (e.g. earthquake, flood)</td>
<td>34</td>
<td>46</td>
</tr>
<tr>
<td>Put strong latches on cabinet doors</td>
<td>31</td>
<td>19</td>
</tr>
<tr>
<td>Pick an emergency contact person outside your area</td>
<td>31</td>
<td>38</td>
</tr>
<tr>
<td>Have a fire extinguisher</td>
<td>27</td>
<td>80</td>
</tr>
<tr>
<td>Rearrange breakable household items</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>Bolt house to foundation</td>
<td>20</td>
<td>33</td>
</tr>
<tr>
<td>Install flexible piping to gas appliances</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>Put spanner or wrench by gas turn-off valve</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Add lips to shelves to keep things from sliding off</td>
<td>12</td>
<td>13</td>
</tr>
</tbody>
</table>

Source: Geological and Nuclear Sciences New Zealand
Summary
The findings from this survey highlight the need for continuing hazards education a) to increase understanding of the hazard types and impacts the Christchurch community could face and b) to improve household preparation. The children's awareness of hazards impacting Christchurch was fairly accurate; however, the awareness of the risk from storms with heavy snow falls and tsunami was very poor. Awareness of the Alpine Fault and the impact of an event greatly needs to be increased considering the level of threat posed to Christchurch and the 'overdue' nature of an earthquake generated along the central Alpine Fault. Vital safety behaviours were well known by the children, with other safety behaviours not as well known. However, incorrect behaviours were rarely chosen, indicating that overall the children generally have a good knowledge of safety behaviours. A significant majority of the children have participated in a hazard education programme, generally at school conducted by Civil Defence personnel. Preparedness plans and practices were reported to be poorly adopted by the children's household. Only emergency practices at school had a majority of children participating. Torches, first aid kits and smoke detectors were the principal preparedness measures reported to have been adopted by the children's families. Less than one fifth of children reported having an emergency kit prepared. Compared to children who have participated in similar studies in Auckland and Washington State, Christchurch children generally have better knowledge of safety behaviours and a greater number have participated in education programmes, but fewer children report having preparedness plans, practices and measures.

Improvement in Christchurch might simply involve adjusting the content and delivery of education programmes. It has been found in other research that an emergency management focused programme that emphasises children's interactions with their parents can increase home preparedness (Ronan & Johnston 2001, 2003). For example, providing children with homework to fill out a home preparedness checklist might be one avenue to translate increased knowledge into useful actions.

References


Awareness of the Alpine Fault and the impact of an event greatly needs to be increased.

Authors
Kirsten Finnis, University of Otago, Dunedin, New Zealand
Sarah Standring, Cobham Intermediate School, Christchurch, New Zealand
David Johnston, Institute of Geological & Nuclear Sciences, Lower Hutt, New Zealand
Kevin Ronan Massey University, Palmerston North, New Zealand
Correspondence to kirstenfinnis@paradise.net.nz or d.johnston@gns.cri.nz