

# How the children coped with the April 2010 Eyjafjallajökull eruption in Iceland

Deanne Bird, Risk Frontiers, Macquarie University, and Guðrún Gísladóttir, University of Iceland, report on research into the use of storytelling and art to help children cope with disaster. 

## ABSTRACT

The Eyjafjallajökull eruption in April 2010 caused severe and long-lasting impacts throughout southern Iceland. This paper explores some of the strategies implemented by adults to help children cope with the ongoing effects. These strategies included reinstating routines and providing activities such as storytelling and art to help children communicate and process their experiences.

## Introduction

Ash fall from the April 2010 Eyjafjallajökull eruption in southern Iceland caused significant economic impacts internationally, with at least a 3.3 billion Euro loss by the airline industry alone (Mazzocchi, Hansstein & Ragona 2010). The eruption, which was located under the glacier also known as Eyjafjallajökull, lasted for 39 days. In addition to ash fall, localised hazards included glacial outburst floods, lightning, rockslides, lahars, and the remobilisation of ash.

While much research has been conducted on the physical attributes of the summit eruption (e.g. Gíslason *et al.* 2011, Gudmundsson *et al.* 2012), few researchers (e.g. Bird & Gísladóttir 2012, Briem 2010) have investigated the societal impacts within Iceland. Moreover, very little has been documented on how children in effected communities coped with the ongoing threat from the volcano. To address this gap, this paper examines strategies implemented by adults to help children cope, prior to, during and after the 2010 Eyjafjallajökull eruption in southern Iceland.

Children are one of the most vulnerable groups in disaster situations (Haynes & Tanner 2014, Ronan, Crellin & Johnston 2012). It is therefore imperative that child-focused disaster risk reduction activities are undertaken to ensure their health, safety and wellbeing. However, children should not be seen as passive victims. Children have the capacity to enact change within the family home (King & Tarrant 2013, Ronan, Crellin & Johnston. 2010, 2012, Ronan

& Johnston 2001, 2003) and the wider community (Haynes, Lassa & Towers 2010, Haynes & Tanner 2014, Mitchell *et al.* 2008, Mitchell, Tanner & Haynes 2009). Moreover, research by Ronan and colleagues has shown that children who have been involved in hazard education campaigns have more realistic perceptions of risk, reduced fears of hazards and increased knowledge of protective behaviours. Furthermore, children who are involved in multiple hazard education campaigns over time are more knowledgeable than those who are involved in just one program (King & Tarrant 2013, Ronan & Johnston 2001).

In the community of Vík in southern Iceland (Figure 1), school hazard education is carried out annually with respect to a Katla eruption. The Katla volcano lies approximately 25km east of Eyjafjallajökull and has produced more catastrophic eruptions since settlement in Iceland than its now infamous neighbour. Like Eyjafjallajökull, Katla lies underneath a glacier and as a result, produces glacial outburst floods, lightning and ash fall, in addition to tsunami that can impact the southern coast of Iceland. The school in Vík is the only elementary school in the southern region required to evacuate during an eruption, as it is located in the tsunami hazard zone. The school in Vík practices its evacuation procedures annually. This involves the children walking hand-in-hand up to higher ground.

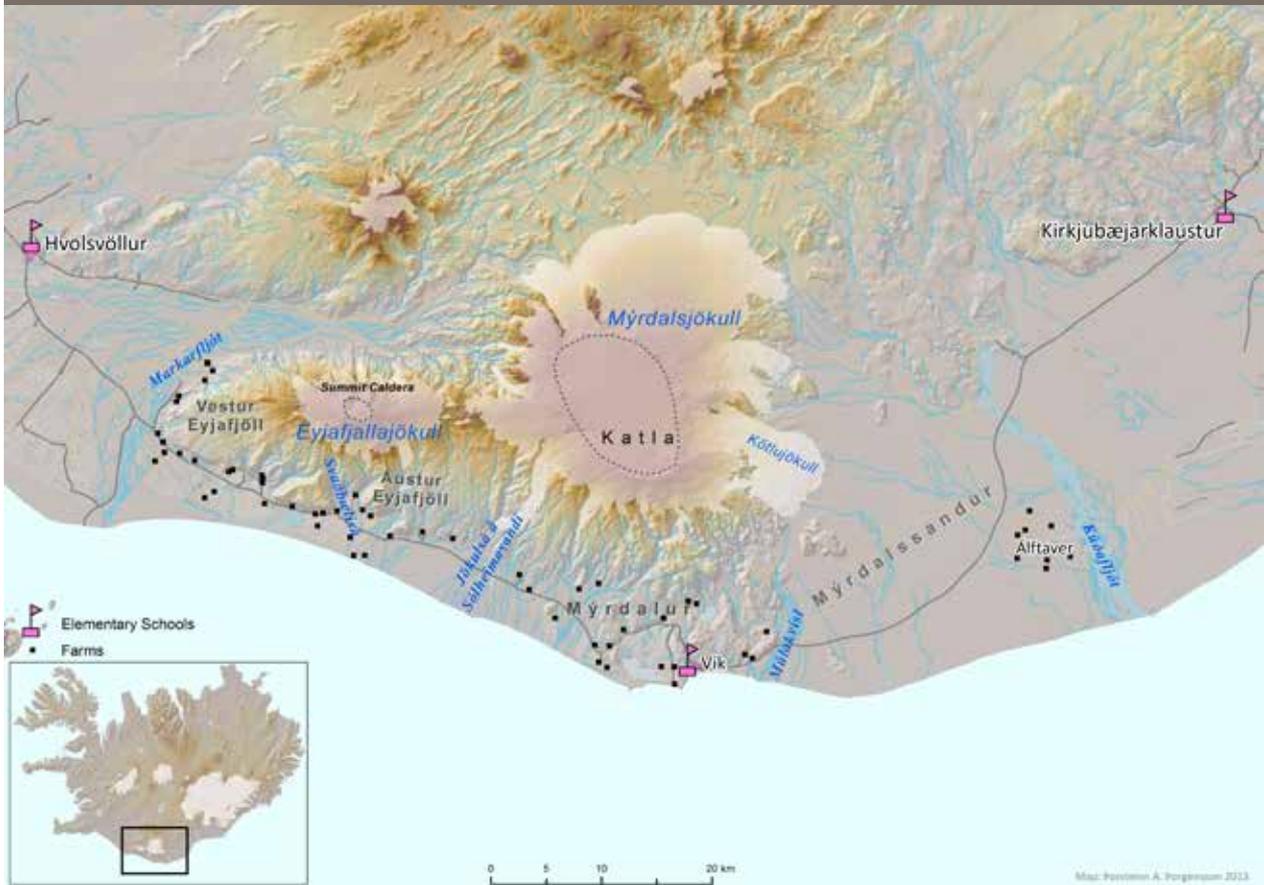
In commemoration of Katla's last major eruption in 1918, the school hosted 90<sup>th</sup> anniversary activities in October 2009, including art (see Figure 2) and a play and musical performances that mimicked the sounds emanated during an eruption.

A full-scale evacuation exercise for communities surrounding the Eyjafjallajökull and Katla volcanoes was last conducted in 2006. With unrest in Eyjafjallajökull in 2009 and 2010, regional hazard and response information meetings were held in March 2010 (Bird, Gísladóttir & Dominey-Howes 2009, 2011, Bird & Gísladóttir 2012).

Katla is well known throughout the region, with many residents having knowledge of past eruptions from stories that have been passed down from generation to generation (Bird, Gísladóttir & Dominey-Howes 2011, Jóhannesdóttir 2005; Jóhannesdóttir & Gísladóttir 2010). Moreover, many people know the legend of

**Figure 1: Map showing southern Iceland.**

The community of Vík is centrally located south of the Mýrdalsjökull glacier, which covers the Katla volcano. Farms depicted on the map were included in the survey undertaken in August 2010. This region includes 558 adults and 141 children under the age of 18 years (Registers Iceland 2010, Statistics Iceland, 2013).



**Figure 2: Art produced by the children.**

The children of Vík used art to commemorate the last major eruption in 1918.



Katla—the wicked female cook (Figure 3) who lived in a monastery located in Álftaver (see Figure 1):

*‘She had magic trousers enabling her to run fast and without a break. When she discovered that a shepherd had misused her priceless belongings, she killed him and hid him in a big barrel of whey. When confronted*

*with the revelation of her crime as the whey was slowly being used up, she fled in the trousers up to the mountains and flung herself into a dark crevasse in the ice cap. Ever since, according to tales, she avenges her fate by pouring fire and water onto the nearby regions.’* (Guðmundsson 1996 pp. 61-62).

This paper examines the various child-specific activities undertaken to ensure the health, safety and wellbeing of children living within close proximity to the Eyjafjallajökull eruption in 2010.

## Methods

The research, completed in August 2010, involved three methods of inquiry:

1. open interviewing
2. semi-structured interviewing, and
3. self-completed questionnaires.

Children under the age of 18 years were not directly involved in the study. However, general data about the household was gathered which included personal experience prior to and during the eruptions, affects of the eruptions on individuals, family, property and businesses (agriculture and tourism), and the use of various media sources to acquire information. Adult

**Figure 3: Art by school children in Vík.**

Artwork of the wicked female cook, Katla, hiding her victim in a barrel of whey. This piece was on display for the Katla 90<sup>th</sup> anniversary celebrations in October 2009.



respondents and interviewees including information on the experience of children prior to, during, and after the eruption, where appropriate.

Interviews were conducted in both Icelandic and English languages with local residents, government officials, and health care, school and emergency management personnel. Interviews were generally one hour in length although some were shorter while others lasted several hours. Questionnaires, which were distributed door-to-door and either collected the following day or returned by post, took about 30-45 minutes to complete.

Overall, 12 interviews were conducted and 59 questionnaires were distributed to households in the rural areas where farming is the predominant occupation. There was a 95 per cent response rate with 57 completed questionnaires being returned. Most respondents (78 per cent) had lived in the region for three or more generations. In total, 138 adults and 37 children were living in the 57 households covered by the survey. A further 66 children were registered as attending the school in Vík. Interviews were taken with several key stakeholders tasked with the care of children in their everyday lives. Household questionnaires in the urban area of Vík are not included in this analysis.

In order to provide context to the research, the following provides an overview of the eruption's impacts on households in general.

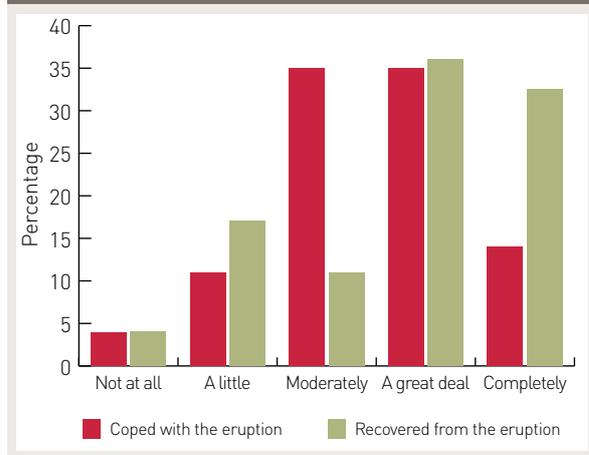
## Results

Less than half (39 per cent) of the respondent householders evacuated during the April 2010 eruption

of Eyjafjallajökull but three-quarters (75 per cent) reported that the eruption impacted their home. These impacts were almost exclusively related to ash fall. A further 60 per cent and 76 per cent reported some level of impact on their or their family's health and emotions, respectively.

When asked how they and their family coped with and recovered from the eruption, the majority of respondents indicated 'moderately' to 'a great deal' and 'a great deal' to 'completely', respectively (Figure 4).

**Figure 4: Responses to the questions: how well do you think you and your family coped with the eruption; and, how well do you think you and your family recovered from the eruption.**



## Child-focused preparedness, response and recovery

In addition to the annual evacuation exercise at the school in Vík, an evacuation exercise was arranged some weeks prior to the Eyjafjallajökull eruption. This was done in response to emergency management meetings, which were held in March 2010 to discuss increased seismicity in Eyjafjallajökull. According to a school official, the children 'love the evacuation exercise; they are not scared'.

In the initial days of the eruption, some children were shocked to see heavy ash fall and they believed they would run out of air to breathe. Moreover, the noise coming from the eruption was exceptionally loud in some areas and children, along with parents, found it difficult to sleep. As a result, the general consensus was that children should have been evacuated from areas experiencing heavy ash fall and noise: 'It would be good for the children to get out of the ash and heavy sound'.

The noise from the eruption caused cupboards to constantly shake in homes within close proximity to the volcano and this terrified the children, along with the darkness caused by heavy ash fall: 'You cannot offer your children to stay in the darkness and the hell'. As a result, many families sent their children away to stay with family members out of the hazard zone. If the weather was calm and the eruption could not be seen

or heard, some families took their children home in order to restore some normality. It was believed that this action helped the children adjust and ensured they were happy to return to their home permanently when the worst of the eruption was over.

However, not all parents were able to send their children away. In these instances, parents tried their best not to show their own fear and worry and many noted that they did not discuss the eruption in front of their children. Moreover, parents were conscious of the negative effect that news media may have on themselves and their children. Many respondents believed that local and international media agencies were sensationalising the impacts and making matters worse by stating that the Eyjafjallajökull eruption was 'a show and nothing in comparison to what Katla can do'.

Despite families being encouraged to take holidays, the school in Vík remained opened during almost all of the eruption (it was only closed for two days in order to clean up the ash). This was considered as extremely important to ensure routine in the children's lives, especially since many remained in the community. Other efforts to ensure normality included holding confirmation ceremonies for local teenagers despite the ash fall, as these are a very important part of Icelandic culture.

To the east of Vík in Álftaver, the children were unable to attend school because the school bus could not provide transport for them through the ash. Similarly, children who lived on the western-side of Eyjafjallajökull were unable to attend school for 10 days as they were advised by the school to stay home due to ash fall. However, the parents thought this period was too long as the children lost a connection with their fellow students. In addition, they were unable to maintain any sort of routine in their lives. Not only did this impact the children at home, but it also impacted the children at the school with reports circulating that one of the girls had perished in the eruption since she had not been attending school.

Parents of children who were kept at home during the worst of the eruption organised fun activities for them to do as a distraction and as a method to help them communicate and process their experiences and emotions. Some families collected ash for volcanologists to collect. Others chose to document the ash fall in the hope that local media would publish their story.

*'I said "let's go out and take a photo and send it to [the national news media agency], and then you'll write an article and all of you can write what you think". That's what we did but nothing was published except the photo but this took their minds off the issue, then they started talking about how they felt and they opened up.'*

One family created a story about a troll that was sleeping in Eyjafjallajökull and how his snoring generated the loud noise. Other families encouraged their children to paint or draw pictures of the volcano (Figure 5).

After the worst of the eruption, other activities were organised for children living within the major ash

**Figure 5: A girl's painting of Eyjafjallajökull erupting.**

This artwork shows a bright sunny day with plenty of green vegetation surrounding the volcano.



fall areas. These included adventure activity days organised by the scouts from Reykjavik and gifts sent to the children, which included books on nature from a publishing house.

To help the children and their families cope with and adapt to the eruption, health care professionals initiated and organised a meeting in early autumn 2010 for all families from the worst affected areas. The meeting, which was very well attended, focused on how children experienced the eruption, how they dealt with it, and how they managed through it. Follow-up discussions were held with those who could not or did not want to attend to ensure those who needed help received it. Health care professionals also published health advice through various forms of media.

In general, it appeared that most children were not afraid during the eruption and that they adapted to the situation very well. This was attributed to their:

- parents remaining calm and providing actions and distractions that helped the children process what was going on around them
- exposure to education about volcanic eruptions through evacuation exercises and commemoration activities, and importantly,
- ability to evacuate from the hazard zone.

One official believed that the psychological impacts would not be a significant issue since people were able to leave the hazard area during the height of the disaster. 'They had a chance to get away, not like what happened in past Katla eruptions when the people were stuck in the homes and darkness for weeks'.

Nevertheless, health care professionals revealed that a few families and children were suffering from Post Traumatic Stress Disorder (PTSD). Officials were of the opinion that PTSD in adults had manifested from ongoing issues that became magnified during the eruption. These people received individual attention through personal meetings. Health care professionals were also concerned that the children were now more aware of the potential risk of Katla erupting after experiencing Eyjafjallajökull.

It was recognised that they ‘have to be prepared. We can’t pretend that Katla isn’t here but we have to be aware of how [the children] can think’.

*‘What we know about children is when they feel bad and when they are worried they don’t really talk about it. So it’s very important to take good notice and to follow up. [The children] keep it by themselves if they are really worried because they don’t want to make mom worry more.’*

## Discussion and conclusion

Actions undertaken by caregivers enhance the ability of children to cope with disaster situations (Clettenberg *et al.* 2011, La Greca *et al.* 2001, Prinstein *et al.* 1996). This research has described various activities, mostly undertaken spontaneously, to help children cope with disaster in Iceland. These activities included reinstating routines and providing activities to help children communicate and process their experiences. While it appeared that PTSD was generally not an issue, officials are aware that some people may endure ill effects and were being monitored accordingly.

Research has shown that PTSD is exacerbated by the extent and degree of exposure to the destructive forces of a hazard event, degree of damage to the home and other familiar infrastructure, continued displacement, separation from social networks, and level of trait anxiety of children and their parents (Evans & Oehler-Stinnett 2006, Lonigan *et al.* 1991, Lonigan *et al.* 1994, Mohay & Forbes 2009). PTSD can be reduced through social support and coping strategies, alongside enhancing a child’s sense of control over a situation by providing them with experience and information (Ronan & Johnston 1999).

In Iceland, preparations for Katla and Eyjafjallajökull eruptions have focused on glacial outburst floods and tsunami. They have not included ash fall, which was the predominant hazard effecting southern Iceland during the 2010 eruption. It is therefore understandable that children were initially frightened when unusual darkness and noise befell their community. Moreover, peripheral impacts and vicarious traumatisation via the

media affected children outside of the declared hazard zones. This highlights the need to educate children about all hazards, in all areas.

The lessons learnt from the Iceland experience can be applied to other hazard regions around the world, including Australia. At the time of writing (2013), bushfires are impacting many communities across New South Wales. Although the fires are isolated to specific areas, the smoke is impacting the greater Sydney region and causing health issues for people with breathing difficulties who have been advised to take extra precautions.

It is therefore imperative that child-focused disaster risk reduction activities encompass all regions. Schools and parents need to provide children with the basic details of hazard impacts to ensure they are aware of what is happening around them and empower them with actions to assist themselves, their families, and others in their community. Excellent examples of this occurred during the 2010-11 Queensland floods with schools in New South Wales signing up to assist Queensland schools through ‘School Aid’<sup>1</sup>. Reciprocal aid between schools internationally has also been established, e.g. the school in Villiers-Bretonneau in France with Victorian schools devastated during the Black Saturday bushfires in 2009 (Figure 6).

## Acknowledgments

This work was financially supported by Vegagerðin (The Icelandic Road Administration). All respondents are thanked for their willingness to participate in this investigation. Contributions are appreciated from the Ash Fall Impacts Working Group, Katharine Haynes, Carolina Garcia Londoño and Guðrún Pétursdóttir in relation to the development of the questionnaire and semi-structured interviews, and from Þorsteinn Ari Þorgeirsson for the development of the map (Figure 1). Thanks is extended to the editor and reviewers for providing insightful comments and detailed recommendations.

1 ‘School Aid’, pers. comm., Quakers Hill East School Principal. At: [www.schoolaid.org.au](http://www.schoolaid.org.au).

**Figure 6: The remembrance to Australia at a school in Villiers-Bretonneau, France.**

This school was rebuilt with donations from Victorian school children after World War I. Following the Black Saturday bushfires, the school children from Villiers-Bretonneau raised \$21 000 for the Victorian bushfire appeal (France in Australia 2012).



Image: Quakers Hill East School Principal

## References

Bird, DK & Gísladóttir, G 2012, *Residents' attitudes and behaviour before and after the 2010 Eyjafjallajökull eruptions – a case study from southern Iceland*. *Bulletin of Volcanology* 74, pp. 1263-1279.

Bird, DK, Gísladóttir, G & Dominey-Howes, D 2009, *Resident perception of volcanic hazards and evacuation procedures*. *Nat. Hazards Earth Syst. Sci.* 9, pp. 251-266.

Bird, DK, Gísladóttir, G & Dominey-Howes, D 2011, *Different communities, different perspectives: Issues affecting residents' response to a volcanic eruption in southern Iceland*. *Bull. Volcanol.* 73, pp. 1209-1227.

Briem, H 2010, *Health effects of the volcanic eruption in Eyjafjallajökull*, *EPI-ICE - Newsletter from Directorate of Health, Chief Epidemiologist for Iceland, Reykjavik*, Vol. 6. Issue 3. August 2010.

Clettenberg, S, Gentry, J, Held, M, & Mock, LA 2011, *Traumatic loss and natural disaster: A case study of a school-based response to Hurricanes Katrina and Rita*. *School Psychology International* 32, pp. 553-566.

Evans, L & Oehler-Stinnett, J 2006, *Children and Natural Disasters: A Primer for School Psychologists*. *School Psychology International* 27, pp. 33-55.

France in Australia 2012, *Students from Villers-Bretonneux helped to rebuild a Victorian school*. At: [www.ambafrance-au.org/Students-from-Villers-Bretonneux](http://www.ambafrance-au.org/Students-from-Villers-Bretonneux) [29 October 2013].

Gíslason, SR, Hassenkam, T, Nedel, S, Bovet, N, Eiríksdóttir, ES, Alfredsson, HA, Hem, CP, Balogh, ZI, Dideriksen, K, Oskarsson, N, Sigfusson, B, Larsen, G & Stipp, SLS 2011, *Characterization of Eyjafjallajökull volcanic ash particles and a protocol for rapid risk assessment*. *Proc. Natl. Acad. Sci. U. S. A.* 108, pp. 7307-7312.

Guðmundsson, AT 1996, *Katla: the wicked witch, Volcanoes in Iceland*. *Vaka-Helgafell, Reykjavík*, pp. 61-67.

Guðmundsson, MT, Thordarson, T, Höskuldsson, Á, Larsen, G, Björnsson, H, Prata, FJ, Oddsson, B, Magnússon, E, Högnadóttir, T, Petersen, GN, Hayward, CL, Stevenson, JA & Jónsdóttir, I 2012, *Ash generation and distribution from the April-May 2010 eruption of Eyjafjallajökull, Iceland*. *Sci. Rep.* 2.

Haynes, K, Lassa, J & Towers, B 2010, *The influence of risk, gender and religion on child-centred disaster risk reduction*. *Children in a Changing Climate working paper 2*. Institute of Development Studies, Brighton.

Haynes, K & Tanner, T 2014, *Empowering young people and strengthening resilience: Youth-centred participatory video as a tool for climate change adaptation and disaster risk reduction*. *Children's Geographies* DOI:10.1080/14733285.2013.848599.

Jóhannesdóttir, G 2005, *Við tölum aldrei um Kötlu hér mat íbúa á hættu vegna Kötlugoss*, Department of Geology and Geography, University of Iceland, Reykjavík, p. 103.

Jóhannesdóttir, G & Gísladóttir, G 2010, *People living under threat of volcanic hazard in southern Iceland: vulnerability and risk perception*. *Nat. Hazards Earth Syst. Sci.* 10, pp. 407-420.

King, TA & Tarrant, RAC 2013, *Children's knowledge, cognitions and emotions surrounding natural disasters: An investigation of Year 5 students*, Wellington, New Zealand. *Australasian Journal of Disaster and Trauma Studies* 2013-1, pp. 17-26.

La Greca, AM, Vernberg, EM, Silverman, WK, Vogel, AL & Prinstein, MJ 2001, *Helping Children Cope with Disasters: A Manual for Professionals Working with Elementary School Children*, Miami, Florida.

Lonigan, CJ, Shannon, MP, Finch Jr, AJ, Daugherty, TK & Taylor, CM 1991, *Children's reactions to a natural disaster: symptom severity and degree of exposure*. *Advances in Behaviour Research and Therapy* 13, pp. 135-154.

## About the authors

**Deanne Bird** is a human geographer specialising in disaster risk reduction. Her research interests include evaluations of risk perception and community-appropriate methods of risk communication, and exploring human behaviour before, during and after disaster. Deanne works closely with community groups (urban, rural and Indigenous populations), local, state and federal governments and emergency management personnel.

**Guðrún Gísladóttir** is a Professor of Geography in the Faculty of Life and Environmental Sciences, Earth Science Institute, University of Iceland. Guðrún works in an interdisciplinary environment, focusing on both the social and physical aspects of natural hazards. Guðrún's research interests also include the impacts of land-use, climate change and volcanism on terrestrial ecosystems, and the development of sustainable land management practices.

Lonigan, CJ, Shannon, MP, Taylor, CM, Finch Jr, AJ & Sallee, FR 1994, *Children Exposed to Disaster: II. Risk Factors for the Development of Post-Traumatic Symptomatology*. *J. Am. Acad. Child Adolesc. Psychiatry* 33, pp. 94-105.

Mazzocchi, M, Hansstein, F & Ragona, M 2010, *The 2010 volcanic ash cloud and its financial impact on the European airline industry*. *CESifo Forum* 2/2010 11, pp. 92-100.

Mitchell, T, Haynes, K, Choong, W & Hall, N 2008, *The Role of Children and Youth in Communicating Disaster Risk*. *Children, Youth and Environments* 18, pp. 254-279.

Mitchell, T, Tanner, T & Haynes, K 2009, *Children as agents of change for Disaster Risk Reduction: Lessons from El Salvador and the Philippines, Children in a changing climate - research*. Institute of Development Studies, Brighton.

Mohay, HA & Forbes, N 2009, *Reducing the risk of posttraumatic stress disorder in children following natural disasters*. *Australian Journal of Guidance and Counselling* 19, pp. 179-195.

Prinstein, MJ, La Greca, AM, Vernberg, EM & Silverman, WK 1996, *Children's coping assistance: How parents, teachers, and friends help children cope after a natural disaster*. *J. Clin. Child Psychol.* 25, pp. 463-475.

Registers Iceland 2010, *Íbúaskrá Rangárþing Eystri, Reykjavík*.

Ronan, K, Crellin, K & Johnston, D 2010, *Correlates of hazards education for youth: a replication study*. *Natural Hazards* 53, pp. 503-526.

Ronan, KR, Crellin, K & Johnston, DM 2012, *Community readiness for a new tsunami warning system: quasi-experimental and benchmarking evaluation of a school education component*. *Natural Hazards* 61, pp. 1411-1425.

Ronan, KR & Johnston, DM 1999, *Behaviourally-based interventions for children following volcanic eruptions: an evaluation of effectiveness*. *Disaster Prevention and Management* 8, pp. 169-176.

Ronan, KR & Johnston, DM 2001, *Correlates of Hazard Education Programs for Youth*. *Risk Anal.* 21, pp. 1055-1064.

Ronan, KR & Johnston, DM 2003, *Hazards Education for Youth: A Quasi-Experimental Investigation*. *Risk Anal.* 23, pp. 1009-1020.

Statistics Iceland 2013, *Statistics » Population » Municipalities*. At: [www.statice.is/Statistics/Population/Municipalities](http://www.statice.is/Statistics/Population/Municipalities), [24 October 2013].