# The psychological impact of living near to a visible disaster site: Final Report [25 May 2021]

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## Executive Summary

* We reviewed the literature to find previous research about the impact of living near to a visible disaster site on someone’s mental health.
* We searched four academic databases and considered over 3,500 possible papers. Only four were relevant. One reported the impression of residents of an earthquake-struck town in Azerbaijan that the presence of rubble was distressing. Two found that reminders of traumatic events, which included the existence of damaged buildings, were associated with poorer mental health in children whose towns had suffered an earthquake or terrorist attack. The final study found no association between exposure to general war-related reminders and mental health in children from Sarajevo.
* A more detailed review was made of three case studies. These related to an airplane crashing into two blocks of flats in Amsterdam, an explosion in a fireworks factory in a city in the Netherlands, and a train derailment and major fire in a town in Canada. We did not find any detailed research into the impact of the visibility of these disaster sites on local residents. The case studies did however highlight the importance of residents being involved and listened to in any decisions around reconstruction. Nonetheless, it is important to remember that case studies, whilst interesting, do not represent high quality research data.
* Although we found very little scientific evidence about the impact of a disaster site on mental health, there is no doubt that this is an important topic. We recommend that additional research be conducted to understand the impact of living near to a disaster site. For example, research conducted with residents around Grenfell Tower may benefit communities faced with having to make decisions as to how best to manage the remains of a building. From the information we have found, and from other research work we have been involved with, it is suggested that the community around Grenfell Tower be involved from the outset in deciding whether this research is done, what questions are important, and how it should proceed.

## Background

The psychological impact of disasters and terrorist attacks has been well documented. Most Government agencies, health services and humanitarian organisations should now be well-acquainted with the scientific evidence on the likely impact of such events and the evidence-based approaches to supporting and treating those whose mental health has been affected by traumatic events (National Institute for Health and Clinical Excellence, 2018).

After the acute stages of a disaster are over, additional disaster-related stressors often continue to exert a detrimental effect on mental health. These are often termed ‘secondary stressors,’ which are the distressing knock-on effects of a disaster, such as navigating insurance claims, dealing with a police investigation, media intrusion, or loss of employment. Although we have previously developed a typology of secondary stressor to support the study of their effects (Lock et al., 2012), there has been surprisingly little work to identify which are most detrimental and how best to mitigate their impact on mental health. Indeed, it is possible that many circumstances which are classically seen as secondary stressors might also have some positive impact on mental health if managed properly. For example, a public inquiry might be distressing, or cathartic, or both. Dealing with an insurance company could be frustrating or could provide the financial support someone needs to resolve other stressors affecting their life.

One potential secondary stressor that can continue to exert an influence is the visibility of the site of a disaster. For people with post-traumatic stress disorder (PTSD), encountering a reminder of a disaster may trigger an increase in distress symptoms or an alteration in behaviour (e.g. Glad, Hafstad, Jensen & Dyb, 2017). For those who live nearby, the constant reminder may also reduce feelings of safety either because of the perceived danger associated with the disaster site itself or because the site causes them to think about the possible risk of the incident, or something like it, happening to them. There may also be an impact on the community through, for example, restricting their ability to access valued community spaces, impacting on house prices, or by drawing the unwelcome presence of the media or ‘disaster tourists.’ Conversely, the presence of a visible site may serve a beneficial function by providing the community with a focal point for acts of remembrance or by preventing Government and society at large from forgetting what has happened. There is also evidence that, for people with PTSD, careful exposure to sources of potential distress can, over time, lead to a reduction in symptoms; this is known as habituation and is a feature of some varieties of therapeutic approaches for PTSD.

The empirical evidence for the impact of the visibility of a disaster site is unclear. In order to assist governments and communities in making decisions about the future of visible disaster sites, we conducted a review of the academic literature. In carrying out the review, we focussed on original evidence relating to the impact of the presence of a disaster site on mental health.

## Method

Our method involved conducting a rapid evidence review. Rapid reviews follow the same general process as a full systematic review, but usually do not search grey literature or include a full quality appraisal of included evidence.

We searched Medline, Embase and PsychInfo for relevant articles. The full search used is given in Appendix 1. In brief, we used three sets of search terms relating to:

1) Disasters or terrorist attacks. This included terms such as ‘fire,’ ‘terrorism’ and ‘hurricane.’

2) Mental health. This included terms such as ‘well-being,’ ‘anxiety’ and ‘psychological.’

3) Visibility. This included terms such as ‘wreckage,’ ‘visibility’ and ‘proximity.’

We combined searches 1, 2 and 3 with AND terms to produce our final search.

A second search was conducted using a similar strategy for the Scopus database. This is also detailed in Appendix 1. We also examined the reference sections of included studies for additional papers that may have been relevant.

We included in our review all studies which met the following criteria:

1) Reported in a peer-reviewed publication, containing original data and written in English;

2) Explicitly evaluated the impact of a visible reminder of a disaster (either the disaster site itself or a memorial) on the mental health of the local population;

3) Or explicitly evaluated the impact of changes in the visibility of a disaster site on the mental health of the local population.

We excluded studies of disasters or incidents where, at the time of data collection, there was a clear, ongoing threat to the physical health of respondents. This is because any mental health impact from the site could be associated with the physical threat, rather than the visibility of the disaster site. We excluded, for example, disasters where there was a toxicological or radiological component (e.g. Chernobyl and Fukushima). Because the focus of this work was on the impact of living close to a visible disaster site, we also excluded studies involving short term exposure to memorials (e.g. the impact of a day trip to a war memorial) and spontaneous memorials. The impact of spontaneous memorials is discussed in a recent systematic review (Collins, Allsopp, Arvanitis, Chitsabesan, French, 2020). Finally, we excluded studies that assessed proximity to a disaster or line of sight to it, unless they assessed the impact of a visual reminder of the disaster separately to witnessing the disaster itself.

We checked with four independent groups whether they were aware of literature in this area. We also examined a previous systematic review of studies that assessed the mental health impact of the 11 September attacks on the World Trade Centre (Hamwey et al., 2020).

To supplement our search, we explored case studies in additional detail by searching Medline and Google for reports or data that might be relevant. Following consultation with representatives from the Ministry of Housing, Communities & Local Government and Public Health England, the three case studies we selected were:

* The Bijlmermeer El Al Flight 1862 disaster of 4 October 1992;
* The Enschede fireworks disaster of 13 May 2000;
* The Lac Mégantic rail disaster of 6 July 2013.

## Results

Our search retrieved 3,498 citations. Based on the title and abstract, it was apparent that the large majority of these were not relevant to the review. Sixty-three papers identified from the search appeared possibly relevant and were examined in full, together with eight papers identified from reference sections of included papers. Of these, we were unable to access the full text of two; from re-review of their abstracts they appeared to be unlikely to meet our inclusion criteria. Only four papers met our inclusion criteria.

Contact with the authors of the Collins et al. (2020) systematic review and with colleagues in the Netherlands failed to identify any additional literature that might be relevant. Contact with two colleagues familiar with the anthropological literature in this area resulted in another four papers being suggested as possibly relevant, of which none were included. A database of 173 citations was also provided to us, of which three appeared possibly relevant: none met our inclusion criteria. No relevant papers were identified from the Hamway et al. (2020) systematic review of the mental health impacts arising from the 11 September World Trade Centre attacks.

The full list of papers that were examined and, if relevant, the reasons for excluding them is given in Appendix 2.

The papers we identified as relevant are summarised below.

### Included studies

Following two, large earthquakes in Azerbaijan in 2012, Alipour and colleagues conducted qualitative interviews with 20 people who had experienced the earthquakes first-hand, seven people who responded in a professional capacity and two focus groups of local survivors (11 participants) or disaster recovery experts (10 participants) (Alipour, Khankeh, Fekrazad et al., 2014). The authors identified multiple problems for the community, including social vulnerability, a lack of a comprehensive rehabilitation plan, incomplete reconstruction, ignorance of local social capital, wasted assets, and psychological problems. Of direct relevance to our review, a “failure of timely reconstruction” was one of the many problems noted. This was mainly discussed in terms of the practical problems that this posed for residents, particularly with the onset of the cold season. For example, one participant noted that “if the houses are completed, people can get back to their normal life… we urge the government only to take the reconstruction seriously. If they complete our houses, we will be relaxed.” However, the importance of reconstruction as “a way to gradually forget the bitter memories of [the] earthquake” was also described. In the words of one resident: “every time I pass this road, I see the rubble on the roadside and the bitter memories of the quake come to my mind again.”

In a study conducted 32 months after the 1999 Parnitha earthquake in Greece, Goenjian and colleagues (2011) asked 511 adolescents to complete questionnaires about their experiences and mental health. In total, 13.6% met the criteria for clinical depression. Various types of reminder about the earthquake were asked about including sounds, places, faces and feelings. This also included “signs of destruction.” More girls (17%) than boys (9%) reported encountering signs of destruction in the previous month. Although signs of destruction was not analysed separately, encountering reminders of the earthquake in general was associated with higher scores on a PTSD scale.

Scrimin and colleagues interviewed 58 children from Beslan, a town that had experienced a terrorist attack on a local school in which 329 people died. The children were asked to complete measures of their mental health and about reminders that they had encountered over the past month. 29% of the children met the criteria for PTSD. One category of reminders asked about was “situational reminders” in which the authors included the ruins of the old school. Several other reminders were also included in this category (e.g. smelling fire or smoke, the cemetery). Situational reminders were commonly reported by children (reported by 48%). Three other categories of reminder were also asked about (e.g. media exposure, thinking about someone who had died, feeling alone). All four categories of reminder were reported as equally distressing for the children. The frequency of reminders, overall, was associated with the likelihood of meeting the criteria for PTSD.

Howell and colleagues (2014) asked 555 secondary school children from Sarajevo and who had lived through the Bosnian war, to complete a set of questionnaires. These included measures of their mental health and their exposure to “sensory reminders” (e.g. “touching something or being touched by something that reminds me of terrible things that happened”) and “general war-related reminders” (e.g. “seeing destroyed or damaged buildings, bridges or streets”). No association was found between experiencing general war related reminders and posttraumatic stress symptoms. The authors ascribed this lack of association to the fact that the importance of these reminders “tend to diminish in their presence and potency over time as cities are rebuilt, news coverage switches in focus to other topics, and political tensions recede.”

## Case studies

### Bijlmermeer

On 4 October 1992, an Israeli cargo aircraft crashed into two large blocks of flats in Bijlmermeer, a deprived region of Amsterdam. Four crew and 39 residents were killed. However, given the unknown number of potentially undocumented migrants who might have been living in the flats, and the intensity of the fire, the number of victims was initially disputed. The incident led to a chaotic aftermath, with substantial anger, accusations of cover-up, and a major public inquiry (Yzermans and Gersons, 2002).

Six months after the disaster, Carlier and Gersons (1997) carried out a survey of 136 residents of the damaged apartment blocks and of near-by buildings with a view of the disaster. In total, 26% met the criteria for PTSD. The authors found a strong association between material loss, bereavement or being home at the time of the disaster and having PTSD. However, the data do not allow us to determine the impact, specifically, of living near to the damaged building. Kroon and Overdijk (2008) provided a comprehensive review of the management of psychosocial aid for survivors, based on “an examination of all relevant city documents, interviews with some 40 city officials and representatives of other aid agencies, and a comprehensive media archive.” They highlight, in particular, the practicalities of organising shelters and providing immediate practical support for survivors, challenges with the media, and access issues with aftercare. They do not mention any issue of the visibility of the building itself, however.

The Bijlmermeer disaster is also notable for what has been described as the ‘second disaster’ that struck residents in the months after the crash (Page and Wessely, 2006). Rumours about the possibility that the plane might have been carrying a toxic cargo began to circulate. This triggered a new round of media attention and high anxiety among residents. Although many physical symptoms were reported by anxious residents, no specific pattern in the symptoms could be found (Huizink et al., 2006). The slow, uncoordinated response by the authorities contributed to a substantial loss of trust among residents, who experienced a high level of distress and anger during this period (Yzermans & Gersons, 2002). The flight manifest, when finally released as part of a parliamentary inquiry, revealed that no unusual hazardous substances had been on the plane.

### Enschede

Enschede is a city in the Netherlands, which suffered a major explosion in a fireworks factory in the district of Roombeek on 13 May 2000. Twenty-three people were killed, over 900 injured, and hundreds of nearby houses were damaged or destroyed leaving the neighbourhood resembling a war zone (Colenbrander, 2002). A major effort was quickly put in place in an attempt to quantify the impact of the disaster on residents, passers-by, and responders, with the first data collected two to three weeks after the disaster occurred. The survey was repeated 18 months and 4 years later. Initial findings from 3,792 people identified mental health symptoms in 25-29% of respondents (van Kamp et al., 2006). Mental health effects were particularly high in residents and passers-by. Of the residents who took part in the first study, 891 completed a questionnaire at the 18-month time point, together with 700 ‘control’ participants from another city in the Netherlands. Health problems had declined over time for Roombeek residents, but were still higher than the control group. For Roombeek residents, 19% had symptoms suggestive of PTSD (Grievink et al., 2007).

A substantial effort was made to consult with residents over how rebuilding in the area should proceed, pursuing an ideal that there should be “maximum feasible participation” in planning the rebuilding (Denters & Klok, 2010). This participation including exhibitions of artwork by local school children highlighting their thoughts for the future and which acted as a route to discuss plans with their parents, active outreach to current and former residents inviting them to attend workshops and to bring neighbours and acquaintances with them, employing an independent “process facilitator,” ensuring residents were represented on the selection committee for a town planner, and an active commitment to openness throughout the process. Professionals involved in the process were instructed to engage seriously with the community, with residents and elected councillors given the right to vote on the acceptability of the final plans. While only 24% of residents took part in consultation activities, the opinions of those who did take part appeared to be at least broadly representative of those of the wider community (Denters & Klok, 2010). Consultation explored the memories residents had of the area and their hopes for the future, leading to eight guiding principles for the redevelopment. These principles focussed on the need to achieve: a right to return; a lively district; a familiar district; a district with history; a district with value for the future; a district within your own hands; a safe district; and a district with boundaries (Bosman et al., 2007). The active efforts made to elicit views from the community and involve them in the planning, allowed the architect to translate the broad principles into a design that met the approval of the residents. This included accepting their desire to demolish most of the surviving housing stock which residents viewed as potentially unsafe, despite the initial protestations of the architect. By 2011, Roombeek had become the most sought-after region of Enschede to live in (Bazen, 2014). Although we are not aware of any formal quantification of the mental health impact of this participatory process, the positive feedback identified in a series of qualitative interviews with residents of the area is striking: in the words of one, “of course I am proud of living here. It’s my neighbourhood. I helped to design it!” (Bazen, 2014).

### Lac Mégantic

On 6 July 2013, an unattended train carrying a cargo of oil derailed in the town of Lac Mégantic, Canada. The resulting fire and explosions killed 47 people, destroyed dozens of buildings and led to the evacuation of a third of the town. The mental health burden was substantial. Two years after the disaster, one survey noted that 67% of Lac Mégantic residents reported at least moderate post-traumatic stress symptoms (Généreux, Maltais, Petit and Roy, 2019). The authors attributed this in part to the effects of an ongoing class action claim for compensation, the resumption of railway activity in the town and “the long process for decontamination and reconstruction.” The reconstruction was itself a topic of controversy. Qualitative interviews between 2014 and 2015 with 57 residents noted a particular concern in the community that they had had insufficient input into decisions around the demolition of buildings in the downtown region, an act that “reinforced the idea that the municipality put administrative concerns ahead of human concerns” (Brisson and Bouchard-Bastien, 2016). This feeling was not helped by a lack of openness in official communication and a loss of trust for some.

Having noted the continuing and substantial mental health impact, a ‘day of reflection was organised by the local public health department in 2016, which in turn led to a renewed recovery and development plan, that was co-created with the community (Généreux, Roy, O’Sullivan and Maltais, 2020). This plan incorporated a range of activities and initiatives, including a ‘Photovoice Initiative’ to allow citizens to map assets in their community and develop a vision for the future, the development of a new outdoor gathering place to promote social activities, and a variety of activities aimed at social reconstruction (Généreux et al, 2019). Promoting community involvement became a key part of the renewed action plan (Généreux and Maltais, 2019).

## Discussion

Although the presence of a visible reminder of a disaster could have both positive and negative effects on the mental health of near-by residents or passers-by, our review was unable to locate a substantial body of evidence to elucidate this issue. Although some qualitative evidence was found in one study that the presence of rubble following an earthquake was upsetting, this study did not specifically focus on the impact of ruins on mental health and it seems unlikely that participants were asked in depth about this particular aspect of the disaster. We note that many people report symptoms of mental distress whether or not they have been exposed to a traumatic event and that the mere presence of distress symptoms in people exposed to trauma does not indicate causation. Additionally, distress is not a diagnosis and shortly after exposure to a traumatic incident, a degree of distress can be commonly expected and may not be pathological.

Three additional studies were also identified, all in children. Two of these reported that reminders of traumatic occurrences in general were associated with greater likelihood of PTSD symptoms. However, although the reminders that were studied included exposure to destroyed buildings, they also included a range other forms of reminder making it difficult to understand the exact contribution of any one specific exposure. The third study found no effect of “general war-related reminders” on mental health.

Although we explored three case studies in more depth in the hope of identifying additional evidence, in none of these could we find direct evidence relating to a mental health effect of the presence of the ruins. The case studies did provide some additional, weak, evidence of a desire for existing damaged buildings to be removed (Enschede) and that a long process of reconstruction might impact on levels of distress (Lac Mégantic). In both cases, however, explanations other than the presence of an upsetting reminder of the disaster appear plausible, including worries about safety and the need to restore amenities and economic activity. There also appears to be some evidence from the case studies that involving the local community in reconstruction plans was viewed positively although we cannot say that such involvement would have been protective of people’s mental health.

An extensive literature exists on the mental health impact of disasters. The absence of evidence of an impact of ruins or other forms of visual reminder of a disaster on the mental health of a community is therefore noteworthy. We believe that two explanations may partly account for this. First, the psychiatric literature in this field has had a tendency to focus on the presence or absence of PTSD. In one assessment of 160 samples of disaster victims that had been studied in the literature up to 2001, 68% of samples had been assessed for PTSD compared to, for example, depression in 36% and anxiety in 20% (Norris et al., 2002). This over-focus on PTSD may have implications for the risk factors or predictor variables that are studied. In order to receive a diagnosis of PTSD, people must have experienced a traumatic exposure that meets the criteria set out in psychiatric manuals. Although definitions of a traumatic exposure have changed over time, they generally focus on the types of exposure that are present on the day of a disaster such as being injured or witnessing a death. Although other mental health symptoms experienced in the weeks and months after a disaster are likely to be distressing, because they do not meet this definition it is possible that they fall into a regrettable blind-spot for researchers in this field. It might be that previous studies have not focussed enough on the presence of other relevant mental health conditions, such as depression or adjustment disorders, which may be linked to the presence of damaged buildings.

Second, in many disasters there are few options available about what to do with a damaged building. The need to rehome former residents, economic pressure or concerns over structural safety often mean that there is pressure to restore land quickly. Whether the presence of a disaster site causes a mental health effect in its own right is not often a key question that will impact on policies related to what to do with the damaged structure(s).

While evidence as to the mental health impact of the visibility of a disaster site was lacking, the case studies we reviewed did point to one factor that policy makers and members of the community should take into consideration when considering the future of any disaster site: the need for community involvement. At one extreme, the lack of openness and erosion of trust that occurred following the Biljmermeer disaster served only to exacerbate distress and anger in the community. Conversely, where effort is made, as in Enschede, to engage members of the community, ensure openness, and discover the preferences of the community, this should help to prevent tension and increase the likelihood of community satisfaction with the final outcome. Ensuring that this occurs requires effort and commitment, to ensure that community engagement is meaningful and that the outcomes do not lose out to political and economic imperatives (Hajer, 2005). However, as we note above, we cannot be sure what impact such engagement will have on trauma-exposed people’s longer-term mental health.

The relative absence of evidence in this area points to a research gap which could usefully be filled. We suggest that research to understand the impact of living near to a disaster site would be of value. For example, research conducted with residents around Grenfell Tower may benefit communities faced with having to make decisions as to how best to manage the remains of a building, with previous commentators having suggested a possible impact arising from the site (Appleby, 2020; Strelitz et al, 2018). Given the current paucity of data and the wide range of stressors that residents have experienced, it may be most beneficial for any such work to be initially conducted qualitatively, in order to understand the breadth of experiences and perceptions residents have about the Tower. In doing so, it would be important to consider the experiences of a diverse group of people who had different experiences on the night of the fire and different backgrounds and risk factors for poor mental health prior to the fire itself. For example, views and experiences may differ between adult residents of nearby buildings, children, residents who may be new to the area, people who work in the area, and residents of more distant towers who have a view towards Grenfell. We also strongly suggest that members of the community are involved in designing any study relating to these issues.

Three potential limitations should be considered with regard to our review. First, we restricted our review to English language publications. Second, the lack of any precise terminology for a damaged building made our search difficult. Other studies may exist that we are not aware of. However, we double-checked our findings with independent experts and against the results of a recent systematic review of all PTSD relevant research relating to the World Trade Centre, but did not identify any additional studies. Third, our review excluded studies which were unable to disentangle the effects of exposure to the disaster itself (e.g. witnessing potentially traumatic events on the day of the incident) from exposure to a subsequent visual reminder of the disaster. For example, one study identified in our search assessed whether residents in areas of New York with a clear line of sight to the World Trade Centre were more likely to report health problems than those who did not have a clear line of sight, and found no difference (Teitler, Garfinkel & Garcia, 2003). It is possible that such ‘line of sight’ measures might be informative about the impact of visual reminders on mental health. However, given the demonstrable impact of witnessing the traumatic events that occur on the day of a disaster on mental health, we took the view that it would not be possible to use such data to understand the impact of a visual reminder in the weeks, months and years afterwards.

## Conclusion

Although the presence of a visible disaster site could theoretically have a positive, negative or neutral impact on someone’s mental health, we have found little empirical evidence relating to the nature of any such impact. Regardless of this, ensuring that the local community is properly involved in the decisions around the future of a site is likely to be beneficial in reducing the risk of distress and increasing the likelihood of satisfaction with the ultimate outcome. We suggest that research to understand the impact of living near to a disaster site would be of value.

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## Conflicts of Interest

Professor Rubin is member of the Scientific Advisory Group for the review of potential environmental contamination in Grenfell and North Kensington

Professor Greenberg is an expert witness advising on the possible mental health effects of the Grenfell Tower disaster.

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**Appendix 1: Search strategy used to identify relevant academic papers**

*Medline, Embase and Psychinfo searches*

Citations from searches 55 and 60 were examined for potentially relevant papers.

Database: Embase <1974 to 2020 Week 40>, Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed

Citations and Daily <1946 to October 01, 2020>, APA PsycInfo <1806 to September Week 4 2020>

Search Strategy:

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1 aberfan.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (22)

2 bomb\*.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (78251)

3 cyclone.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (3480)

4 disaster\*.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (108608)

5 Earthquake.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (20584)

6 explosion.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (29172)

7 hurricane.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (10983)

8 industrial accident.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm,

mh] (863)

9 landslide.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (1227)

10 september 11th.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(1000)

11 shooting\*.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (13601)

12 storm.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (31874)

13 terrorism\*.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(27977)

14 tidal wave.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (366)

15 tornado.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (1831)

16 tsunami.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (6992)

17 typhoon.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (1331)

18 world trade centre.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm,

mh] (51)

19 well?being.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(112411)

20 anxiety.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (852574)

21 panic.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (62431)

22 post?traumatic stress.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm,

mh] (128551)

23 ptsd.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (96883)

24 stress.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (2482141)

25 "mental health".mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(715389)

26 depress\*.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(1723676)

27 neurosis.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (62078)

28 adjustment disorder\*.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm,

mh] (14657)

29 distress.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (431105)

30 psychological.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(1748712)

31 resilience.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(89176)

32 coping.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (241712)

33 "mental disorder\*".mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm,

mh] (450091)

34 "positive psychology".mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm,

mh] (8858)

35 "satisfactory life".mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm,

mh] (152)

36 mindfulness.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(35839)

37 flourish.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (4893)

38 pleasure.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (36400)

39 flow.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (2094122)

40 growth.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (4466157)

41 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or

38 or 39 or 40 (12435518)

42 memorial.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (39607)

43 anniversary.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(32211)

44 visible.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (310089)

45 visibility.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(41889)

46 ruin\*.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (3299)

47 "disaster site".mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(297)

48 wreckage.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (214)

49 scene.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (61422)

50 proximity.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(137005)

51 reconstruction.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh]

(552180)

52 grenfell.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, ui, sy, tc, id, tm, mh] (135)

53 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 52 (292897)

54 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 (1158353)

55 41 and 53 and 54 (2257)

56 fire.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, an, ui, sy, tc, id, tm, mh] (69882)

57 inferno.mp. [mp=ti, ab, hw, tn, ot, dm, mf, dv, kw, fx, dq, nm, kf, ox, px, rx, an, ui, sy, tc, id, tm, mh] (298)

58 56 or 57 (70158)

59 58 and 41 and 54 (474)

60 59 not 55 (366)

Following our main search, we included the terms “rubble” and “disaster site” by searching for them separately, combining them using an OR term, and combining with search 41 above. We then selected unique references that we had not already screened by using a NOT operator to exclude references that appeared in search 55. This left 178 new citations, none of which were relevant. Adding the term “reminder” in a similar manner identified 70 new citations, none of which additional to those already identified in the Scopus search.

*Scopus search*

## ( ( TITLE-ABS-KEY ( "disaster site" )  OR  TITLE-ABS-KEY ( ruin )  OR  TITLE-ABS-KEY ( rubble )  OR  TITLE-ABS-KEY ( wreckage )  OR  TITLE-ABS-KEY ( proximity )  OR  TITLE-ABS-KEY ( "line of sight" )  OR  TITLE-ABS-KEY ( "reminder" )  OR  TITLE-ABS-KEY ( memorial )  OR  TITLE-ABS-KEY ( visual )  OR  TITLE-ABS-KEY ( scene ) ) )  AND  ( ( ( ( TITLE-ABS-KEY ( disaster )  OR  TITLE-ABS-KEY ( terroris\* ) ) )  OR  ( ( TITLE-ABS-KEY ( grenfell )  OR  TITLE-ABS-KEY ( world  AND trade  AND centre )  OR  TITLE-ABS-KEY ( lac  AND megantic )  OR  TITLE-ABS-KEY ( enschede )  OR  TITLE-ABS-KEY ( bijlmermeer ) ) ) )  AND  ( ( TITLE-ABS-KEY ( mental  AND health )  OR  TITLE-ABS-KEY ( psychologic\* )  OR  TITLE-ABS-KEY ( psychiatr\* )  OR  TITLE-ABS-KEY ( "well-being" )  OR  TITLE-ABS-KEY ( post  AND traumatic  AND stress  AND disorder )  OR  TITLE-ABS-KEY ( ptsd )  OR  TITLE-ABS-KEY ( depression )  OR  TITLE-ABS-KEY ( anxiety )  OR  TITLE-ABS-KEY ( distress ) ) ) )  AND  ( LIMIT-TO ( LANGUAGE ,  "English" ) )

**Appendix 2: List of papers retained for full-text evaluation from database searches and contact with other experts, with main reason for exclusion where relevant.**

|  |  |
| --- | --- |
| **Reference** | **Primary reason for exclusion** |
| Alipour F, Khankeh HR, Fekrazad H, Kamali M, Rafiey H, Sarrami Foroushani P, et al. Challenges for resuming normal life after earthquake: a qualitative study on rural areas of Iran. PLoS Curr. 2014;6:17. | **Included** |
| Argyrides M, Downey JL. September 11: Immediate and Long Term Effects on Measures of Aggression, Prejudice, and Person Perception. North American Journal of Psychology. 2004;6(1):175-88. | Not about a visible disaster site |
| Assanangkornchai S, Tangboonngam SN, Sam-Angsri N, Edwards JG. A Thai community's anniversary reaction to a major catastrophe. Stress and Health. 2007;23(1):43-50. | Not about a visible disaster site |
| * Barakat S. Housing reconstruction after conflict and disaster. Humanitarian Policy Group, Network Papers. 2003; 43:1-40. | Not about a visible disaster site |
| Barrios RE. 'Here, I'm not at ease': anthropological perspectives on community resilience. Disasters. 2014;38(2):329-50. | Not about a visible disaster site |
| Berroeta H, Pinto de Carvalho L, Castillo-Sepulveda J, Opazo L. Sociospatial ties and postdisaster reconstruction: An analysis of the assemblage in the mega-fire of Valparaiso. J Community Psychol. 2020;25:25. | Not about a visible disaster site |
| Blanchard EB, Rowell D, Kuhn E, Rogers R, Wittrock D. Posttraumatic stress and depressive symptoms in a college population one year after the September 11 attacks: The effect of proximity. Behaviour Research and Therapy. 2005;43(1):143-50. | Not about a visible disaster site |
| Boano C. Housing anxiety and multiple geographies in post-tsunami Sri Lanka. Disasters. 2009;33(4):762-85. | Not about a visible disaster site |
| Bohleber W. Remembrance, trauma and collective memory. The battle for memory in psychoanalysis. International Journal of Psychoanalysis. 2007;88(2):329-52. | Not about a visible disaster site |
| Collins H, Allsopp K, Arvanitis K, Chitsabesan P, French P. Psychological impact of spontaneous memorials: A narrative review. Psychological Trauma: Theory, Research, Practice and Policy. 2020 | Not about a permanent memorial |
| Dionisio MR, Pawson E. Building resilience through post-disaster projects: Responses to the 2010 and 2011 Christchurch earthquakes and 2011 Tohoku Tsunami. Australasian Journal of Disaster and Trauma Studies 2016;20:107-116. | No original data. |
| Cerdá M, Bordelois PM, Galea S, Norris F, Tracy M, Koenen KC. The course of posttraumatic stress symptoms and functional impairment following a disaster: what is the lasting influence of acute versus ongoing traumatic events and stressors? Social Psychiatry and Psychiatric Epidemiology. 2013 Mar 1;48(3):385-395 | Not about a visible disaster site |
| Collodi J, Pelling M, Fraser A, Borie M, Di Vicenz S. How do you build back better so no one is left behind? Lessons from Sint Maarten, Dutch Caribbean, following Hurricane Irma. Disasters. 2019;16:16. | Not about a visible disaster site |
| Cueto RM, Fernandez MZ, Moll S, Rivera G. Community Participation and Strengthening in a Reconstruction Context After a Natural Disaster. J. 2015;43(4):291-303. | Not about a visible disaster site |
| Curtis A, Mills JW, Leitner M. Katrina and vulnerability: The geography of stress. Journal of Health Care for the Poor and Underserved. 2007;18(2):315-30. | Not about a visible disaster site |
| Daly ES, Gulliver SB, Zimering RT, Knight J, Kamholz BW, Morissette SB. Disaster mental health workers responding to ground zero: One year later. Journal of Traumatic Stress. 2008;21(2):227-39. | Not about a visible disaster site |
| Dekovic M, Koning IM, Jan Stams G, Buist KL. Factors associated with traumatic symptoms and internalizing problems among adolescents who experienced a traumatic event. Anxiety, Stress and Coping. 2008;21(4):377-86. | Not about a visible disaster site |
| DeLisi LE, Maurizio A, Yost M, Papparozzi CF, Fulchino C, Katz CL, Altesman J, Biel M, Lee J, Stevens P. A survey of New Yorkers after the Sept. 11 2001 Terrorist Attacks. American Journal of Psychiatry 2003; 160: 780-783. | Not about a visible disaster site |
| DiMaggio C, Galea S, Emch M. Spatial proximity and the risk of psychopathology after a terrorist attack. Psychiatry Research. 2010;176(1):55-61. | Not about a visible disaster site |
| Divsalar P, Dehesh T. Prevalence and predictors of post-traumatic stress disorder and depression among survivors over 12 years after the Bam earthquake. Neuropsychiatric Disease and Treatment 2020; 16: 1207-1216 | Not about a visible disaster site |
| Dominelli L. Empowering Disaster-Affected Communities for Long-Term Reconstruction: Intervening in Sri Lanka After the Tsunami. Journal of Social Work in Disability and Rehabilitation. 2013;12(1-2):48-66. | Not about a visible disaster site |
| Fan C, Jiang Y, Mostafavi A. Emergent social cohesion for coping with community disruptions in disasters. Journal of the Royal Society Interface. 2020;17 (164) (no pagination)(20190778). | Not about a visible disaster site |
| Fan L. Shelter strategies, humanitarian praxis and critical urban theory post-crisis reconstruction. Disasters. 2012;36(SUPPL.1):S64-S86. | Not about a visible disaster site |
| Friedberg JP, Adonis MN, Von Bergen HA, Suchday S. Short communication: September 11th related stress and trauma in New Yorkers. Stress and Health. 2005;21(1):53-60. | Not about a visible disaster site |
| Fu M, Guo J, Qu Z, Han Z, Wang S, He H. Long-Term Health Consequences Among Wenchuan Earthquake Adult Survivors: Implications of a Framework for Postearthquake Reconstruction. J Nerv Ment Dis. 2019;207(10):884-92. | Not about a visible disaster site |
| Gambone LJ. Thoughts of Katrina: Posttraumatic growth in the aftermath of disaster. Dissertation Abstracts International: Section B: The Sciences and Engineering. 2011;71(9-B). | Not peer reviewed |
| Glad KA, Hafstad GS, Jensen TK, Dyb G. A longitudinal study of psychological distress and exposure to trauma reminders after terrorism: Psychological Trauma: Theory, Research, Practice, and Policy. 2017; 9: 145-152 | Not about a visible disaster site |
| Glad KA, Jensen TK, Hafstad GS, Dyb G. Posttraumatic stress disorder and exposure to trauma reminders after a terrorist attack. Journal of Trauma and Dissociation 2016; 17: 435-447 | Not about a visible disaster site |
| Goenjian A. A mental health relief programme in Armenia after the 1988 earthquake. Implementation and clinical observations. British Journal of Psychiatry. 1993;163(AUG.):230-9. | Not about a visible disaster site |
| Goenjian AK, Roussos A, Steinberg AM, Sotiropoulou C, Walling D, Kakaki M, Karagianni S. Longitudinal study of PTSD, depression, and quality of life among adolescents after the Parnitha earthquake. Journal of Affective Disorders 2011; 133: 509-515. | **Included** |
| Hansen BT, Dinesen PT, Ostergaard SD. Increased Incidence Rate of Trauma- and Stressor-related Disorders in Denmark After the Breivik Attacks in Norway. Epidemiology. 2017;28(6):906-9. | Not about a visible disaster site |
| Hansen MB, Nissen A, Heir T. Proximity to terror and post-traumatic stress: a follow-up survey of governmental employees after the 2011 Oslo bombing attack. BMJ Open. 2013;3(7). | Not about a visible disaster site |
| Hogg D, Kingham S, Wilson TM, Griffin E, Ardagh M. Geographic variation of clinically diagnosed mood and anxiety disorders in Christchurch after the 2010/11 earthquakes. Health Place. 2014;30:270-8. | Not about a visible disaster site |
| Howell KH, Kaplow JB, Layne CM, Benson MA, Compas BE, Katalinkski R, Pasalic H, Bosankic N, Pynoos R. Predicting adolescent posttraumatic stress in the aftermath of war: Differential effects of coping strategies across trauma reminder, loss reminder and family conflict domains. Anxiety, Stress and Coping 2014; 28: 88-104 | **Included** |
| Johal S, Mounsey Z, Tuohy R, Johnston D. Coping with disaster: General practitioners’ perspectives on the impact of the Canterbury earthquakes, PLoS Currents. 2014 Apr 2;6 | Not about a visible disaster site |
| Kessler RC, McLaughlin KA, Koenen KC, Petukhova M, Hill ED. The importance of secondary trauma exposure for post-disaster mental disorder. Epidemiology and Psychiatric Sciences. 2012;21(1):35-45. | Not about a visible disaster site |
| Klein TP, Devoe ER, Miranda-Julian C, Linas K. Young children's responses to September 11th: The New York City experience. Infant Ment Health J. 2009;30(1):1-22. | Not about a visible disaster site |
| Laugharne J, Janca A, Widiger T. Posttraumatic stress disorder and terrorism: 5 Years after 9/11. Current Opinion in Psychiatry. 2007;20(1):36-41. | Not about a visible disaster site |
| Lazaratou H, Paparrigopoulos T, Galanos G, Psarros C, Dikeos D, Soldatos C. The psychological impact of a catastrophic earthquake: A retrospective study 50 years after the event. Journal of Nervous and Mental Disease. 2008;196(4):340-4. | Not about a visible disaster site |
| * Lindell MK, Prater CS. Assessing community impacts of natural disasters. Natural Hazards Review. 2003; 4(4):176-85. | Not about a visible disaster site |
| * Low SM. Lessons from imagining the World Trade Center site: An examination of public space and culture. Anthropology and Education Quarterly; 2002;33: 395-405 | Not about a visible disaster site |
| * Low SM. The memorialization of September 11th: Dominant and local discourses on the rebuilding of the World Trade Centre site. American Ethnologist 2004;31:326-339 | Not about a visible disaster site, or a permanent memorial |
| * Low SM, Taplin DH, Lamb M. Battery Park City: An ethnographic field study of the community impact of 9/11. Urban Affairs Review 2005; 40(5):655-682 | Not about a visible disaster site |
| Ma Z, Lin Z. The impact of exposure to memorial reports on the 5.12 Wenchuan earthquake on sleep quality among adult survivors ten years after the disaster: Evidence for nonlinear associations. Comprehensive Psychiatry. 2020;97:152150. | Not about a visible disaster site |
| Ma Z, Xia Y, Lin Z. Post-Traumatic Growth Following Exposure to Memorial Reports of the 5.12 Wenchuan Earthquake: The Moderating Roles of Self-Esteem and Long-Term PTSD Symptoms. Int J Environ Res Public Health. 2019;16(18):04. | Not about a visible disaster site |
| Mahat-Shamir M, Ring L, Hamama-Raz Y, Ben-Ezra M, Pitcho-Prelorentzos S, David UY, et al. Do previous experience and geographic proximity matter? Possible predictors for diagnosing Adjustment disorder vs. PTSD. Psychiatry Research. 2017;258:438-43. | Not about a visible disaster site |
| Marshall RD, Bryant RA, Amsel L, Suh EJ, Cook JM, Neria Y. The psychology of ongoing threat: relative risk appraisal, the September 11 attacks, and terrorism-related fears. American Psychologist. 2007;62(4):304-16. | No original data |
| Maybery D, Jones R, Dipnall JF, Berger E, Campbell T, McFarlane A, Carroll M. A mixed-methods study of psychological distress following an environmental catastrophe: the case of the Hazelwood open-cut coalmine fire in Australia, Anxiety, Stress, & Coping. 2020 Mar 3;33(2):216-230 | Not about a visible disaster site |
| Mazza M, Pacitti F, Pino MC, Peretti S, Mazzarelli E. Investigation on quality of life and psychological well-being of citizens of L'Aquila after earthquake on April 6, 2009. Rivista di Psichiatria. 2014;49(3):145-51. | Not about a visible disaster site |
| McFarlane AC, Raphael B. Ash Wednesday: The effects of a fire. Australian and New Zealand Journal of Psychiatry. 1984;18(4):341-51. | Unable to access |
| Merilainen E. The dual discourse of urban resilience: robust city and self-organised neighbourhoods. Disasters. 2020;44(1):125-51. | Not about a visible disaster site |
| Najarian LM, Majeed MH, Gasparyan K. Effect of relocation after a natural disaster in Armenia: 20-year follow-up. Asian Journal of Psychiatry. 2017;29:8-12. | Not about a visible disaster site |
| Neria Y, DiGrande L, Adams BG. Posttraumatic Stress Disorder Following the September 11, 2001, Terrorist Attacks: A Review of the Literature Among Highly Exposed Populations. American Psychologist. 2011;66(6):429-46. | No original data |
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