

## APPLYING CROWD PSYCHOLOGY TO DEVELOP RECOMMENDATIONS FOR THE MANAGEMENT OF MASS DECONTAMINATION

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Mass decontamination is a public health intervention employed by emergency responders following a chemical, biological, or radiological release. It involves a crowd of people whose interactions with each other and with the emergency responders managing the incident are likely to affect the success of the decontamination process. The way in which members of the public collectively experience decontamination is likely to affect their behavior and hence is crucial to the success of the decontamination process. Consequently, responders and the responsible authorities need to understand crowd psychology during mass emergencies and disasters. Recently, the social identity approach to crowd psychology has been applied to explain public perceptions and behavior during mass emergencies. This approach emphasizes that crowd events are characteristically intergroup encounters, in which the behavior of one group can affect the perceptions and behavior of another. We summarize the results from a program of research in which the social identity approach was applied to develop and test recommendations for the management of mass decontamination. The findings from this program of research show that (1) responders' perceptions of crowd behavior matter; (2) participants value greater communication and this affects their compliance; and (3) social identity processes explain the relationship between effective responder communication and relevant outcome variables, such as public compliance, public cooperation, and public anxiety. Based on this program of research, we recommend 4 responder management strategies that focus on increasing public compliance, increasing orderly and cooperative behavior among members of the public, reducing public anxiety, and respecting public needs for privacy.

**T**HE THREAT OF INCIDENTS INVOLVING CHEMICAL, biological, radiological, and nuclear (CBRN) agents has increased in recent years, in part because of advances in technology<sup>1,2</sup> and the increased willingness of terrorists to obtain and use CBRN materials.<sup>3,4</sup> Incidents involving CBRN agents are likely to have a large impact. One reason for this is that the uncertainty and unfamiliarity associated with these types of agents is likely to result in large numbers of people seeking treatment.<sup>5</sup> Indeed, one of the key motivations for releasing a CBRN agent may be the anticipated psychological effect on the target population.<sup>6</sup> However, it has been suggested that interventions designed to protect

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members of the public from the threat posed by CBRN agents, such as decontamination, may actually be more frightening than the contaminant itself, if the interventions are not managed appropriately.<sup>7</sup>

Decontamination showering involves those who have potentially been contaminated undergoing a shower with mild soapy water in order to remove any contaminant that may be present on their skin. This reduces the risk that the agent will be absorbed into the skin and also reduces the risk of secondary contamination of other people and places, such as receiving hospitals.

Planning for incidents requiring decontamination has focused on large-scale incidents involving “mass” decontamination. The focus on planning for these incidents increased following the sarin attacks on the Tokyo subway in 1995<sup>5</sup> and the terrorist attacks in the US in 2001. In the UK, this increased focus on planning for incidents requiring mass decontamination has resulted in the development of specially designed New Dimension MD1 mass decontamination tents.<sup>8</sup> These allow for the decontamination of up to 150 people per hour and would be used by the UK Fire and Rescue Service (FRS) in the event that an incident requiring mass decontamination were to occur. Planning for incidents involving mass decontamination continues to be a major concern for emergency services and policymakers.

However, mass decontamination has typically been seen as essentially a technical issue, with very little focus on planning for the human side of managing large numbers of people during the process.<sup>9</sup> Little consideration has therefore been given to how members of the public might experience the decontamination process and how this might consequently affect their behavior.<sup>9,10</sup> Where public behavior has been considered, there has been a reliance on traditional crowd behavior theories that emphasize irrationality and “mass panic.”<sup>11,12</sup> These theories have been discredited by over 50 years of research that shows that crowd behavior is normative, rather than irrational, and that mass panic is rare.<sup>13-18</sup> Further, a belief in crowd panic and the need for control management strategies is counterproductive, since it may result in responders and the responsible authorities withholding vital information from members of the public<sup>19</sup> and may therefore produce the very psychosocial vulnerability that responders and policymakers are hoping to prevent.<sup>20,21</sup>

There is therefore a need to update planning and guidance for incidents involving mass decontamination, so that these are based on recent theory and research, rather than on outdated assumptions about mass panic. One approach that has been applied to understanding public behavior during various crowd events is the social identity approach. The social identity approach provides an explanation for group behavior (such as cooperation) and for relations between “ingroups” (those who share a social identity) and “outgroups” (a group with whom ingroup members do not identify). Where a group authority is seen as illegitimate, the potential consequences of this could include noncom-

pliance with responder instructions and challenges to responders’ authority.

We carried out a program of research in which we applied the social identity approach to develop and test recommendations for responder management strategies for mass decontamination. In this article, we integrate the key findings from this program of research. Bringing the findings together in this way enables us to evaluate the potential contribution of social psychology to the management of mass decontamination and to derive a set of recommendations for responder management strategies. Before describing the findings from our program of research, we provide a brief overview of the way we applied principles from the social identity approach.

## APPLYING SOCIAL IDENTITY PRINCIPLES

In the field of health and wellbeing, the social identity approach has been applied to a diverse range of problems, from traumatic brain injury<sup>22</sup> to depression,<sup>23</sup> and has been able to predict health-related behaviors in different contexts.<sup>24</sup> The approach has also been applied to develop a number of group-based interventions to manage such health issues.<sup>25</sup>

Incidents involving mass decontamination are intergroup encounters between a crowd—defined as a group in which people are face-to-face in an unstructured, novel situation<sup>26</sup>—and responders. The social identity approach,<sup>27,28</sup> which explains cognition and behavior through reference to group and intergroup relations, was thought to be relevant to incidents of this type. In the case of mass decontamination, members of the public respond to the incident itself, to each other, and to the emergency responders. Hence, we examined the literature on crowd processes and intergroup relations to derive some hypotheses to explain public responses in such incidents.

We reviewed studies of intergroup behavior in various different crowd contexts (eg, between police and football supporters, or police and protesters) to identify factors that could be relevant during incidents involving mass decontamination. This research demonstrated the pivotal role of perceptions of responder legitimacy and the way this can affect the nature of intergroup behavior. According to the social identity approach, a response that is perceived as legitimate promotes cooperation and compliance, while a response that is perceived as illegitimate increases the risk of intergroup conflict.<sup>29-31</sup> Effective responder communication has been found to increase perceptions of responder legitimacy,<sup>32,33</sup> thus increasing identification with police and increasing compliance with police instructions.<sup>33,34</sup>

We applied these principles to incidents involving mass decontamination to hypothesize that effective communication from emergency responders would result in increased perceptions of responder legitimacy and therefore increased identification with emergency responders. To

understand why perceptions of responder legitimacy can enhance identification with emergency responders, it is important to take into account the *content* of the shared identity; in the present case, we hypothesized that communication from emergency responders that emphasizes the health benefits of decontamination and explains the reasons behind the actions responders are taking would enhance identification between responders and members of the public around a shared identity of protecting and maintaining public health. Put differently, the public would come to internalize the responders' task of decontamination and to see it as their own, since it would now be a "health" issue common to all. In line with the social identity research on health behaviors, we predicted that shared identification with the responders and among the public would be the key factor determining responses on 3 key outcome measures: public compliance, public cooperation, and public anxiety.

## OVERVIEW OF METHODS USED

In our program of research, we used a variety of research designs and methods to examine the importance of social psychological factors in the management of mass decontamination and more specifically to test the extent to which social identity processes can affect public experiences and behavior during such incidents. Our initial research focused on examining what is already known about incidents involving mass decontamination, including likely public behavior, and current responder management strategies. Methods used included a literature review of published reports of small-scale incidents involving decontamination (<30 people),<sup>9</sup> interviews with emergency responders,<sup>10</sup> and analysis of feedback from volunteers (members of the public, members of Casualties' Union, and medical students) who had taken part in field exercises involving mass decontamination.<sup>35,36</sup> Findings suggested that public perceptions of effective responder communication and respect for public needs for privacy during decontamination are essential to facilitate the successful management of incidents involving mass decontamination.

However, these methods were either observational in nature or relied on preexisting data sets, and therefore they permitted little control over the variables measured. To address this, we developed a questionnaire for use during a mass decontamination field exercise.<sup>37</sup> This field exercise was a multiagency exercise, carried out in the center of a large city. Volunteers (members of the public) were asked to complete a pre-exercise questionnaire and postexercise questionnaire, both of which included social identity measures (eg, perceptions of responder legitimacy, identification with emergency responders, identification with other members of the public), as well as measures relating to perceptions of responder communication and the relevant outcome variables. Analysis of volunteer feedback data

from this exercise represented our first opportunity to examine the psychological factors underlying the relationships between effective responder communication and the relevant outcome variables.

We then carried out an online visualization experiment<sup>38</sup> and a mass decontamination field experiment<sup>39</sup> in which we tested the effect of 3 different responder communication strategies on public compliance, public cooperation, and public anxiety. Participants in both studies were students from the University of Sussex. The experimental designs used enabled us to manipulate and test different responder communication strategies and thus facilitated a greater degree of control over the study design and the measures used. We tested the effectiveness of the same communication strategies in both the online visualization experiment and the mass decontamination field experiment. However, in the mass decontamination field experiment, we asked participants to actually undergo decontamination, as they would during a real incident.<sup>39</sup> Asking participants to actually undergo decontamination increased the ecological validity of the research and also enabled us to collect behavioral data alongside self-report data.

## OVERVIEW OF FINDINGS

Below we discuss the findings from our program of research in more detail, justifying each of the 3 chosen outcome variables (public compliance, public cooperation, and public anxiety) in turn and explaining how the results from our program of research can be used to generate recommendations to improve outcomes during incidents involving mass decontamination.

### *Compliance*

Compliance with mass decontamination can be defined as members of the public undertaking any actions recommended by emergency responders in order to undergo decontamination successfully, in terms of removing any contaminant from their skin as quickly as possible and behaving in an orderly way. These actions include disrobing prior to decontamination, undergoing a decontamination shower, and dressing in the re-robe suits provided. As noted above, decontamination is an unfamiliar and potentially embarrassing intervention. Members of the public may therefore be reluctant to undergo decontamination, especially if the process is not managed effectively.<sup>7</sup> Reduced public compliance and cooperation may result in delays in the decontamination process,<sup>40</sup> which could cost lives during a real incident.<sup>41,42</sup> Thus, examining ways to increase public compliance during mass decontamination could result in lives being saved.

All of the studies we carried out examined the role of effective responder communication in increasing

compliance with the decontamination process. Various different types of data were collected, including self-report data,<sup>35-38</sup> interview data,<sup>10</sup> observational data,<sup>36,39</sup> and behavioral measures of the efficiency of the decontamination process (ie, timing the process).<sup>39</sup> The findings from these studies suggested that perceptions of effective responder communication resulted in increased levels of public compliance.

In our field experiment and online visualization experiments,<sup>38,39</sup> we specifically tested which aspects of responder communication strategies resulted in increased perceptions of effective responder communication and hence increased public compliance. Results suggested that for communication to be perceived as effective, 2 different types of information needed to be provided to members of the public: (1) open communication about the nature of the incident and why decontamination was necessary, along with regular updates about actions responders were taking; and (2) sufficient practical information about the actions those involved needed to take in order to successfully undergo decontamination. When statements from responders included both open communication and practical information, this resulted in increased perceptions of effective responder communication. These increased perceptions of effective responder communication resulted in increased perceptions of responder legitimacy and increased identification with emergency responders, 2 factors that were found to predict increased public compliance, measured through both self-report measures<sup>36,38,39</sup> and observation of participant behavior.<sup>39</sup> Overall, our studies consistently showed that effective responder communication, along with respect for public needs for privacy, increased the willingness of members of the public to comply with the need for decontamination.<sup>35-39</sup>

It is not only important that members of the public are *willing* to comply with the decontamination process; they must also be *able* to comply with the process. Qualitative analysis of feedback data from emergency preparedness field exercises revealed that several participants reported that a lack of practical information and instructions from emergency responders resulted in confusion and in their not being able to complete the decontamination process successfully.<sup>35</sup> This is supported by observations carried out during our field experiment, in which less confusion was observed among participants who were provided with sufficient practical information compared to those in other conditions.<sup>39</sup> Effective responder communication, containing both open explanations about the need for decontamination and sufficient practical information, resulted in increased speed and efficiency of the decontamination process.<sup>39</sup>

Our review of small-scale incidents involving decontamination showed that respect for privacy was also an important factor that could increase public compliance.<sup>9</sup> Findings from this review have been replicated in the results from several other research studies,<sup>10,35,36,39</sup> all of which

indicated that emergency responders should respect the public's need for privacy in order to ensure compliance with the decontamination process. Having sufficient privacy resulted in increased perceptions of responder legitimacy, a key variable affecting public compliance and cooperative behavior.<sup>36,39</sup>

Importantly, as well as showing the impact of effective responder communication and respect for the public's privacy on compliance, by applying principles from the social identity approach, our research also suggests the mechanism behind this effect. Specifically, our findings showed that effective responder communication and respect for privacy increased perceptions of responder legitimacy, which in turn increased identification with emergency responders and identification with other members of the public, and it is this that increased public compliance.<sup>36,38,39</sup> By indicating the mediating role of social identity processes, our research has enabled us to generate recommendations for effective responder management strategies, outlined in detail in the Practical Implications section below.

### *Willingness to Help and Cooperate with Others*

Mass decontamination requires large numbers of people to wait their turn and to progress through the process in an orderly fashion. Increased orderly and cooperative behavior (eg, orderly queuing) and helping behavior (eg, mutual help with disrobing, washing, etc) will facilitate the smooth running of the decontamination process and could result in lives being saved. By contrast, failure of members of the public to behave cooperatively reduces the ability of emergency services personnel to manage the incident and may result in increased spread of any contaminant.<sup>40</sup> It is therefore important to understand factors that affect willingness to cooperate with and help others during incidents involving mass decontamination.

We have examined willingness to help and cooperate with others as a key outcome variable in 3 studies.<sup>36,38,39</sup> We used a variety of measures, including observational measures of public helping and cooperation<sup>39</sup> and self-reported measures of people's own willingness to help others<sup>38</sup> and their perceptions that others will behave in a helpful and cooperative way.<sup>36</sup> Findings from these studies consistently showed that effective responder communication resulted in increased willingness to help and cooperate with others. As above, this relationship was shown to be mediated by perceptions of responder legitimacy, identification with emergency responders, and identification with other members of the public. Previous research into the role of social identity processes during mass emergencies and disasters indicates that identification with others can increase helping and cooperative behavior,<sup>15,43</sup> and it is suggested that this may be due in part to shared identity

facilitating collective agency (a belief that those involved can work together to overcome challenges they may face).<sup>44</sup> Our findings are in line with this, in showing that there is a relationship among identification with other members of the public, collective agency, and willingness to help others.

Our research also extended this finding by showing that identification with emergency responders (based on increased perceptions of responder legitimacy) resulted in increased identification among members of the public,<sup>36,38,39</sup> a relationship that has not previously been examined.

## *Anxiety*

Anxiety can be defined as a “tense, unsettling anticipation of a threatening but vague event; a feeling of uneasy suspense.”<sup>45(p3)</sup> Anxiety is distinct from fear, in that anxiety can occur around an imagined (or exaggerated) threat, whereas fear occurs in response to a specific identifiable threat.<sup>45</sup> Both of these concepts are distinct from “panic,” which as well as involving fear or anxiety about a real or imagined threat also involves a degree of irrational behavior.<sup>46</sup> Our focus has been on the impact of mass decontamination on public anxiety (rather than fear or panic), a decision taken for 3 reasons. First, evidence suggests that panic is uncommon during mass emergencies and disasters and that orderly behavior is a more typical public response.<sup>17,18,47</sup> Second, the concept of “panic” revolves around a judgment of behavior as irrational. However, it is unclear what the reference point for this judgement should be in an emergency, and therefore whether or not a behavior is defined as panic may be subjective.<sup>47</sup> Third, decontamination occurs in response to potential contamination with a CBRN agent. Uncertainty is likely to be high during incidents involving releases of such agents, as identifying the substance involved (or indeed whether a release has actually taken place) can take several hours.<sup>5</sup> Thus, members of the public are more likely to experience anxiety (in relation to an uncertain threat) than fear (in relation to a specific identifiable threat).

Decontamination involves the need to shower naked, or barely clothed, in front of others—an unfamiliar, frightening, and potentially embarrassing situation.<sup>7</sup> These factors therefore increase the potential for anxiety during incidents involving decontamination<sup>48,49</sup> and increase the need for responders to plan for this in their management of the incident. Understanding both the factors that affect levels of public anxiety and the effect that anxiety may have on public behavior during mass decontamination is likely to be crucial for developing effective management strategies.

We have examined the factors that affect public anxiety during mass decontamination in all of our research studies.<sup>9,10,35-39</sup> We predicted that effective responder communication would reduce public anxiety, as this has been found to be the case during several small-scale incidents involving decontamination.<sup>48,49</sup> Our qualitative findings support this: Members of the public stated that they would

feel less anxious if they had received more effective communication from emergency responders.<sup>35</sup> However, there was mixed support for the relationship between effective responder communication and reduced anxiety in our quantitative work, with some studies indicating a relationship between effective responder communication and reduced anxiety<sup>38,39</sup> and others showing no such relationship.<sup>36</sup> A possible reason for this discrepancy is that these studies used different measures of anxiety. The study showing no relationship between effective responder communication and reduced anxiety used a measure of actual anxiety experienced, while the 2 studies showing a relationship between effective responder communication and reduced anxiety used a measure of *expectations* of anxiety during a real incident. We found that actual anxiety experienced was very low,<sup>36,39</sup> creating difficulties in accurately measuring the impact of effective responder communication on anxiety. This is likely because we examined public anxiety during simulated incidents, in which participants knew that no harm would come to them. Using a measure of expectations of anxiety during a real incident allowed us to begin to overcome this issue, but more work is needed to ascertain the role of effective responder communication in reducing public anxiety during mass decontamination.

## IMPLICATIONS OF FINDINGS

### *Theoretical Implications*

This program of research is novel in applying social psychology, in particular principles from the social identity approach, to incidents involving mass decontamination. Until now, mass decontamination has been treated as a purely technical issue,<sup>9</sup> with very little emphasis placed on understanding how members of the public are likely to behave during such incidents. Where crowd psychology has been considered, there has been a tendency for policymakers<sup>9</sup> and emergency responders<sup>10</sup> to rely on assumptions of “mass panic.” This has led to a focus on controlling, rather than communicating with, members of the public.<sup>9,10</sup> By applying principles from the social identity approach to incidents involving mass decontamination, we have been able to not only challenge existing assumptions and provide new understandings of the determinants of public behavior, but also to generate theoretically derived recommendations for managing such incidents. Further, the findings from the program of research summarized here provide evidence that principles of the social identity approach are applicable in the context of incidents involving mass decontamination, an area in which the social identity approach has not previously been applied.

More generally, the application of social identity principles to social or health problems is in line with the development of the “social cure,”<sup>25</sup> in which a range of health issues have been found to be amenable to group-based

solutions. A review of the relevant literature reveals that social identity has an impact on health in many ways, from being a predictor of people's health-related behaviors (ie, individuals are more likely to engage in a health-promoting behavior if it is perceived as being a norm of a group with which they identify) to affecting clinical outcomes (eg, reduced depression and anxiety, enhanced quality of life, and reduced likelihood of developing a chronic illness).<sup>24</sup> The current program of research is therefore in line with this development, in showing how psychological group membership can affect positive health outcomes (eg, reduced anxiety, increased compliance with recommended behaviors) in a mass emergency setting.

### *Practical Implications*

Findings from our program of research suggest that a crucial factor for improving the success of the decontamination process is the extent to which members of the public see the process as legitimate and identify with the responders. In such cases, members of the public internalize and come to take ownership of the task of decontamination and respond actively, rather than behaving passively or reluctantly. Based on the findings described above, we highlight 4 recommendations for practices that will increase perceptions of responder legitimacy and public identification with responders. These practices will therefore encourage members of the public to take ownership of the task of decontamination and engage with it. We argue that these 4 recommendations, which are both theoretically derived and evidence-based, should be included in future guidance for emergency responders:

1. *Communicate openly with members of the public about the nature of the incident and the actions that are being taken.* Responders should strive to communicate openly about any actions that they are taking and about the nature of the incident. Responders should not wait until all the facts are known before initiating communication with members of the public; it is better to communicate that there is uncertainty than to communicate false information or not to communicate at all.
2. *Provide health-focused explanations about decontamination.* Responders should communicate the health aspects of decontamination, explaining why all the steps involved in decontamination are necessary and how decontamination will protect members of the public and their loved ones.
3. *Provide sufficient practical information.* Emergency responders should provide members of the public with sufficient practical information during the decontamination process, such as how members of the public should undergo the decontamination process and what actions they can take to reduce risks to their health.
4. *Respect the public's concerns about privacy and modesty.* Emergency responders should take care to respect the

public's needs for privacy throughout the decontamination process; failure to do so could result in increased anxiety and reduced compliance.

These 4 recommendations should be included in decontamination guidance materials for emergency responders, as well as being used to improve current training for responders on communicating with members of the public during incidents that require mass decontamination. Indeed, the findings reported by Carter et al<sup>35</sup> have been used to inform a hospital decontamination best practices document prepared by the Harvard School of Public Health Emergency Preparedness and Response Exercise Program,<sup>50</sup> while the findings reported by Carter et al<sup>35,39</sup> have been incorporated into a patient decontamination guidance document prepared by the US Departments of Homeland Security and Health and Human Services.<sup>51</sup>

The research we have described highlights the importance of social psychological factors, in particular social identity processes, in incidents involving mass decontamination. Findings suggest that effective responder communication plays a key role in improving outcomes such as increased public compliance and cooperation, and that this relationship is mediated by social identity variables. However, in order for emergency services personnel to communicate effectively with members of the public during these types of incidents, certain practical issues will need to be addressed. Research has shown that the personal protective equipment (PPE) worn by emergency responders presents a challenge for responders when trying to hear, and be heard by, members of the public.<sup>35</sup> Several approaches could be taken to overcome this, including playing prerecorded communication messages to crowd members over a loudspeaker during the incident; including a radio or amplifier in each personal protective suit, to allow emergency responders to make themselves heard more easily by members of the public; and setting up a board with visual instructions of the decontamination process at the entrance to the decontamination showers. Certain groups (eg, those who do not speak English, those with learning disabilities or hearing disabilities) are likely to have increased difficulties in hearing and/or understanding any communication from emergency responders, and planning for the needs of such groups is essential. Suggestions for meeting the needs of these groups include the use of interpreters, bilingual signs, and broad nonverbal gestures (eg, mimicking required actions, giving a "thumbs up" sign to indicate everything is okay).<sup>52</sup>

Various methods of decontaminating members of the public are now being proposed, alongside, or instead of, a decontamination shower in one of the New Dimension MD1 showering tents. These methods include (1) interim decontamination (a basic shower, using an FRS ladder and hose), which would take place prior to a full shower in the MD1 showering tents; (2) dry decontamination, in which those affected would remove their clothes and then use an

absorbent material (eg, a towel, blue roll) to remove the contaminant from their skin; and (3) wind decontamination (Air-Decon), in which those affected enter a wind tunnel with very high-speed winds, to remove any gases that may be present beneath their clothes.<sup>53</sup> However, since each of these interventions involves an unfamiliar and potentially stressful situation for those affected, the findings presented here will likely be applicable across any or all of these interventions.

Further, while incidents involving mass decontamination represent some unique challenges for emergency responders, as discussed above, it is likely that several of the outcomes will also be applicable across a broad range of mass emergencies and disasters. In almost all mass emergencies and disasters, it is likely that the authorities will recommend actions for members of the public to take in order to protect themselves and others around them. The findings presented here suggest that perceptions of effective communication from the authorities will be essential for increasing public perceptions of the legitimacy of the authorities' messages and, hence, for increasing public compliance with recommended actions. Thus, the findings from this body of research may be used to prepare effective communication strategies for a range of mass emergencies and disasters.

## CONCLUSION

Our research is novel in applying social psychological theories, in particular the social identity approach, to understanding of public experiences and behavior during mass decontamination and to generating recommendations for responder management of such incidents. The body of research reviewed here provides evidence that effective responder communication is essential to facilitate the successful management of incidents involving mass decontamination. Further, the findings show that an understanding of the mediating role played by social identity processes during these types of incidents can help to inform more effective responder communication strategies. Despite the increasing evidence relating to the importance of communication during incidents involving mass decontamination, there is currently very little emphasis on planning for communicating with members of the public during these types of incidents. Where public behavior has been considered, there has been a reliance on assumptions of mass panic, which has led to a focus on controlling, rather than communicating with, members of the public. It is essential that policymakers urgently move their focus away from planning for "control" management strategies and instead concentrate on preparing effective public communication strategies during incidents involving mass decontamination. In the increasingly likely event that an incident of this type occurs in the UK, an effective communication strategy, developed based on an understanding

of social psychological factors, will facilitate the speedy and efficient management of the decontamination process and will result in injuries being minimized and lives being saved.

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## REFERENCES

- Alexander DA, Klein S. The challenge of preparation for a chemical, biological, radiological, or nuclear terrorist attack. *J Postgrad Med* 2006;52(2):126-131.
- HM Government. *Securing Britain in an Age of Uncertainty: The Strategic Defence and Security Review*. London, UK: HM Government; 2010.
- O'Brien LB. The evolution of terrorism since 9/11. *FBI Law Enforcement Bulletin* September 2011. <http://leb.fbi.gov/2011/september/the-evolution-of-terrorism-since-9-11>. Accessed January 12, 2015.
- Schneidmiller C. Nuclear smuggling shows terrorist WMD threat persists: State Department. *Global Security Newswire* August 1, 2012. <http://www.nti.org/gsn/article/state-report/>. Accessed January 12, 2015.
- Okumura T, Suzuki K, Fukuda A, et al. The Tokyo subway attack: disaster management, part 2: hospital response. *Acad Emerg Med* 1998;5(6):618-624.
- Mazzone A. The use of CBRN weapons by non-state terrorists. *Global Security Studies* 2013;4(4):23-30. <http://globalsecuritystudies.com/Mazzone%20CBRN-AG.pdf>. Accessed January 12, 2015.
- Holloway HC, Norwood AE, Fullerton CS, Engel CC, Ursano RJ. The threat of biological weapons: prophylaxis and mitigation of psychological and social consequences. *JAMA* 1997;278(5):425-427.
- New Dimension Regional Team. *National Guidance Document: Fire Service Mass Decontamination*. London, UK: New Dimension Regional Team; 2003.
- Carter H, Drury J, Rubin GJ, Williams R, Amlôt R. Communication during mass casualty decontamination: highlighting the gaps. *International Journal of Emergency Services* 2013;2(1):29-48.
- Carter H, Drury J, Rubin GJ, Williams R, Amlôt R. Emergency responders' experiences of and expectations regarding decontamination. *International Journal of Emergency Services* 2014;3(2):179-192.
- Le Bon G. *The Crowd: A Study of the Popular Mind*. London: Ernest Benn; 1895.
- Smelser NJ. *Theory of Collective Behavior*. Glencoe, IL: Free Press; 1963.

13. Cornwell B. Bonded fatalities: relational and ecological dimensions of a fire evacuation. *Sociological Quarterly* 2003; 44(4):617-638.
14. Cornwell B, Harmon W, Mason M, Merz B, Lampe M. Panic or situational constraints? The case of the M/V Estonia. *Int J Mass Emerg Disasters* 2001;19(1):5-25.
15. Drury J, Cocking C, Reicher S. The nature of collective resilience: survivor reactions to the 2005 London bombings. *Int J Mass Emerg Disasters* 2009;27(1):66-95.
16. Feinberg WE, Johnson NR. The ties that bind: a macro-level approach to panic. *Int J Mass Emerg Disasters* 2001;19(3):269-295.
17. Johnson NR. Panic at "The Who concert stampede": an empirical assessment. *Social Problems* 1987;34(4):362-373.
18. Johnson NR. Fire in a crowded theatre: a descriptive investigation of the emergence of panic. *Int J Mass Emerg Disasters* 1988;6(1):7-26.
19. Drury J, Novelli D, Stott C. Psychological disaster myths in the perception and management of mass emergencies. *J Appl Soc Psychol* 2013;43:2259-2270.
20. Furedi F. Fear and security: a vulnerability-led policy response. *Soc Policy Adm* 2008;42(6):645-661.
21. Wessely S. Don't panic! Short and long term psychological reactions to the new terrorism: the role of information and the authorities. *J Mental Health* 2005;14(1):1-6.
22. Haslam C, Holme A, Haslam SA, Iyer A, Jetten J, Williams H. Maintaining group memberships: social identity continuity predicts well-being after stroke. *Neuropsychol Rehabil* 2008;18(5-6):671-691.
23. Cruwys T, Dingle GA, Haslam C, Haslam SA, Jetten J, Morton TA. Social group memberships protect against future depression, alleviate depression symptoms and prevent depression relapse. *Soc Sci Med* 2013;98:179-186.
24. Haslam SA, Jetten J, Postmes T, Haslam C. Social identity, health and well-being: an emerging agenda for applied psychology. *Appl Psychol* 2009;58(1):1-23.
25. Jetten J, Haslam C, Haslam SA, eds. *The Social Cure: Identity, Health and Well-Being*. New York and Hove: Psychology Press; 2012.
26. Reicher S. The St Pauls riot: an explanation of the limits of crowd action in terms of a social identity model. *Eur J Soc Psychol* 1984;14(1):1-21.
27. Tajfel H, Turner J. An integrative theory of intergroup conflict. In: Austin WG, Worchel S, eds. *The Social Psychology of Intergroup Relations*. Monterey, CA: Wadsworth; 1979.
28. Turner JC, Hogg MA, Oakes PJ, Reicher SD, Wetherell MS. *Rediscovering the Social Group: A Self-Categorization Theory*. Oxford, UK: Blackwell; 1987.
29. Drury J, Reicher S. Collective action and psychological change: the emergence of new social identities. *Br J Soc Psychol* 2000;39(4):579-604.
30. Reicher S. 'The Battle of Westminster': developing the social identity model of crowd behaviour in order to explain the initiation and development of collective conflict. *Eur J Soc Psychol* 1996;26(1):115-134.
31. Stott C, Hutchison P, Drury J. 'Hooligans' abroad? Intergroup dynamics, social identity and participation in collective 'disorder' at the 1998 World Cup Finals. *Br J Soc Psychol* 2001;40(3):359-384.
32. Reicher S, Stott C, Drury J, Adang O, Cronin P, Livingstone A. Knowledge-based public order policing: principles and practice. *Policing* 2007;1(4):403-415.
33. Stott C, Adang O, Livingstone A, Schreiber M. Tackling football hooliganism: a quantitative study of public order, policing and crowd psychology. *Psychol Public Policy Law* 2008;14(2):115-141.
34. Stott C, Hoggett J, Pearson G. 'Keeping the peace': social identity, procedural justice and the policing of football crowds. *Br J Criminol* 2012;52(2):381-399.
35. Carter H, Drury J, Rubin GJ, Williams R, Amlôt R. Public experiences of mass casualty decontamination. *Biosecur Bio-terror* 2012;10(3):280-289.
36. Carter H, Drury J, Amlôt R, Rubin GJ, Williams R. Perceived responder legitimacy and group identification predict cooperation and compliance in a mass decontamination field exercise. *Basic Appl Soc Psych* 2013;35(6):575-585.
37. Carter H, Drury J, Rubin GJ, Williams R, Amlôt R. The effect of communication on anxiety and compliance during mass decontamination. *Disaster Prevention and Management* 2013;22(2):132-147.
38. Carter H, Drury J, Amlôt R, Rubin GJ, Williams R. Effective responder communication, perceived responder legitimacy and group identification predict public cooperation and compliance in a mass decontamination visualisation experiment. *Journal of Applied Social Psychology* 2014.
39. Carter H, Drury J, Amlôt R, Rubin GJ, Williams R. Effective responder communication improves efficiency and psychological outcomes in a mass decontamination field experiment: implications for public behaviour in the event of a chemical incident. *PLoS One* 2014;9(3):e89846.
40. Edwards NA, Caldicott DGE, Eliseo T, Pearce A. Truth hurts—hard lessons from Australia's largest mass casualty exercise with contaminated patients. *Emerg Med Australia* 2006;18(2):185-195.
41. Lillie SH, Mattis JN, Kelly JM, Rayburn BB. *CBRN Decontamination: Multi-Service Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Decontamination*. Fort Monroe, VA: US Army Training and Doctrine Command; Quantico, VA: Marine Corps Combat Development Command; Newport, RI: Navy Warfare Development Command; and Maxwell Air Force Base, AL: Headquarters Air Force Doctrine Center; 2006.
42. Schulze P, Lake WA. *Guidelines for Mass Casualty Decontamination During a HAZMAT/Weapons of Mass Destruction Incident: volume I*. Aberdeen Proving Grounds, MD: US Army Edgewood Chemical Biological Center; 2009.
43. Drury J, Cocking C, Reicher S. Everyone for themselves? A comparative study of crowd solidarity among emergency survivors. *Br J Soc Psychol* 2009;48(3):487-506.
44. Drury J. Collective resilience in mass emergencies and disasters: a social identity model. In: Jetten J, Haslam C, Haslam SA, eds. *The Social Cure: Identity, Health, and Well-Being*. Hove, UK: Psychology Press; 2012.
45. Rachman SJ. *Anxiety (Clinical Psychology: a modular course)*. New York: Psychology Press; 2013.
46. Sheppard B, Rubin GJ, Wardman JK, Wessely S. Terrorism and dispelling the myth of a panic prone public. *J Public Health Policy* 2006;27(3):219-245.
47. Sime JD. Escape behaviour in fires and evacuations. In: Canter D, ed. *Fires and Human Behaviour*, 2nd ed. London: David Fulton Publishers; 1990.
48. Hanley C. Residents sickened by pesticide cloud; ag officials insider changing rules. *Latino News* December 7, 1999.



- [http://wearcam.org/decon/decon\\_like\\_rape\\_dec99.html](http://wearcam.org/decon/decon_like_rape_dec99.html). Accessed October 7, 2010.
49. Vogt BM, Sorensen JH. *How Clean Is Safe? Improving the Effectiveness of Decontamination of Structures and People Following Chemical and Biological Incidents*. Oak Ridge, TN: Oak Ridge National Laboratory; 2002.
50. Harvard School of Public Health Emergency Preparedness and Response Exercise Program. *Proposed Minimum Decontamination Capabilities for Hospitals in Massachusetts*. Boston, MA: Harvard School of Public Health; 2013. <http://www.hsph.harvard.edu/wp-content/uploads/sites/1435/2013/01/Proposed-Decontamination-Capabilities-for-Hospitals-in-MA-2013.pdf>. Accessed January 28, 2015.
51. US Department of Homeland Security, US Department of Health and Human Services. *Patient Decontamination in a Mass Chemical Exposure Incident: National Planning Guidance for Communities*. Washington, DC: US Department of Homeland Security, US Department of Health and Human Services; 2012. [http://www.enmagazine.com/items/PatientDeconinMassChemExposureIncident\\_Sept2012DraftforReview.pdf](http://www.enmagazine.com/items/PatientDeconinMassChemExposureIncident_Sept2012DraftforReview.pdf). Accessed May 28, 2013.
52. Taylor KM, Balfanz-Vertiz K, Humrickhouse R, Jurik C. Decontamination with at-risk populations: lessons learned. *Internet Journal of Rescue and Disaster Medicine* 2009;9(1).
53. Okumura T, Seto Y, Fuse A. Countermeasures against chemical terrorism in Japan. *Forensic Sci Int* 2013;227(1-3):2-6.

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