

# Methodological challenges in assessing general population reactions in the immediate aftermath of a terrorist attack

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## Abstract

*Assessing mental health needs following a disaster is important, particularly within high-risk groups such as first responders or individuals who found themselves directly caught up in the incident. Particularly following events involving widespread destruction, ingenuity and hard work are required to successfully study these issues. When considering responses among the general population following less devastating events such as a conventional terrorist attack, or following an event involving a chemical, biological, radiological or nuclear agent, other variables may become more relevant for determining the population's overall psychosocial well-being. Trust, perceived risk, sense of safety, willingness to take prophylaxis and unnecessary attendance at medical facilities will all be important in determining the overall psychological, medical, economic and political impact of such attacks. Assessing these variables can help government agencies and non-governmental organizations to adjust their communication and outreach efforts. As there is often a need to provide these data quickly, telephone surveys using short time-windows for data collection or which use quota samples are often required. It is unclear whether slower, more conventional and more expensive survey methods with better response rates would produce results different enough to these quicker and cheaper methods to have a major impact on any resulting policy decisions. This empirical question would benefit from further study. Copyright © 2008 John Wiley & Sons, Ltd.*

**Key words:** general population reactions, aftermath, terrorist attack, Chemical, Biological, Radiological or Nuclear terrorism (CBRN)

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## Introduction

Since the 1980s a substantial body of work has investigated how exposure to a disaster can affect an individual's mental health (Norris and Elrod, 2006). A large proportion of this research has focused on assessing the experiences and needs of those people directly affected by a disaster; for example, those who were injured, lost their loved ones or were displaced from their homes. This work has helped to define the likely rates of psychiatric disorder among these groups, to chart the natural progression of disorders following a disaster, to identify risk factors for the development of mental health problems and to shed light on the

potential mechanisms involved and the possible interventions that may be of assistance to those who are affected.

At the same time, a related stream of research has focused on the effects disasters can have on the wider population; on individuals who may not have been directly caught up in an incident, but who may experience its repercussions nonetheless. For many disasters, and especially for terrorist attacks using conventional explosives, most people within the general population of an affected city or region will have little direct involvement with an incident. Nonetheless, numerous studies have demonstrated that the psychological

ramifications of terrorist attacks can extend far into the community (e.g. Galea et al., 2003; Miguel-Tobal et al., 2006; Schlenger et al., 2002; Schulden et al., 2006). That this is so should come as no surprise. After-all, the true aim of terrorists is often not just to kill or maim, these are simply means to an end. Rather the true intent is to spread fear among the wider community and in doing so gain sway over the community's politicians and its decision-makers.

Thus while research into the psychiatric effects of disasters on those who have been directly involved in them is important, so too are studies designed to inform us about the mental health status and needs of the wider population. In this special issue, Kessler and colleagues (Kessler, Keane, Ursano, Mokdad, and Zaslavsky, this issue) have produced an excellent account of strategies for assessing mental health needs among the former group, highlighting the tremendous logistical challenges involved in conducting this research in the aftermath of a catastrophic event such as Hurricane Katrina. In this paper, we hope to complement their account by focusing on the issues which face researchers attempting to survey the general population of a city or region following a more geographically constrained incident such as a terrorist attack. In doing so, we will highlight two main points. Firstly that in a general population sample, measuring conventionally defined new-onset psychiatric disorder may be less important than assessing other indicators of psychosocial well-being and secondly that in some situations using quicker and cheaper sampling strategies that fall short of the highly impressive procedures outlined by Kessler and colleagues (Kessler et al., this issue) may still produce valid and useful results.

### **The importance of new-onset psychiatric disorder in the unexposed general population**

Most previous studies, be they of direct victims, first responders or general population samples, have focused on post-traumatic stress disorder (PTSD) as their main, if not sole, outcome (Norris and Elrod, 2006). This by no means captures the full breadth of the potential mental health problems that can occur following a traumatic incident. Many other forms of psychiatric disorder, including phobias, substance abuse, depressive and anxiety disorders and somatoform disorders, can and do occur and represent important outcomes that should also be measured. Yet we would contend that even where a full spectrum of conventionally defined

psychiatric disorders is covered, a mental health needs assessment conducted in the general population following a terrorist incident still runs the risk of overlooking outcomes that may be essential in understanding the main impact of an incident on the psychological well-being of the population. We have three reasons for being cautious about an exclusive focus on conventional psychiatric disorder in the immediate period following a terrorist attack or other highly contained disaster.

Firstly, such events typically result in psychiatric disorders for only a small percentage of the population. Even among highly exposed groups, disorders such as those described earlier are the exception, rather than the rule. Among general population samples, the incidence of disorder following a terrorist attack is usually lower still (e.g. Galea et al., 2003; Schulden et al., 2006). Much more common is resilience; the tendency for people to endure hardship and trauma without experiencing any long-term psychiatric sequelae (Bonanno, 2004). And importantly, most people who do initially appear to experience new-onset psychiatric disorders or symptoms following a disaster also show a remarkable ability to recover in the subsequent weeks and months, turning to their own pre-existing support networks in order to talk about their experiences and to obtain the practical help and advice that they need. In the immediate aftermath of an attack, formal interventions from psychiatrists, psychologists or psychotherapists are often neither required nor requested and can sometimes do more harm than good (Galea et al., 2003; Rose et al., 2003; Rubin et al., 2005; Stuber et al., 2006). This is not to say that small-scale or temporary increases in apparent psychiatric disorder are not worthy of study. But if the aim of a mental health needs assessment is to provide guidance on how to reduce or cope with the main mental health issues affecting a population, merely documenting transient increases of a large range of conventional psychiatric diagnoses in the immediate aftermath of an incident may not be particularly helpful.

A second problem with focusing primarily on standard psychiatric diagnoses is the difficulties that can be faced in distinguishing distress from disorder. As others have argued (Horwitz, 2007; Inter-Agency Standing Committee, 2007), it would be a mistake to confuse the culturally sanctioned expressions of distress that occur following a natural disaster or terrorist attack with the existence of mental disorders. While symptoms of

distress usually reflect a normal, 'healthy' response to an abnormally stressful situation, mental disorders reflect more fundamental alterations in the psychological functioning of an individual which would persist regardless of subsequent changes in any external stressors. It can be difficult to make this distinction using the types of psychiatric questionnaire typically used in mental health needs assessments, however, as these batteries assess only the presence of psychiatric symptoms and not their underlying causes. While the best mental health needs assessments test the sensitivity and specificity of their instruments against the results of diagnostic interviews conducted by experienced clinicians, this resource-heavy endeavour is not possible in many situations.

Thirdly, even where measurement of genuine disorder is achieved, it can be difficult to work out which individuals with a psychiatric disorder developed their illness as a result of the disaster and which individuals were already suffering from mental health problems prior to the disaster. Various solutions have been used in the past to help clarify the incidence of disorder following a major incident. One option is to recruit a carefully matched control group from an unaffected area in order to compare rates of disorder between two superficially similar communities. But in the context of assessing mental health needs within a largely unexposed sample from the general population following a terrorist attack, it is difficult to see how a sufficiently comparable control group could be recruited which has not heard about the attack and which has not been psychologically affected by it. Another possibility is to question participants about their pre-disaster mental health status or to ask them to describe only symptoms which have been experienced following the disaster. Recall for the intensity, time-course or even existence of psychiatric symptoms is notoriously poor, however (Kruijshaar et al., 2005). A third solution proposed by Kessler and colleagues (Kessler et al., this issue) is to use pre-incident data for the affected region that was gathered for other purposes as a baseline for assessing changes in overall rates or even changes in individual respondents. Although an excellent idea in principle, some caution may be warranted with this approach. Two important concepts within survey research are the 'same stimulus' and 'constant stimulus' principles, which state that a question must mean the same thing to different participants and have a stable meaning over time if the responses between participants or between

time-points can be meaningfully compared (Bishop, 2005). That two questions have identical wording may not be sufficient to guarantee this. It is well known, for example, that even simple alterations in the order of questions within an interview can alter the way in which participants interpret and respond to them (Bowling et al., 1999). Differences in the perceived rationale of a mental health interview as revealed in any introductory preamble or as hinted at by its content can also alter how participants respond to mental health questions (LaGuardia et al., 1983). And perhaps most problematically of all, even the social and political context in which a questionnaire is administered can drastically alter the perceived meaning of the individual questions contained within it: a question asked during a period of calm might be interpreted differently when repeated following a disaster (Bishop, 2005). For research conducted in groups at high risk of developing disorder following a terrorist attack, these points may seem relatively minor. But for general population samples in which the incidence of disorder is likely to be low, the noise introduced by changes in the perceived meaning of a question could have a dramatic influence on a study's results.

### **The importance of psychosocial well-being in the unexposed general population**

Assessing the incidence of conventional psychiatric diagnoses among the general population in the immediate aftermath of a terrorist attack is thus difficult to do and of uncertain usefulness in guiding public health decisions. Are there other outcomes which might prove more informative? Certainly a variety of other, non-clinical changes in the psychological status of general population samples have been observed following terrorism which can be relatively widespread and sometimes persistent. These range from a reduced sense of safety (Bleich et al., 2003; Rubin et al., 2005), to behavioural alterations intended to reduce the risk of exposure to future terrorist events (Gigerenzer, 2006; Schulden et al., 2006), to changes in the way people view the world or themselves (Rubin et al., 2007a), to acute distress that falls short of meeting any formal diagnostic criteria (Rubin et al., 2005). These alterations in the psychosocial well-being of a community may not necessarily require treatment at an individual level, but it is still important to assess how extensive they are and what factors might help to ameliorate them, especially given their potential to adversely

influence a wide range of important medical (Gigerenzer, 2006), economic (Schulden et al., 2006) and political (Bali, 2007) trends. An incident's psychosocial, rather than psychiatric, effects may become particularly important where an attack or a disaster involves a chemical, biological, radiological or nuclear (CBRN) component. It is well-recognized that the public are often poorly informed about the nature of CBRN agents and hold a range of misconceptions relating to what different CBRN agents are, how they work, and what treatments or precautions can reduce the risks associated with them (e.g. Blendon et al., 2003b; Fischhoff et al., 2003; Rubin et al., 2007b). Such misperceptions, together with the genuine uncertainties people face in knowing who has been exposed to a CBRN agent, have the potential to result in high levels of fear among the general population and extensive behavioural changes which may themselves result in greater physical and psychological morbidity than the original incident itself. For example, unnecessary self-evacuations from areas perceived to be contaminated, stigmatization of affected communities, avoidance of work-places or other centres of economic activity, stockpiling or ill-advised use of prophylaxis, avoidance of medical centres by people genuinely exposed to an agent, and excessive use of medical services by unexposed patients with health anxiety have all been witnessed following CBRN related incidents (e.g. Hyams et al., 2002). In the longer-run, meanwhile, the potential exists for CBRN incidents to degenerate into a vicious circle of scientific uncertainties, rumours of cover-up, the appearance of difficult to define and medically inexplicable 'syndromes' in the exposed community, and a breakdown in trust between the affected population and the authorities (Hyams et al., 2002). Identifying early warning signs of such trends and ways to counteract them might be the most important role a mental health needs assessment could play in the immediate period following a CBRN release. Identifying what these warning signs might be, and how they can best be captured using a post-incident survey, is itself a topic which requires further attention (see e.g. Page et al., 2006).

#### **Practical help and information as a mental health need**

Providing basic services which address the physical needs of members of the public or which enhance pre-existing family and community support structures are

crucial steps in protecting and improving mental health and psychosocial well-being following disaster (Inter-Agency Standing Committee, 2007). We therefore heartily concur with Kessler et al.'s suggestion that mental health needs assessments be used to study uptake or access to aid programmes, or awareness and opinions concerning recent governmental or non-governmental organization (NGO) initiatives (Kessler et al., this issue). Timely feedback of survey data to the relevant agencies could help them to assess their impact and fine-tune their communication or outreach efforts. In terms of the unexposed general population, this additional use for mental health surveys could be particularly important during a CBRN-related incident, where misunderstandings are already prevalent and where government agencies face the challenge of communicating technical information to a lay audience in a short period of time. For example, after the fatal poisoning of a former KGB officer with polonium-210 in central London in 2007, traces of the radioactive material were found in numerous locations throughout the city, causing enormous media interest and an intensive effort by the UK's Health Protection Agency (HPA) to trace all those who might have come into contact with it. Over the course of several weeks, the HPA issued daily press releases and briefings in an effort to inform the public about the lack of any risk faced by the vast majority and the need for those people who had been in a contaminated location to come forward for testing. By using a rapid turn-around survey to assess public perceptions of polonium-210, we were able to demonstrate that many of the messages contained within the HPA's briefings were not recalled by the public. However we were also able to show that this was of only peripheral importance. Only one piece of factual information was strongly correlated with perceptions of risk from the incident and this single fact (that to be at risk, one had to have been to a contaminated location) had been successfully communicated to over 70% of the general population, providing substantial reassurance (Rubin et al., 2007b). If done quickly, similar work could be helpful in creating or fine-tuning public health messages during a future major incident and in reducing its psychosocial impact.

However, using surveys to assess awareness, or opinions following a major incident, does raise the issue of what has been referred to as 'non-opinions', that is, the willingness of most people to offer an opinion during a survey regarding issues about which they know nothing

about (Bishop, 2005). For instance, in our Polonium-210 survey, 98% of our respondents were happy to tell us whether they thought the HPA's response to the incident was an over-reaction, under-reaction or about right, despite the fact that most appeared to be poorly informed about the incident and were presumably equally ill-informed about the HPA's response (Rubin et al., 2007b). Similarly during a survey we conducted in the aftermath of the 7 July London bombings, while between 21% and 29% of people informed us that they were aware of a dedicated 7 July family assistance centre, a special helpline number for those who were affected, or the National Health Service's trauma response programme, the biggest recognition (37%) was for the entirely fictitious 'London Rescue Programme' (Rubin et al., 2005). Where non-psychometrically tested items or scales are to be included in mental health needs assessment surveys, care should be taken to evaluate how people are responding to them, by conducting cognitive pre-testing, for example, or by asking random sub-samples of respondents to provide a brief qualitative explanation for their answer, or by using filter questions which enquire whether the respondent has heard enough about a policy or intervention to have developed an opinion about it. While this is true for any survey, the speed with which questionnaires or interview schedules are often put together following a disaster and the desire to reduce the number of apparently superfluous or uninformative items within them can mean that these quality control procedures are sometimes not given due attention.

### Speed versus quality

In their paper, Kessler and colleagues note the importance of implementing mental health needs assessments quickly, so that the results have the best chance of influencing policy in a timely fashion (Kessler et al., this issue). We agree. Particularly with respect to interventions designed to improve psychosocial well-being through the provision of better advice, information or services, the earlier these interventions can be begun or improved upon, the better the outcome is likely to be. Equally, if the data gathered is to be used for longitudinal follow-up to assess risk factors for psychiatric or psychological outcomes, the earlier that data can be gathered, the less risk there is of recall bias (Wessely et al., 2003). Not discussed by Kessler and colleagues, however, is the importance of having a short time-frame for the data collection period. Particularly

following terrorist attacks, public opinions, perceptions and knowledge can change rapidly as the media's focus switches from stories about the recovery effort to attempts to allocate blame, as arrests are made, and as further attacks or false alarms occur. For surveys attempting to assess predictors of psychosocial well-being soon after an incident or which are intended to produce baseline data allowing for later follow-up, such changes can be problematic (Blendon et al., 2003a). Our survey of public reactions to the 7 July London bombings is a case in point (Rubin et al., 2005). Data collection for this survey began 11 days after the attacks and took four days to complete. Only hours after our final interview took place, a second wave of attacks occurred. Although this time the bombs failed to explode, the 21 July attacks almost certainly changed public perceptions of safety, levels of distress and intended behaviours – our primary outcomes. Had our data collection taken five days to complete instead of four, 20% of our data would have been rendered either unusable or misleading.

Obtaining data from a sufficiently large sample of the general public within a short-time frame is often realistically only achievable using telephone-based or web-based methods. Although the latter hold great promise, the proportion of the population who have web access and who respond to such surveys is still too low to allow web-based surveys to be used with confidence for this purpose, leaving telephone surveys as the only realistic approach. The difficulties of conducting epidemiological surveys by telephone are well known: some people (particularly women) are more likely to answer the phone than others, individuals who share a phone line with many others (e.g. those in large households) have a lower chance of selection, individuals with more than one telephone line have a higher chance of selection, and those with no telephone at all or who only use a mobile phone have no chance of selection. Methodological and statistical techniques are available to reduce the influence of these effects and the potential biases associated with them. More problematic is the possibility that subtle psychological differences exist between those who choose to participate in a telephone survey and those who do not. For example, it has been demonstrated that responders tend to be more civic minded than non-responders, a bias that may be important when considering the effects of a disaster on, say, indicators of social cohesion (Groves et al., 2000). This problem of non-response bias

becomes more relevant when considering the validity of rapid turn-around surveys. A telephone survey conducted over five days might generate an overall response rate of around 25%, with many weeks of repeated callbacks required to bring this up to 50% (Keeter et al., 2006). However, while there is some evidence to suggest that late-responders to telephone surveys are systematically different to early responders on certain health related variables, in practice this effect seems to make little difference to the overall prevalence estimates that are obtained when late responders are included or excluded from the results (Chiu et al., 2001). Similarly, few differences have been found in ratings of social engagement, concern about safety, political attitudes or lifestyle when the results of standard five-day long surveys are compared with those of more rigorous surveys which use a 21-week long data collection period, advance warning letters, and monetary incentives (Keeter et al., 2006). To our knowledge, similar research has never been done to assess whether a rapid turn around telephone survey gives equivalent results to a more rigorous approach with regards to the type of mental health or psychosocial data that are of interest following a terrorist attack or a disaster. Although changes at the top-end of the response rate spectrum (from 74% to 82%) have previously been shown to have limited impact on prevalence estimates for mental disorders in the general community, it would of interest to see if this effect also extended to lower response rates and post-disaster contexts (Kessler et al., 1995). Similarly, while non-probability quota sampling has had something of a bad press in previous years (Smith, 1983), where funds are limited and large sample sizes need to be delivered quickly this method may have the potential to provide reasonable estimates of the prevalence of common mental disorders or indicators of psychosocial well-being (Groves, 2006). The choice of whether to adopt a complex sampling strategy such as that described by Kessler and colleagues, a more simple telephone sampling strategy using either short or long data collection periods, or a quota sampling technique should therefore be based on pragmatic considerations, including the availability of funding and the speed with which the results are required. Ideally these decisions should be guided by further research comparing the effects of different sampling techniques on the prevalence estimates they achieve for relevant mental health and psychosocial outcomes. In this regard, we are reminded of the words of Bob Worcester,

the founder of the MORI polling organization, who noted that 'after all, even if the precision to the usual 95% confidence level could be guaranteed, how many times does the Minister care whether the finding is 77% or 73%, so long as he or she knows that about three-quarters of the electorate favour the policy?' (Worcester, 1996). If different sampling strategies are capable of producing results that vary only slightly, then the best approach may be that which is capable of producing the results quickly, while leaving sufficient funds in place to enable additional or more in-depth follow-ups to be conducted in the future.

### Declaration of Interests

The authors have no competing interests.

### References

- Bali VA (2007). Terror and elections: lessons from Spain. *Electoral Studies* 26: 669–87. DOI: 10.1016/j.electstud.2007.04.004
- Bishop GF (2005). *The illusion of public opinion: fact and artefact in American public opinion polls*. Oxford: Rowman & Littlefield.
- Bleich A, Gelkopf M, Solomon Z (2003). Exposure to terrorism, stress-related mental health symptoms, and coping behaviors among a nationally representative sample in Israel. *JAMA* 289: 612–20.
- Blendon RJ, Benson JM, DesRoches CM, Weldon KJ (2003a). Using opinion surveys to track the public's response to a bioterrorist attack. *J Health Communication* 8: 83–92. DOI: 10.1080/713851964
- Blendon RJ, DesRoches CM, Benson JM, Herrmann MJ, Taylor-Clark K, Weldon KJ (2003b). The public and the smallpox threat. *N Engl J Med* 348: 426–32. DOI: 10.1056/NEJMs023184
- Bonanno GA (2004). Loss, trauma, and human resilience. *Am Psychol* 59: 20–8. DOI: 10.1037/0003-066X.59.1.20
- Bowling A, Bond M, Jenkinson C, Lamping DL (1999). Short-form 36 (SF-36) health survey questionnaire: which normative data should be used? Comparisons between the norms provided by the Omnibus Survey in Britain, the Health Survey for England and the Oxford Life Survey. *J Public Health Med* 21: 255–70.
- Chiu P-L, Riddick H, Hardy AM (2001). A comparison of characteristics between late/difficult and non-late/difficult interviews in the national health interview survey. *Proceedings of the Annual Meeting of the American Statistical Association*, 5–9 August.
- Fischhoff B, Gonzalez RM, Small DA, Lerner JS (2003). Evaluating the success of terror risk communications. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science* 1: 254–8. DOI: 10.1089/153871303771861450.

- Galea S, Vlahov D, Resnick H, Ahern J, Susser E, Gold J, et al. (2003). Trends of probable post-traumatic stress disorder in New York City after September 11 terrorist attacks. *Am J Epidemiol* 158: 514–24.
- Gigerenzer G (2006). Out of the frying pan into the fire: behavioral reactions to terrorist attacks. *Risk Analysis* 26: 347–51. DOI: 10.1111/j.1539-6924.2006.00753.x
- Groves RM (2006). Nonresponse rates and nonresponse bias in household surveys. *Public Opinion Quarterly* 70: 646–75. DOI: 10.1093/poq/nfl033
- Groves RM, Singer E, Corning A (2000). Leverage-saliency theory of survey participation: description and an illustration. *Public Opinion Quarterly* 64: 299–308.
- Horwitz AV (2007). Distinguishing distress from disorder as psychological outcomes of stressful social arrangements. *Health* 11: 273–89. DOI: 10.1177/1363459307077541
- Hyams KC, Murphy FM, Wessely S (2002). Responding to chemical, biological or nuclear terrorism: the indirect and long-term health effects may present the greatest challenge. *J Health Politics, Policy and Law* 27: 273–91. DOI: 10.1215/03616878-27-2-273
- Inter-Agency Standing Committee (2007). IASC guidelines on mental health and psychosocial support in emergency settings. Geneva: Inter-Agency Standing Committee.
- Keeter S, Kennedy C, Dimock M, Best J, Craighill P (2006). Gauging the impact of growing nonresponse on estimates from a national RDD telephone survey. *Public Opinion Quarterly* 70: 759–79. DOI: 10.1093/poq/nfl035
- Kessler RC, Little RJA, Groves RM (1995). Advances in strategies for minimizing and adjusting for survey nonresponse. *Epidemiol Rev* 17: 192–204.
- Kruijshaar ME, Barendregt J, Vos T, de Graaf R, Spijker J, Andrews G (2005). Lifetime prevalence estimates of major depression: an indirect estimation method and a quantification of recall bias. *Eur J Epidemiol* 20: 103–11. DOI: 10.1007/s10654-004-1009-0
- LaGuardia R, Smith G, Francois R, Bachman L (1983). Incidence of delayed stress disorder among Vietnam era veterans: the effect of priming on response set. *Am J Orthopsychiatry* 53: 18–26.
- Miguel-Tobal JJ, Cano-Vindel A, Gonzalez-Ordi H, Iruarrizaga I, Rudenstine S, Vlahov D, et al. (2006). PTSD and depression after the Madrid March 11 train bombings. *J Traumatic Stress* 19: 69–80.
- Norris FH, Elrod CL (2006). Psychosocial consequences of disaster. A review of past research. In Norris FH, Galea S, Friedman MJ, Watson PJ (eds). *Methods for Disaster Mental Health Research*. London: The Guildford Press, pp 20–42.
- Page LA, Petrie KJ, Wessely SC (2006). Psychosocial responses to environmental incidents: a review and a proposed typology. *J Psychosomatic Res* 60: 413–22.
- Rose S, Bisson J, Wessely S (2003). A systematic review of single-session psychological interventions ('debriefing') following trauma. *Psychotherapy and Psychosomatics* 72: 176–84. DOI: 10.1159/000070781.
- Rubin GJ, Brewin CR, Greenberg N, Simpson J, Wessely S (2005). Psychological and behavioural reactions to the bombings in London on 7 July 2005: cross sectional survey of a representative sample of Londoners. *Br Med J* 331: 606–11. DOI: 10.1136/bmj.38583.728484.3A
- Rubin GJ, Brewin CR, Greenberg N, Hacker Hughes J, Simpson J, Wessely S (2007a). Enduring consequences of terrorism: 7 month follow-up survey of reactions to the bombings in London on 7 July 2005. *Br J Psychiatry* 190: 350–6. DOI: 10.1192/bjp.bp.106.029785
- Rubin GJ, Page LA, Morgan O, Pinder RJ, Riley P, Hatch S, et al. (2007b). Public information needs after the poisoning of Alexander Litvinenko with Polonium-210 in London: cross sectional telephone survey and qualitative analysis. *Br Med J* 335: 1143–6. DOI: 10.1136/bmj.39367.455243.BE
- Schlenger WE, Caddell JM, Ebert L, Jordan BK, Rourke KM, Wilson D, et al. (2002). Psychological reactions to terrorist attacks. Findings from the national study of Americans' reactions to September 11. *JAMA* 288: 581–8.
- Schulden J, Chen J, Kresnow M, Arias I, Crosby A, Mercy J, et al. (2006). Psychological responses to the sniper attacks, Washington DC area, October 2002. *Am J Preventive Med* 31: 324–7.
- Smith TMF (1983). On the validity of inferences from non-random samples. *J Royal Stat Soc A* 146: 394–403.
- Stuber J, Galea S, Boscarino JA, Schlesinger M (2006). Was there unmet mental health need after the September 11, 2001 terrorist attacks? *Soc Psychiatry Psychiatric Epidemiol* 40: 1–11.
- Wessely S, Unwin C, Hotopf M, Hull L, Ismail K, Nicolaou V, et al. (2003). Stability of recall of military hazards over time. Evidence from the Persian Gulf War of 1991. *Br J Psychiatry* 183: 314–22.
- Worcester R (1996). Political polling: 95% expertise and 5% luck. *J Royal Stat Soc A* 159: 5–20.

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