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## Public information needs after the poisoning of Alexander Litvinenko with polonium-210 in London: cross sectional telephone survey and qualitative analysis

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### ABSTRACT

**Objectives** To identify public perceptions of the risk to health after the poisoning of Alexander Litvinenko with polonium-210 (<sup>210</sup>Po) in London and to assess the impact of public health communications.

**Design** Cross sectional telephone survey and qualitative interviews.

**Setting** London, United Kingdom.

**Participants** 1000 people completed the cross sectional survey and 86 potentially exposed people completed the qualitative interviews.

**Main outcome measures** Perception of risk to personal health after the <sup>210</sup>Po incident. Qualitative interviews were analysed with an emphasis on information needs.

**Results** 11.7% of the survey sample (n=117) perceived their health to be at risk. Aside from personal variables the main predictors of perceived risk to health were believing that the incident was related to terrorism (odds ratio 2.7, 95% confidence interval 1.5 to 4.6) rather than to espionage, that it was targeted at the wider public rather than one person (5.9, 3.2 to 10.9), and that it could affect people who had not been in the contaminated area (3.2, 2.1 to 5.1). Participants in the qualitative interviews were generally satisfied with the information they had received, although they would have preferred more information about their individual risk of exposure, the results of their urine tests, and the health implications of the incident.

**Conclusions** Perceptions of the public that the <sup>210</sup>Po incident in London in 2006 was related to espionage helped to reassure them that the risks to personal health were low. In the event of future incidents it is important to ensure that detailed, comprehensible information about the risks of any exposure is available.

### INTRODUCTION

People's subjective assessment of the risk posed by exposure to harmful substances in the environment can show a noticeable discrepancy with the objective level of risk involved. Certain scenarios tend to be associated with increased perceptions of risk, with

substances that are manmade, have dreaded consequences, involve involuntary exposure, are hard to detect, or cause disagreement among experts all tending to lead to greater concern.<sup>1,2</sup> Given that increased perceptions of risk can in turn lead to increased anxiety and behavioural changes,<sup>3</sup> how the public perceives a hazard can play an important part in determining its medical, social, and economic effects.

During major incidents that impact on public health, health agencies and emergency services often need to reassure the public about the level of risk involved, advise about measures being taken to safeguard their health, and specify what personal actions can be taken to minimise risk.<sup>1,2,4</sup> This communication can be challenging. In the face of scientific uncertainties, changing situations, constant requests from the media for information, and staff under intense pressure, it can be hard to provide timely, clear, and consistent information.<sup>5</sup> Knowing what the public already understand about an incident or health hazard can help, by alerting communicators to any unfounded fears of the public and allowing them to ensure that their messages resonate with pre-existing beliefs.<sup>1</sup> Identifying these beliefs before an incident can be even more helpful, as this allows appropriate messages to be developed and tested and then used quickly in emergencies.<sup>6</sup> Although studies on patient information needs relating to chemotherapy or radiotherapy exist,<sup>7</sup> it is difficult to extrapolate from therapeutic approaches to unexpected exposures that produce no beneficial effect. As there have been few incidents involving the intentional release of radiological agents, previous studies that have assessed risk perceptions relating to these scenarios have relied mainly on focus groups, interviews, or simulations to produce evidence about what risk communication strategies might be helpful. Despite these studies providing valuable insights they can never replicate the sensations of threat during a real incident. Learning lessons from events in the real world is therefore vital.

We assessed the public's perceptions of risk to the release of polonium-210 (<sup>210</sup>Po) in central London in

November 2006, when Alexander Litvinenko was poisoned.<sup>8</sup> We also assessed the public's knowledge and perceptions of the communication strategies used at that time by the UK's Health Protection Agency, the body responsible for protecting public health during the incident. As perceptions of an incident probably differ depending on someone's involvement,<sup>9,10</sup> we used two approaches in this study: a cross sectional telephone survey of a representative sample of adult Londoners and in-depth qualitative interviews with people who had been in two areas known to have been contaminated during the incident. In our survey we tested whether knowledge about <sup>210</sup>Po or perceptions of the nature of the incident were associated with a reduced perception of risk. In our qualitative interviews we assessed what incident specific or communication factors were associated with increased anxiety among potentially exposed people and whether any deficits could be identified in the information provided by the Health Protection Agency.

## METHODS

After the death of Alexander Litvinenko on 23 November 2006 from <sup>210</sup>Po poisoning, the Health Protection Agency started a public health response to assess risk to people potentially exposed to this radioisotope and to offer them a test.<sup>8</sup> Investigations initially centred on a sushi restaurant in central London and the bar of a London hotel. The public were advised to telephone NHS Direct if they had been in either venue on 1 November and were asked about symptoms of acute <sup>210</sup>Po poisoning. When requested by callers, clinical staff at the Health Protection Agency returned phone calls, assessed people further, and offered a urine test for <sup>210</sup>Po if indicated. On 7 December this protocol changed after several members of the hotel's staff tested positive for <sup>210</sup>Po: people were now asked to contact the Health Protection Agency if they had been in the hotel bar between 31 October and 2 November, and were offered a urine test. People who had contacted the agency before 7 December were advised about the changed risk assessment by letter. Throughout this period the media focused on rumours of an espionage involvement in Litvinenko's death, while the Health Protection Agency produced almost daily press releases and briefings tackling the resulting public health issues.

### Cross sectional telephone survey

Between 8 and 11 December 2006 Ipsos MORI carried out a telephone survey of 1000 adult Londoners, using random digit dialling. Proportional quota sampling ensured that respondents were demographically representative of the general London population, with quotas based on sex, age, employment status, residential location, home ownership, and ethnicity.<sup>11</sup>

The primary outcome was whether participants perceived that their own health was at risk as a result of the <sup>210</sup>Po incident. Perceiving personal health to be at risk was defined as a response of 3 or 4 to the question: "On a scale of 0 to 4, where 0 is not at all and 4 is a lot, to what degree do you feel your health is at risk as a

consequence of the recent radiation incidents?" Predictor variables consisted of personal details; how well informed participants believed they were about the radiation incidents; accuracy on nine true or false items relating to <sup>210</sup>Po; whether participants believed the incident was best described as terrorism, a public health threat, a crime, espionage or spying; whether participants believed the incident was intended to harm only one person, a small number of specific people, or the wider public; and whether participants believed that the advice to contact NHS Direct was an under-reaction, over-reaction, or about right. Eight of the nine true or false items reflected information conveyed in press releases issued by the Health Protection Agency in the period immediately before our survey. A ninth item, concerning the lack of a treatment for <sup>210</sup>Po poisoning, was not explicitly included in these releases. Each interview lasted 15 to 20 minutes.

### Qualitative sampling

Participants from four groups were selected for our qualitative interviews. The first consisted of people who had been in the sushi restaurant on 1 November, had contacted NHS Direct, and had given permission for the Health Protection Agency to contact them. The other three groups consisted of people who had been in the hotel bar between 31 October and 2 November and who had either accepted the offer of urine testing, refused this offer, or failed to reply to the Health Protection Agency after being informed about their eligibility for urine testing.

Potential participants were sent letters explaining that researchers would be in touch to find out about their views and experiences. As long as an opt-out was not received, participants were telephoned and an interview completed. Interviewers were provided with scripts to ensure that each participant was asked the same questions but were also instructed to probe for further detail in areas that seemed important to the respondent. For the restaurant sample, interviews focused on reasons for contacting NHS Direct, how participants would describe the <sup>210</sup>Po incident, what information was received from NHS Direct or the Health Protection Agency, how helpful or reassuring that was, and what effects the incident had had on their lives. Although these participants were not routinely offered urine testing, we asked them whether they would have accepted a test if it had been offered, and why. Interviews with participants from the hotel groups were similar but also included questions about why they had accepted or declined urine testing, what their understanding of the results were, and whether they would have liked more information about any aspect of the test. In addition, participants were asked to rate how much they thought their health was at risk immediately before contacting NHS Direct, using the same item as used in our cross sectional survey.

Participants from the restaurant sample were interviewed between 27 December 2006 and 5 January 2007. Those from the hotel samples were interviewed between 22 January and 8 February 2007. Within each

group, potential participants were selected at random from records kept by the Health Protection Agency until we thought that no new information was being learnt from the interviews.

### Analyses

We weighted the survey data to ensure that the groups were representative of the London population. We calculated odds ratios for the association between each personal variable and perceived risk to health as a result of the incident. We used being Muslim as the reference category for religion given a previously identified association between being Muslim and experiencing heightened distress after the London bombings on 7 July 2005.<sup>10</sup> To assess whether perceptions of, or knowledge about, the incident had any impact on risk perceptions over any effects of the personal variables, we calculated odds ratios for non-personal predictors using separate binomial logistic regressions adjusting for sex, age,

income, ethnicity, and religion. These potential confounders were chosen a priori as variables likely to have an impact on risk perception. We used SPSS version 12.0.1 for statistical analyses.

GJR and LP coded the transcripts of interviews using techniques adapted from grounded theory methods.<sup>12</sup> Statements within each interview were first grouped into categories, using headings that seemed to reflect the overarching theme being discussed. After the main categories had been defined by the coders, variables within each category were identified by grouping statements together that reflected the same core issue (for example, “anxiety” or “family pressure” as variables within the category “reasons for calling NHS Direct”).

### RESULTS

Of the 11 058 eligible respondents contacted for the cross sectional survey, 1238 agreed to participate and

**Table 1 | Predictors of perception that personal health is at risk after incident in which Alexander Litvinenko was poisoned with polonium-210 in London**

Variables	No (%)	No (%) perceiving health at risk	Unadjusted odds ratio (95% CI)
Women	510 (51)	73 (14)	1.7 (1.2 to 2.6)
Men	490 (49)	44 (9)	Reference
Age (years):			
18-24	124 (12)	15 (12)	1.6 (0.7 to 3.4)
25-34	251 (25)	33 (13)	1.7 (0.9 to 3.4)
35-54	361 (36)	42 (12)	1.5 (0.8 to 2.8)
55-64	111 (11)	14 (13)	1.6 (0.7 to 3.6)
≥64	153 (15)	13 (9)	Reference
Ethnicity:			
Non-white	289 (29)	58 (20)	2.8 (1.9 to 4.1)
White	711 (71)	59 (8)	Reference
Religion:			
None	294 (29)	19 (7)	0.2 (0.1 to 0.4)
Other faith	637 (64)	80 (13)	0.4 (0.2 to 0.7)
Muslim	69 (7)	18 (26)	Reference
Yearly income (n=842):			
<£30 000	487 (58)	86 (18)	4.6 (2.6 to 7.9)
≥£30 000	355 (42)	16 (5)	Reference
Parental status:			
Children under 18	316 (32)	38 (12)	1.0 (0.7 to 1.6)
No children	684 (68)	79 (12)	Reference
Pregnancy status:			
Self or partner is pregnant	36 (4)	6 (17)	1.6 (0.7 to 3.9)
Neither self nor partner pregnant	964 (96)	110 (11)	Reference
Working status:			
Working full or part time	622 (62)	68 (11)	0.8 (0.6 to 1.3)
Not working	378 (38)	48 (13)	Reference
Housing tenure:			
Rented	395 (40)	60 (15)	1.7 (1.2 to 2.5)
Owner	605 (61)	57 (9)	Reference
Frequency of travel to central London:			
Less than weekly	497 (50)	69 (14)	1.5 (1.0 to 2.3)
Once a week or more	503 (50)	48 (10)	Reference

Total sample size for each variable is 1000, unless stated otherwise. Samples of fewer than 1000 result from refusals, “don’t know,” or “other” responses.

1000 completed interviews (9.1%). Overall, 117 of these respondents (11.7%) were categorised as perceiving their health to be at risk as a result of the  $^{210}\text{Po}$  incident during which Alexander Litvinenko was poisoned (table 1). Levels of knowledge about  $^{210}\text{Po}$  were generally low, with recognition of messages from the Health Protection Agency ranging from 15% (if  $^{210}\text{Po}$  gets on to your clothes it can be removed using a normal washing machine) to 58% ( $^{210}\text{Po}$  is usually dangerous only if it enters your body; table 2). The exception was for the statement that "If you have not been in one of the areas known to be contaminated with  $^{210}\text{Po}$ , then there is no risk to your health": 71% of the sample recognised that this was correct. Regarding perceptions of the event (table 3), most participants believed that the incident was related to a crime or to espionage (68%) and that

it was not targeted at the wider public (86%). Most also thought the Health Protection Agency's response to the incident had been appropriate or about right (80%).

#### Personal variables associated with risk perception

Unadjusted odds ratios showed that being female (1.7, 95% confidence interval 1.2 to 2.6), being of non-white ethnicity (2.8, 1.9 to 4.1), having a household income of less than £30 000 (€43 000; \$61 000) yearly (4.6, 2.6 to 7.9), being in rented accommodation (1.7, 1.2 to 2.5), and travelling into central London less than once a week (1.5, 1.0 to 2.3) were associated with perceiving personal health to be at risk. Subscribing to no religion (0.2, 0.1 to 0.4) or any other religion (0.4, 0.2 to 0.7) was associated with a lower likelihood of perceived risk to health than being Muslim (table 1).

**Table 2 | Knowledge related predictors of perception that personal health is at risk after incident in which Alexander Litvinenko was poisoned with polonium-210 ( $^{210}\text{Po}$ ) in London**

Variables	No (%)	No (%) perceiving health at risk	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)*
How well informed do you think you are about health risks relating to the recent radiation incidents? (n=987):				
Not well informed (0 or 1)†	372 (38)	52 (14)	1.4 (0.9 to 2.0)	1.0 (0.7 to 1.6)
Well informed (2-4)†	614 (62)	64 (10)	Reference	Reference
$^{210}\text{Po}$ occurs naturally in the environment [true]:				
Incorrect or don't know	726 (73)	87 (12)	1.1 (0.7 to 1.8)	1.3 (0.8 to 2.1)
Correct	274 (27)	29 (11)	Reference	Reference
Exposure to $^{210}\text{Po}$ is always fatal [false]:				
Incorrect or don't know	424 (42)	72 (17)	2.5 (1.6 to 3.6)	1.6 (0.9 to 2.3)
Correct	576 (58)	45 (8)	Reference	Reference
$^{210}\text{Po}$ is usually dangerous only if it enters your body—for example, if you eat it [true]:				
Incorrect or don't know	416 (42)	68 (16)	2.1 (1.4 to 3.1)	1.6 (1.0 to 2.5)
Correct	584 (58)	49 (8)	Reference	Reference
If $^{210}\text{Po}$ gets on to your clothes it can be removed using a normal washing machine [true]:				
Incorrect or don't know	852 (85)	105 (12)	1.7 (0.9 to 3.1)	1.3 (0.7 to 2.6)
Correct	148 (15)	12 (8)	Reference	Reference
Most people exposed to $^{210}\text{Po}$ start to feel ill within a few days [false]:				
Incorrect or don't know	739 (74)	98 (13)	2.0 (1.2 to 3.4)	1.7 (0.9 to 3.0)
Correct	261 (26)	19 (7)	Reference	Reference
The main health effects of $^{210}\text{Po}$ can take years to develop [true]:				
Incorrect or don't know	610 (61)	76 (13)	1.2 (0.8 to 1.8)	1.1 (0.7 to 1.8)
Correct	390 (39)	41 (11)	Reference	Reference
It takes only a few minutes for scientists to test if you have been exposed to $^{210}\text{Po}$ [false]:				
Incorrect or don't know	631 (63)	76 (12)	1.1 (0.7 to 1.7)	1.3 (0.8 to 2.1)
Correct	369 (37)	41 (11)	Reference	Reference
Medicines are available that can prevent people exposed to $^{210}\text{Po}$ from becoming ill [false]:				
Incorrect or don't know	415 (42)	55 (13)	1.3 (0.9 to 1.9)	1.1 (0.7 to 1.6)
Correct	585 (59)	62 (11)	Reference	Reference
If you have not been in one of the areas known to be contaminated with $^{210}\text{Po}$ then there is no risk to your health [true]:				
Incorrect or don't know	292 (29)	67 (23)	3.9 (2.6 to 5.8)	3.2 (2.1 to 5.1)
Correct	708 (71)	50 (7)	Reference	Reference

Total sample size for each variable is 1000, unless stated otherwise. Samples of fewer than 1000 are a result of refusals, "don't know," or "other" responses.

\*Adjusted for sex, age, income, ethnicity, and religion.

†Scale from 0 (not at all) to 4 (a lot).

### Knowledge or perceptions of the incident and risk perception

Odds ratios adjusted for age, sex, income, ethnicity, and religion showed that believing that  $^{210}\text{Po}$  can be dangerous even if it does not enter the body (1.6, 1.0 to 2.5) and believing that  $^{210}\text{Po}$  can pose a risk to people who have not entered a contaminated area (3.2, 2.1 to 5.1) were associated with increased perceptions of risk to personal health (table 2). Participants who believed that the incident was related to terrorism (2.7, 1.5 to 4.6) or was a threat to public health (1.9, 1.1 to 3.4) were more likely to believe that their own health was at risk than those who reported that it was related to crime or espionage (table 3). Participants who thought that the incident was aimed at the wider public were more likely to perceive that their own health was at risk than those who believed that it was targeted at only one person (5.9, 3.2 to 10.9).

### Qualitative results

Sixteen women and 15 men (mean age 35 (SD 10) years) were interviewed for the restaurant sample. Twenty two did not participate: three who had not been in the restaurant, five who declined to participate, and 14 who could not be contacted. For the hotel samples, 37 men and 18 women (mean age 43 (SD 12) years) were interviewed, including 24 people who accepted a urine test, 21 who failed to respond to the Health Protection Agency's letter, and 10 who declined testing. Non-responders consisted of nine people who had not been in the hotel on a relevant date, one who was aged less than 18 years, three who declined to participate, and 27 who could not be contacted. Of the 78 participants who answered the question on income, 65 (83%) had annual household incomes of over £30 000. Two of 31 (6%) participants from the restaurant sample reported believing that

their health was at risk before contacting NHS Direct, compared with 7 of 53 (13%) participants from the hotel sample.

### Reasons for calling NHS Direct

Four motivating factors given for contacting NHS Direct were pressure from friends or relatives, official guidance, civic duty, and anxiety.

### Descriptions of the incident

When participants were asked to describe recent events their responses reflected four main themes. Exotic descriptions emphasised the unusual or bizarre nature of the incident—for example, "It seems like it is in the wrong place. It doesn't seem like it should be happening in London." Menacing descriptions, which were relatively rare, included comments such as "it is quite shocking," or "quite sinister." More common were descriptions comparing events to a spy story, with James Bond being mentioned several times. The precise targeting of the incident was mentioned by several participants.

### Initial sources of anxiety

Several factors affected initial levels of anxiety. Of these the presence or absence of symptoms was the most prominent. Participants without symptoms often took this as a sign that they had not been exposed, particularly given the dramatic symptoms experienced by Litvinenko. For participants who had had symptoms, however, concern and uncertainty tended to be higher.

Anxiety was also related to the perceived likelihood of exposure, with perceptions being driven by the participant's temporal or physical proximity to Litvinenko. For example, one participant commented that "I read that the guy who was killed was there at

**Table 3 | Perceptions of incident in which Alexander Litvinenko was poisoned with polonium-210 ( $^{210}\text{Po}$ ) in London as predictors of perception that personal health is at risk**

Variables	No (%)	No (%) perceiving health at risk	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)*
Which one of these phrases best describes the recent events in the United Kingdom (n=934):				
Terrorism	140 (15)	31 (22)	3.3 (2.0 to 5.4)	2.7 (1.5 to 4.6)
A public health threat	160 (17)	29 (18)	2.6 (1.6 to 4.2)	1.9 (1.1 to 3.4)
A crime, espionage, or spying	634 (68)	51 (8)	Reference	Reference
Which of these following phrases best describes recent events: An incident intended to harm . . . (n=954):				
A small number of specific people	383 (40)	39 (10)	2.1 (1.2 to 3.5)	1.6 (0.9 to 2.8)
The wider public	137 (14)	47 (34)	9.5 (5.5 to 16.4)	5.9 (3.2 to 10.9)
Only one person	434 (46)	23 (5)	Reference	Reference
The HPA are advising anyone who has been in an area affected by $^{210}\text{Po}$ to contact NHS Direct for more information. Do you think this advice is an . . . (n=978):				
Over-reaction	76 (8)	10 (13)	1.3 (0.6 to 2.7)	1.4 (0.6 to 3.1)
Under-reaction or not enough	116 (12)	23 (20)	2.2 (1.3 to 3.6)	1.3 (0.7 to 2.4)
Appropriate response or about right	787 (80)	81 (10)	Reference	Reference

HPA=Health Protection Agency.

Total sample size for each variable is 1000, unless otherwise stated. Samples of less than 1000 are due to refusals, "don't know," or "other" responses.

\*Controlling for sex, age, income, ethnicity, and religion.

about 3pm and I left about 2ish, so that was as much as I needed to know.” Another, more concerned participant commented that she had “recognised [an associate of Litvinenko] and I moved into his booth as he was leaving.” Factors such as participants washing their hands at the venue, only being in the location very briefly, having had a drink at the hotel bar, or being a regular visitor were also mentioned as moderating perceived risk and anxiety. Comparisons with other, presumably more at risk, groups were also made: “If the [restaurant staff] had tested negative [. . .] I was pretty comfortable then that I was at no risk.” Uncertainties about the nature of  $^{210}\text{Po}$  caused anxiety for some, as did its radioactivity. Personality traits (“I don’t get in a flap about these things”) and fatalism (“either you had it or you didn’t, not much point in getting stressed about it”) also played a part.

#### Information needs

Although some participants found their calls to NHS Direct and the Health Protection Agency reassuring, others found them less helpful. The most common complaint concerned a lack of information. Comments such as “they didn’t really give much information” and “we weren’t really told very much” were typical of people’s experiences. And although callers were given general reassurance, many noted that this was no substitute for specific information. As one put it, “All they said was platitudes which were effectively meant to reassure; how reassuring they were I’m not sure.”

Participants’ information needs fell into three main areas. Firstly, there was a desire for up to date information. The daily updates placed on the Health Protection Agency’s website were praised by several participants, although many others seemed unaware that these existed. Secondly, a need for individualised information on the likelihood of exposure was often mentioned. Those who received specific information revealing that their risk of exposure was low tended to be reassured. Others who wanted to make their own risk assessment based on when Litvinenko was in the restaurant or hotel were left feeling uncertain when this information was not provided to them. Thirdly, participants wanted information about short term health effects and derived reassurance if they answered “no” to the screening questions on symptoms asked during the phone call. For example, one participant commented: “It quickly became self-evident that I was not someone who should have a concern because I had not had any of the symptoms which were on the list.” For participants who had had a symptom on the list, however, this aspect of the phone call could be more troubling.

#### Factors affecting the desire for testing

Thirteen of the 21 people who did not respond to the Health Protection Agency’s letter could not recall receiving it. Five others received it but did not understand that they were being offered testing. For the remaining three, plus the 10 participants who explicitly

declined a test, the main reason for declining was a perception that the likelihood of exposure was low. An apparent lack of personal benefit was also cited by some (“I sort of think, well there’s nothing you can do about it, even if it’s positive”) whereas others believed that the way in which testing had been offered implied that it was not important (“It seemed a rather passive offer”). Those who accepted the offer most often cited “peace of mind” as their rationale, although pressure from friends or relatives also played a part. Participants who were at the restaurant and were not offered testing were usually quite accepting of this fact. Although a minority believed they had a right to be tested, most believed that this was “probably unrealistic since there were so many of us.” For these participants a lack of symptoms and a low likelihood of exposure were the most salient reasons for probably declining screening if it was offered, whereas peace of mind was the reason most often given for probably accepting.

#### Impact of test results

Most participants who were at the hotel and provided a urine sample for testing described their results as reassuring and as expected. None the less, these participants repeatedly spoke of their need for more information. Many had been told only that their results were “of no concern.” This left some confused or even suspicious and comments such as “what is ‘of no concern’? It would have been nicer to know what the polonium amount was” and “well the test results came back normal, although there’s no indication of what normal is . . . I’ve really got to take their word for it, haven’t I?” were common. The other question often raised was what the results meant for potential long term health effects. Most participants thought that “of no concern” implied that long term effects were unlikely, but many would have preferred this to have been made explicit.

#### Impact on life

Few participants reported that the incident had any major impact on their life. Although some mentioned heightened anxiety, this was temporary for most. Only one person reported stigmatisation as a result of the incident. Similarly, whereas five people reported feeling less safe, these feelings had limited effects on their daily lives. Many more viewed their experiences as interesting or even exciting, making comments such as “it makes an interesting story” or “everybody was rather fascinated about it” and using humour to normalise the event. Despite this, some still mentioned underlying concerns about potential long term effects.

#### DISCUSSION

The incident in which Alexander Litvinenko was poisoned with polonium ( $^{210}\text{Po}$ ) in London caused limited public concern about health risks, despite involving radioactive contamination. This was partly due to the perception of the incident as a spy story and to the successful communication about the restricted nature of any risk. Had the incident been

portrayed as linked to terrorism, public concern might have been greater.

Shortly after the Health Protection Agency revised its risk assessment for people attending the hotel bar where Litvinenko had been drinking, 11.7% of our cross sectional survey sample thought that their own health might have been at risk as a result of the  $^{210}\text{Po}$  incident. Although there was no risk to people who had not been in a contaminated location, given that radiation is consistently rated as one of the most feared environmental hazards,<sup>13</sup> it is surprising that rates of perceived risk were not higher.

Two factors helped to limit perceptions of risk surrounding this incident. Firstly, the Health Protection Agency's communication about the restricted nature of the risks associated with the contamination seems to have been successful. Although our survey suggested that public knowledge about  $^{210}\text{Po}$  was limited in many respects; 71% of respondents knew that there was no risk to their health if they had not been in one of the known contaminated areas. This knowledge was strongly associated with a lower likelihood of perceived risk to health. Regardless of how successful communication was about other issues surrounding  $^{210}\text{Po}$ , getting this single message across did help to reassure the public.

Secondly, perceptions of risk were also strongly associated with the perceived motivation of the perpetrators, with respondents who thought that the incident was related to espionage or was aimed at one person reporting the least perceived risk and those who thought that it was related to terrorism or aimed at the general public reporting the most. These associations may have been driven by concerns about possible future incidents, with previous terrorist attacks in London having been perceived as predicting another attack in the near future.<sup>10</sup> And although a non-deliberate release of hazardous material might also result in further incidents as new locations are found to be contaminated, additional terrorist attacks may be more difficult for the emergency services to prevent, detect, or contain.

Although our study was not specifically designed to assess the extent of perceptions of risk in the exposed group, our finding that between 6% and 13% of respondents from the restaurant and hotel samples thought that their health was at risk suggests that such perceptions were low even here. The personal characteristics of the exposed population may go some way to explaining this: for example, 83% of our sample had yearly household incomes of more than £30 000, a factor associated with lower risk perception in our survey. This group also tended to be well educated, a factor which may have assisted the Health Protection Agency to explain the level of risk involved. A future incident involving a less affluent group may result in higher levels of concern and may require different styles of communication.

As with the general public, potentially exposed people wanted information about their risk of exposure. Although the general public could be

reassured with information about the geographical containment of the incident, however, exposed people needed more precise information relating to their specific circumstances, with participants citing factors such as lack of symptoms or the amount of time spent in a location as reasons for believing that their risk was low. These factors also played a part in determining whether someone accepted or declined urine testing. Although useful in reducing anxiety, such judgments may not be valid: in particular, the absence of acute symptoms does not necessarily imply that exposure has been avoided.<sup>14</sup> This may be particularly relevant in the event of future incidents involving novel or unrecognised agents, or where health impacts have a long latent period. In such circumstances, providing clearer advice about the nature or timing of health effects might help to improve the uptake of mass screening or treatment programmes, although possibly at the expense of increased anxiety.

#### Information needs

A common criticism from participants was that insufficient information was provided during their initial telephone contacts with NHS Direct or the Health Protection Agency. More information would have been preferred on an individual's risk of exposure and on the implication of the presence or absence of symptoms. Obtaining up to date information about the incident was also important. These needs are broadly in line with those previously reported by focus groups concerning scenarios as a result of "dirty bombs."<sup>15</sup> Providing such detailed information is problematic during acute incidents, particularly if staff are working under time constraints, if there is a need to prioritise obtaining clinical data from a caller, or if the requested information is classified. Directing callers to an alternative source of information may tackle some of these problems. In the  $^{210}\text{Po}$  incident, simply informing callers about the availability of daily updates on the Health Protection Agency's website or providing a helpline number for more detailed queries would probably have satisfied most requests for information. Providing a candid explanation as to why certain requested information cannot be provided may also help to maintain trust.<sup>16</sup>

More information was also wanted about the meaning of urine test results. Advice that these were "of no concern" was perceived as unhelpfully vague. Participants wanted to know their actual numerical results and to be given a suitable reference value for comparison. Participants also wanted explicit information about what the results meant for possible long term health effects. Providing such information before starting testing might have helped to reinforce the reassurance people felt when their test results were normal.<sup>17</sup> Given that some participants did not understand that testing was being offered, perceived the offer to be passive, or declined the offer owing to a perceived lack of any personal benefit, providing further information about the test at an early stage might have helped people to make a more informed choice.



**WHAT IS ALREADY KNOWN ON THIS TOPIC**

Effective communication of risk during public health incidents can reassure the public and provide information to those affected

**WHAT THIS STUDY ADDS**

Public concern about health risks after the polonium-210 (<sup>210</sup>Po) incident in London was low because contamination was seen as related to espionage and because the public understood that unexposed people were not at risk

Access to detailed and updated information is important, particularly information on personal risk of exposure and test results

**Methodological issues**

Public perceptions about major incidents are liable to change rapidly as new information becomes available and media reporting evolves. Obtaining a “snapshot” of public perceptions and their predictors can therefore be difficult. In this study we used quota sampling to assess possible predictors of risk perceptions. This allowed us to obtain data from a large, representative sample within a short space of time. The trade-off for this was a low response rate (9.1%). This rate is not unusual for a telephone survey based on quota samples, however, and nor is it as valid an indicator of non-participation in quota surveys as it would be in a random probability survey. None the less, it is possible that our results may have been different had a higher response rate been achieved. In particular it has been shown that responders to telephone surveys score higher on ratings of civic involvement than non-responders.<sup>18</sup> As such it is possible that our sample may have been more attentive to Health Protection Agency messages than the general population and more trusting of the various agencies involved, making them less likely to believe that their health was at risk than the general population.

Response rates were less of a problem for our qualitative interviews, which were intended to explore factors that help to reassure or inform exposed people rather than to estimate the prevalence of these factors. Participants for these interviews were therefore purposively sampled from four groups of theoretical interest. Selection biases may still have affected these results, however, as we were able to interview only those people who had provided the Health Protection Agency with their contact details. It is possible that those who did not contact the agency after the <sup>210</sup>Po incident perceived the event in qualitatively different ways. Recall bias may also have adversely affected our interview data, with participants being asked to recall their thoughts and feelings during an event that had occurred one or two months previously. It is possible that the largely reassuring information that was given out during the intervening period caused participants to re-evaluate how they had felt during the initial stages of the incident. As such, respondents may have retrospectively considered their risk to be lower.

Finally, the open ended nature of our qualitative interviews gave participants the freedom to raise concerns that might have been missed in a more rigidly

structured, quantitative, interview. The purpose of these exploratory interviews was not to assess the relative importance of the factors that we identified, however, although the findings from our study may help to inform the selection of variables for a quantitative survey of any future incident.

**Conclusion**

Our study emphasises the importance of giving people access to detailed, comprehensible, and relevant information about risks to which they have been exposed and tests or treatments on offer. The dismissive comments of some participants about the attempts to reassure rather than to inform them and the confusion some had over their urine test results illustrates the difficulties that experts can face in providing this level of detail to a lay audience. Ongoing consultation with those on the receiving end of this information should help to prevent and correct any similar problems in the event of a future incident.

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