Psychological and stress effects of the Chernobyl accident

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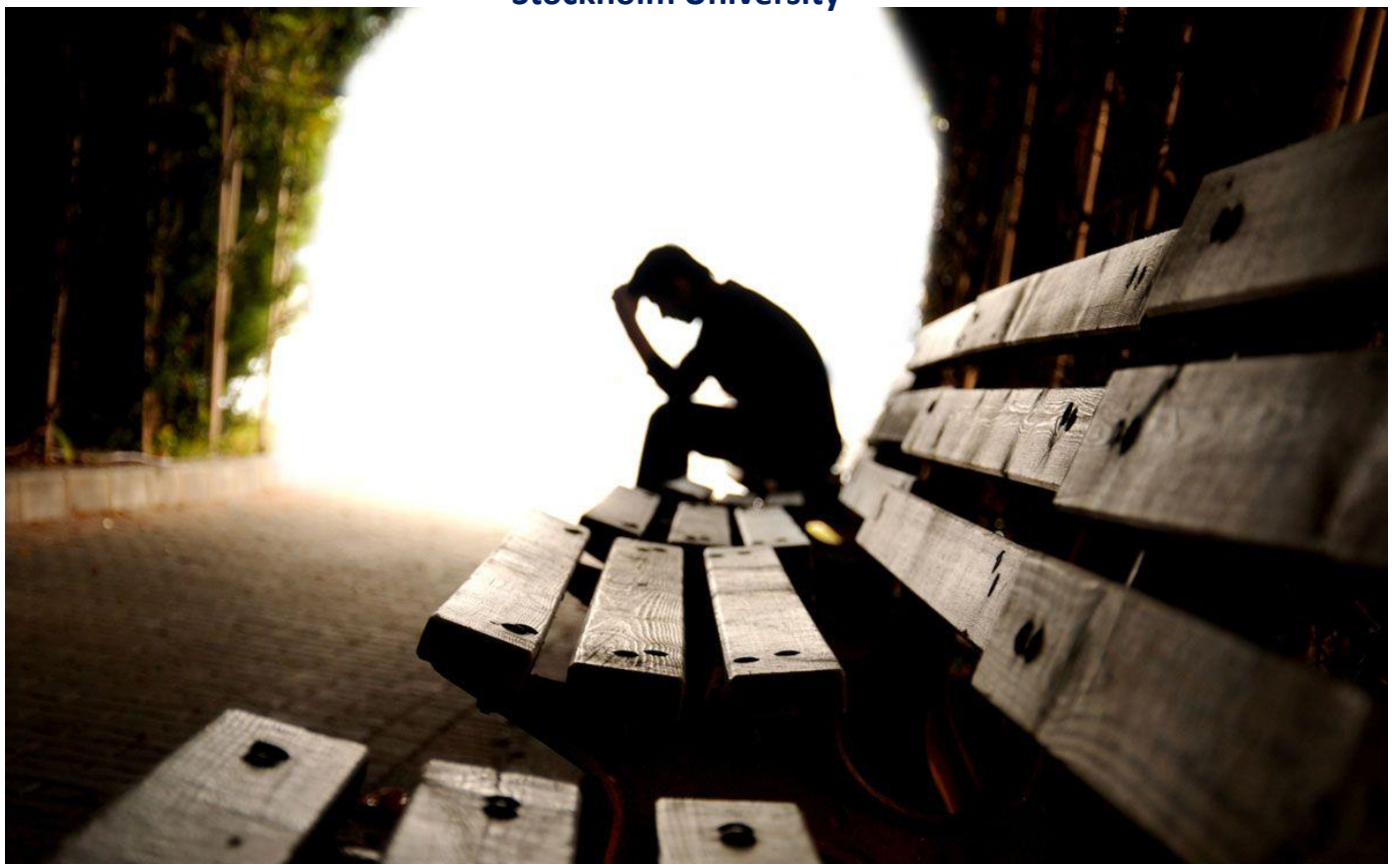

KVA seminar 2016 04 25

Population groups that were target of research on psychological effects

Main source: Bromet et al. Clinical Oncology 23: 297-305, 2011.

Groups

1. ***Recovery operation workers – liquidators (~ 600 000)***
   - **Potential radiation-related cognitive impairment**
   - **Psychiatric effects of exposure-related stress**

2. ***Children exposed in utero or as young infants***
   - **Cognitive impairment**
   - **Psychological disorders**
   - **IQ, learning ability**
   - **Emotional wellbeing**

3. ***Adult evacuees from the exclusion zone plus adult residents of strict control zones (~ 600 000)***
   - ***Emotional wellbeing***
   - ***GHQ-12 (general health questionnaire)***
   - ***PTSD (post traumatic stress response)***

1. Recovery operation workers - liquidators

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Potential radiation-related cognitive impairment

Author and year	Number of cases and controls	Endpoint	Result
Loganovsky et al. 2000, 2004	300 cases (Ukraine) 20 controls	Schizophrenia related disorders	4.5 x elevated rate of SRD: 5/10 000 vs expected 1.1/10 000
Polyukov et al. 2000	300 cases (active during first 4 months) 387 controls (active after month 4) (Ukraine)	Accelerated aging: „radiation progeroid syndrome“	86% cases showed accelerated aging as compared to 59% of controls
Gamache et al. 2005	36 cases 91 controls	neuropsychological test battery	Liquidators performed significantly worse

1. Recovery operation workers - liquidators

Psychiatric effects of exposure-related stress

Author and year	Number of cases and controls	Endpoint	Result
Rahu et al. 1997, 2006	5000 Estonian liquidators	Suicide rate	Standardised Mortality Ratio (SIR): 1.52 (95% CI: 1.01-2.19)
J-F Viel et al. 1997	1412 Latvian liquidators	mixed mental-psychosomatic disorders	Prevalence: 46%. Risk factors were: work (> 1 time) on the damaged reactor roof, forest work and fresh fruit consumption
Loganovsky et al. 2008	295 cases 397 controls	mixed mental-psychosomatic disorders	depression (18.0% v. 13.1%) and suicide ideation (9.2% v. 4.1%)

1. Recovery operation workers - liquidators

Conclusions

The evidence about the psychological impact of Chernobyl work exposure is compelling.

It is not clear how far it is due to radiation exposure or to general stress.

General problems of the studies are methodological limitations such as:
Convenience samples.
Lack of assessment of reliability of procedures and measures.
Failure to adjust for confounders such as age, alcohol consumption, etc.

2. Cognitive impairment and emotional wellbeing of exposed children

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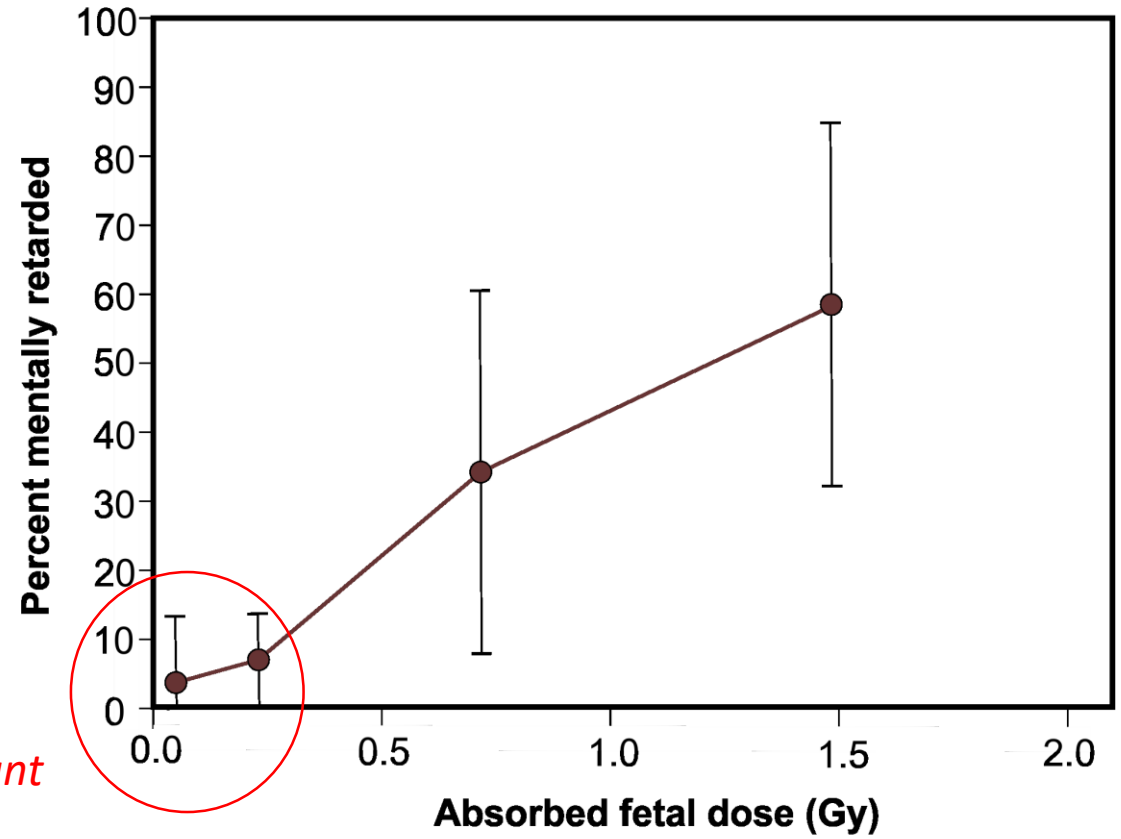
Why is this studied?

Cognitive impairment was observed among atomic bomb survivors albeit after doses in excess of some 0.5 Gy

Frequency of mental retardation as function of dose among those exposed in utero to atomic bomb radiation

H. Otake and WJ Schull, Br J Radiol 57:409-414, 1984



Not significant

2. The first study on mental retardation in children

Author and year	Number of cases and controls	Endpoint	Result
WHO 1995: **Health consequences of the Chernobyl accident : results of the IPHECA pilot projects and related national programmes**	Belarus: 906 / 962 Russia: 725 / 300 Ukraine: 588 / 759	Mental retardation and behavioural disorders	There was an increased level of mental retardation and behavioral disorders among the exposed children, but there was no dose-response relationship. It was concluded that the results may be due to the concern of parents.

2. Further studies on mental retardation in children

Author and year	Number of cases and controls	Endpoint	Result
Kolominsky et al. 2000, Igumnov et al. 2000	250 cases and 250 controls in Belarus.	Neuropsychological anomalies	Increased psychiatric disorders among exposed children, but no dose-response, so results attributed to cultural differences between cases and controls
Nyagu et al. 1998	544 cases 759 controls in Ukraine	IQ measures and psychiatric evaluation	Lower IQ among exposed, behavioural problem scores: 45% in exposed and 29% in controls. Significant correlation with dose so finding attributed to radiation.
Lichter et al. 2000, Bromet et al. 2000	300 evacuees from Pripyat, 300 controls	IQ, learning capability and psychological symptoms	No differences

Two more studies on cognitive ability among evacuees with negative results

2. Further studies on mental retardation in children

Author and year	Number of cases and controls	Endpoint	Result
Loganovsky et al. 2008	100 evacuees, 50 controls	Clinical psychiatric assessment	Psychiatric problems among 71% of exposed vs 34% of controls. Results do not correlate with maternal reports on children´s behavioural symptoms
Huizink et al. 2007	232 stress-exposed and 572 non-exposed Finnish twins	Behavioural disorders	2.3-fold risk (95% CI: 1.13-4.72) of lifetime depression symptoms
Heiervang et al. 2010	84 prenatally exposed children (contaminated area in Norway) vs 94 controls	Neuropsychol ogical tests on verbal tasks	Exposed adolescents performed more poorly than controls

2. Studies on mental retardation in children

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Conclusions

The evidence about the neuropsychiatric and cognitive impact of radiation-exposure in infancy is not consistent.

The prenatally exposed cohort is now 30 years old and many have become parents themselves. Their health and wellbeing are important to monitor.

3. Adult evacuees from the exclusion zone plus adult residents of strict control zones

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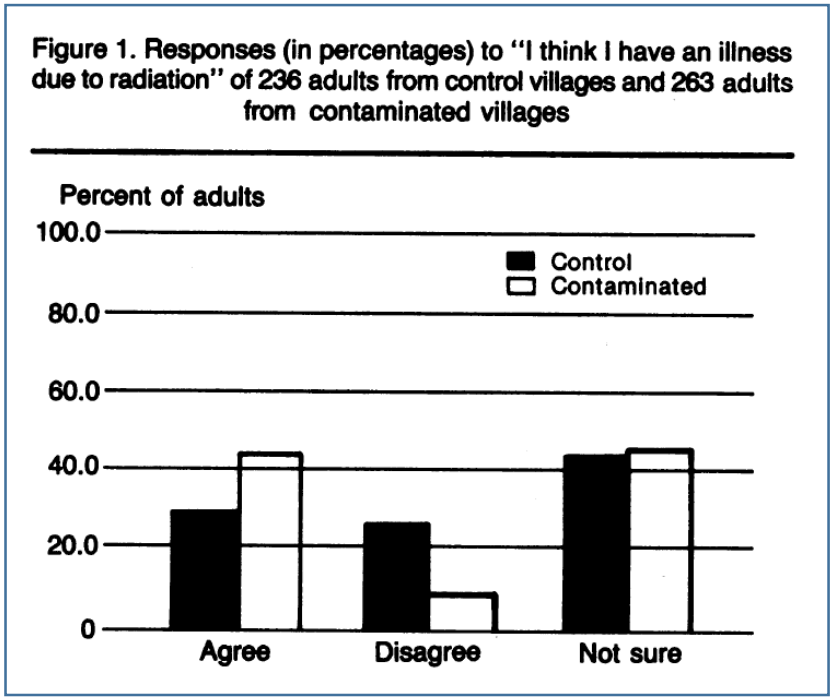
1991: the first analysis of psychological effects carried out by the IAEA
Data was collected on more than 1350 residents of 13 villages

H.M. Ginzburg. Public Health Reports 2, 1993

Result: The levels of anxiety and stress of the villagers appeared to be disproportionate to the biological significance of the levels of IAEA-measured radioactive contamination.



Almost half the adults in all the villages were unsure if they had a radiation-related illness. The IAEA effort indicates that the villagers need to be educated about their actual risks, and they need to understand what types of illnesses are, and are not, associated with exposure to radioactive contamination.

3. Adult evacuees from the exclusion zone plus adult residents of strict control zones

Author and year	Number of cases and controls	Endpoint	Result
Viinamäki et al. 1995	325 cases (Bryansk) 278 controls	GHQ-12	Higher rate of minor mental disorder in women (48% vs 34%), but not in men
Havenaar et al. 1997	1617 cases (Gomel) 1427 controls	GHQ-12	Higher GHQ score in exposed vs non-exposed (64% vs 48%). Mothers with young children were at a particularly high risk.
Adams et al. 2002, 2011	300 evacuee mothers 300 controls	Depressions, PTSD	More lifetime depressions (child age 11: 44% vs 30%, child age 19: 29% vs 19%). Higher PTSD (20% vs 8%). Concern of mothers was a significant factor contributing to decision to emmigrate to Israel and USA.

GHQ-12: 12-item General Health Questionnaire
PTSD: post traumatic stress response

3. Adult evacuees from the exclusion zone plus adult residents of strict control zones

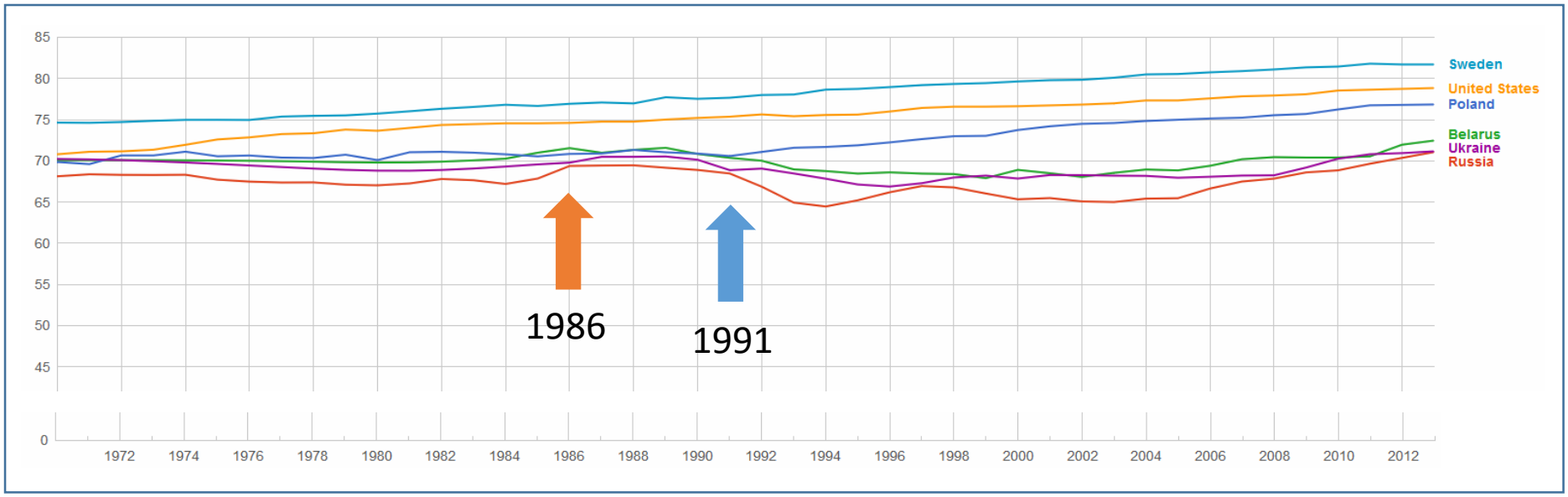
Conclusions

There is no doubt that the Chernobyl accident had a strong impact on the wellbeing on the evacuees and residents of strict control zones. But the effect is difficult to quantify.

WHO Chernobyl forum stated in 2006: “The mental health impact of Chernobyl is the largest public health problem unleashed by the accident to date.”

The late effects of the Chernobyl disaster were superimposed on the decline of life quality after 1991 in Belarus, Russia and Ukraine

Life expectancy dropped after the Soviet Union fell apart in 1991



Data from the World Bank

Why is the mental health impact of Chernobyl the largest public health problem unleashed by the accident to date?

Source: E.J. Brommet. Journal of Radiological Protection 32:N71-N75, 2012.

Generally, the most important risk factors for mental health after a disaster are:

- The severity or scale of the disaster.
- Personal vulnerability factors like being a mother of young children.
- Extent of chaos and hardships in the post-disaster environments such as aftershocks, stigma, lack of medical support, contradictory information from the public officials.

These factors were given after the Chernobyl accident

Evacuee adults and children were not only stigmatised because of their radiation exposure but also strongly resented because they were given new apartments ahead of local residents who had spent years on waiting lists.

Benefits given to evacuee children, such as annual medical check-ups and hot lunches at schools became bones of contention amidst widespread poverty in the general population.

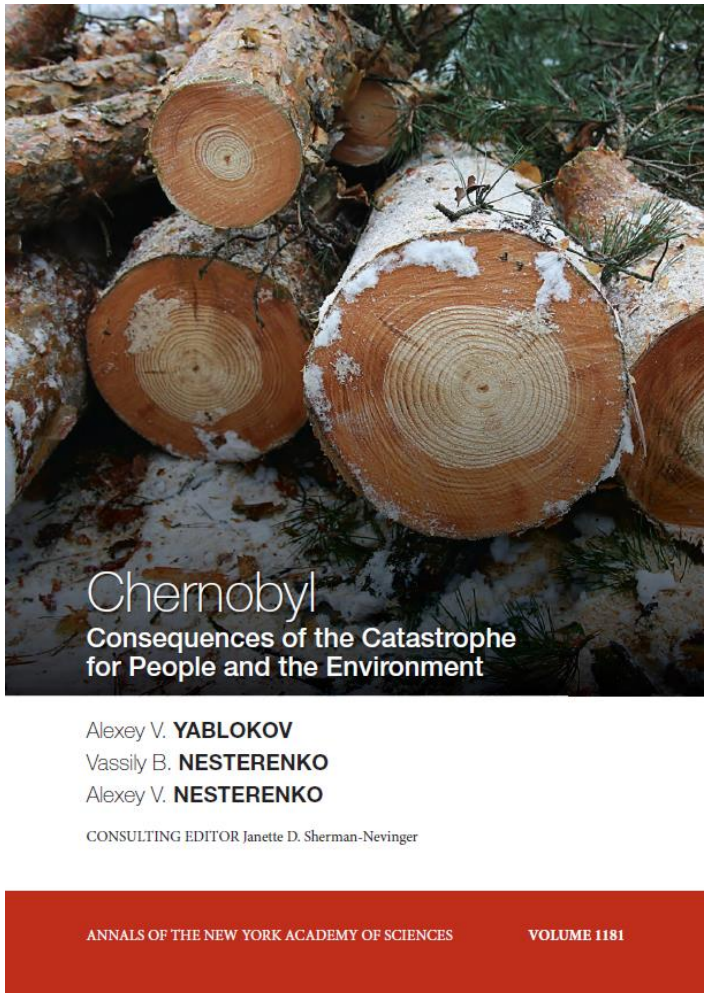
Official disclosure about what happened at Chernobyl went from absent to misleading, resulting in growing distrust in authorities, irrational fear and widespread rumours.

Why is the mental health impact of Chernobyl the largest public health problem unleashed by the accident to date?

One cause: exaggerated reports on radiation effects

(results of Google search “horrors of Chernobyl”

Example of an exaggerated report on radiation effects



From year to year there has been an increase in non malignant diseases.

In Kiev, Ukraine, where before the meltdown, up to 90% of children were considered healthy, the figure is now 20%.

In some Ukrainian territories, there are no healthy children.

Causes for alarm are complications of pregnancy and the state of health of children born to so-called “liquidators” (Chernobyl’s cleanup workers) and evacuees from zones of high radionuclide contamination.

Against the background of such persuasive data, some defenders of atomic energy deny the obvious negative effects of radiation upon populations.

Example of an exaggerated report on radiation effects

http://www.ippnw.org

The overall cancer morbidity rate in all organs including colon, urinary bladder and thyroid, is significantly higher in all regions of Belarus.

It was most pronounced in the Gomel region, where it increased by more than 50% - from 147.5 to 224.6.

In Gomel the relative incidence of cancer cases rose from 240.0 per 100,000 in 1989 (the lowest incidence rate in all of Belarus at the time) to 346.0 per 100,000 in 1999 (by far the highest in all of Belarus).

Rumours

Source: M. Rahu. European Journal of Cancer 39: 295-299, 2003

Examples of actual rumours

- Several trucks, each carrying each carrying tens of carcasses of lethally irradiated elk, drove north on a peninsula on Saareema Island in Estonia to secretly burry them (1986).
- In Kiev, 15 000 nuclear victims were bulldozed into mass graves (1986).
- The Chernobyl disaster was an intentional experiment aiming at gathering knowledge about the effects of radiation on people (1996).
- As a result of radiation over 300 000 persons have died by now (in 2000).
- Most of the clean-up workers are now disabled, some are terminally ill and others have died (in 2000).
- As a result of the accident in Chernobyl, the number of skin cancer cases in Romania has increased 60 times (date not known).

How can rumours and disinformation be prevented?

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Source: J. Doorley and HF Garcia, Routledge Taylor & Francis, 2007

Rumours arise from uncertainty, from the absence of context and concrete information by which those affected by a crisis may understand its significance.

The basic law of rumour (Alport and Postman, 1940) :

The two essential conditions of importance and ambiguity are related to rumour transmission in a roughly quantitative manner as follows:

R ~ I x A, where

R - the reach, intensity, duration, and reliance on a rumour;
I - the importance of the rumour to the hearer or reader, if true;
A - the level of ambiguity or uncertainty surrounding the rumour.

Dynamics of controlling a rumour in the news cycle

As a general rule, opportunities to employ the **R ~ I x A** formula to kill negative stories appear only at specific points in the news cycle. If you miss one point, your chance of killing the story is very low until the next point in the news cycle.

These points are within:

45 Minutes
6 Hours
3 Days
2 Weeks