Translating Behavioural Science Principles and Evidence into Modelling for Extreme Events

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Translating behavioural science into policy and practice:

CBRN terrorism

[PRACTICE]

Flooding / conventional terrorism

Pandemic influenza; acid attacks

The Health Protection Research Unit in Emergency Preparedness and Response at King's College London

Deloitte.

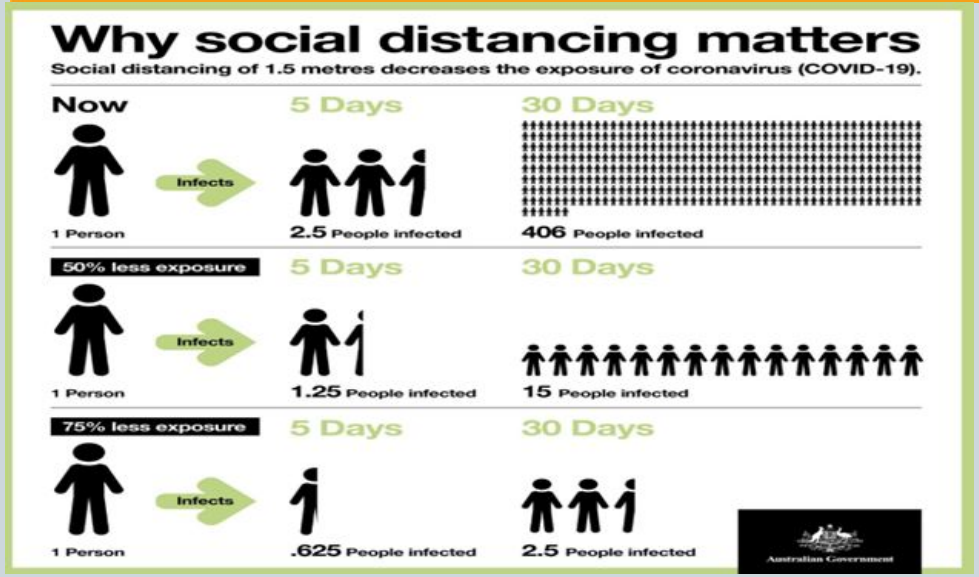
Marauding terrorist attacks

Why is perception of risk important?

- **The UK Blackett Review for High Impact Low-Probability Risks:**
- "For many high impact risks we do not understand what the public actually expects in a situation, or how tolerant they may be of 'abnormal' risks during a crisis"
  (Government Office for Science, 2011, p. 24).

Fear as a health risk Risk perceptions inform behaviour.

- Implications for physical health, as well as emotional health.
- Spontaneous behaviours can lead to higher risk (e.g. fly vs drive).
- Public behaviour can impact the effectiveness of healthcare systems (e.g. Tokyo Sarin Attacks; Goiania, Brazil radiological incident, Litvinenko, COVID-19).



See: Becker, 2004; Gray & Ropeik, 2002; Henderson et al., 2004; Rubin et al., 2007; Sheppard et al., 2006; Vonderford, 2004; Wray & Jupka, 2004, etc.

Variations in perceived risk: expert vs public

Impact (of the reasonable worst case scenario using the impact indicators below)	< 1 in 500	1 to 5 in 500	5 to 25 in 500	25 to 125 in 500	> 125 in 500
Level E			7 25†		
Level D	34*		12 13 29		
Level C		18 28 33* 36*	14 19 21 26† 27* 38	2 3 6* 15 16 17 20	
Level B	30	24	35*	4 5 9* 10* 11* 23 32* 37	1
Level A			8* 22	31	

Likelihood

(of the reasonable worst case scenario of the risk occurring in the next year)

*Risk not plotted in the 2017 NRR | †COVID-19 is not included in the risk matrix and is therefore not included in these risks

Malicious Attacks
1. Attacks on publicly accessible locations
2. Attacks on infrastructure
3. Attacks on transport
4. Cyber attacks
5. Smaller scale CBRN attacks
6. Medium scale CBRN attacks
7. Larger scale CBRN attacks
8. Undermining the democratic process*

Serious and Organised Crime
9. Serious and organised crime – vulnerabilities*
10. Serious and organised crime – prosperity*
11. Serious and organised crime – commodities*

Environmental Hazards
12. Coastal flooding
13. River flooding
14. Surface water flooding
15. Storms
16. Low temperatures
17. Heatwaves
18. Droughts
19. Severe space weather
20. Volcanic eruptions
21. Poor air quality
22. Earthquakes
23. Environmental disasters overseas
24. Wildfires

Human and Animal Health
25. Pandemics†
26. High consequence infectious disease outbreaks†
27. Antimicrobial resistance*
28. Animal diseases

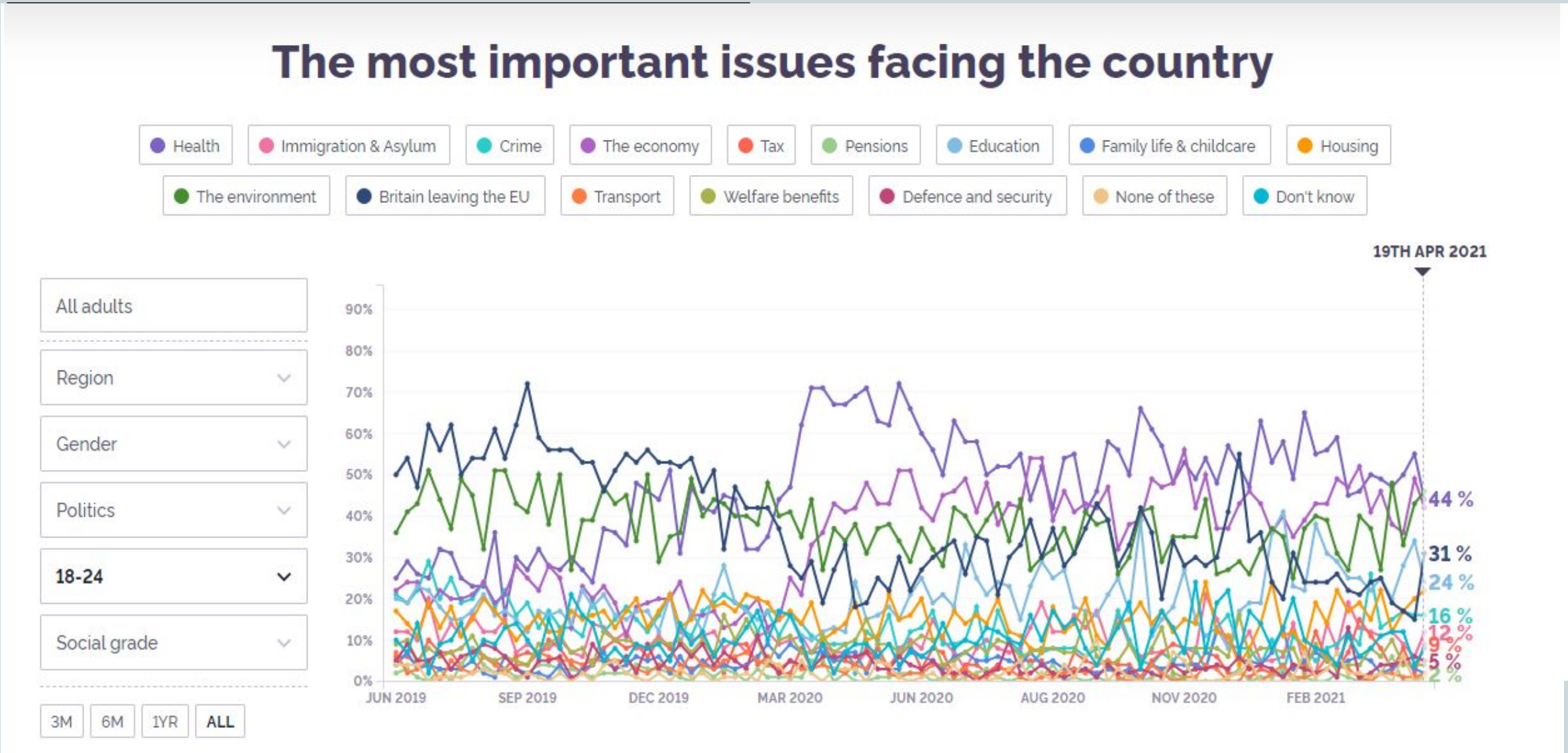
Major Accidents
29. Widespread electricity failures
30. Major transport accidents
31. System failures
32. Commercial failures*
33. Systematic financial crisis*
34. Industrial accidents – nuclear*
35. Industrial accidents - non nuclear*
36. Major fires*

Societal Risks
37. Industrial action
38. Widespread public disorder

Figure 3. Percentage of focus group employees willing to report to work during a delibrate release of the pneumonic plague by sector

Willing and Able Building a crisis resilient workforce

Variation in public perceptions:



Comparing apples to oranges:

Expert Perceptions of Risk:

- Can I identify a clear cause and effect relationship?
- Can I quantify the amount of harm?
- Do I suspect a hazard, based on past experience?
- Is there a possibility of an accident?
- Is there possible exposure to the risk (e.g. pollutant/violence)?

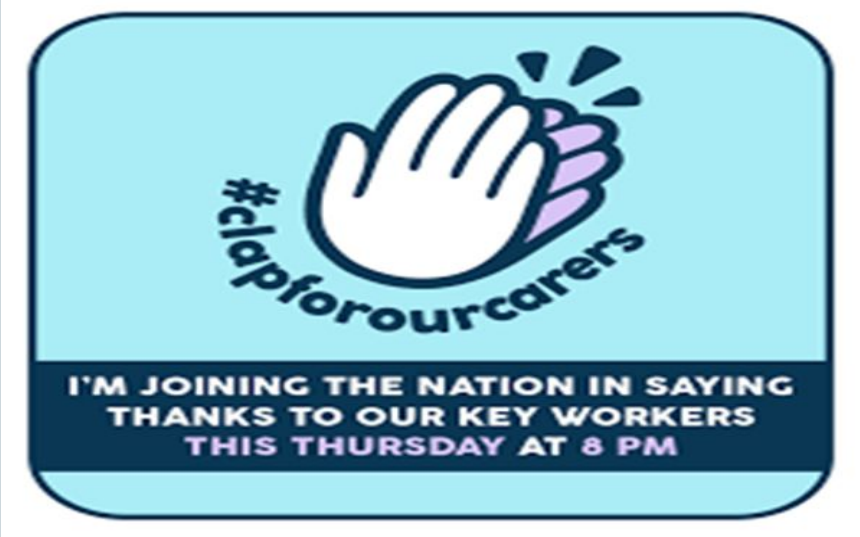
Public Risk Perception Factors:

- Voluntary vs. Involuntary
- Familiar vs. Non-familiar
  - Unknown Risk: New, unknown to those exposed, delayed effects.
- Control vs. Lack of Control
- Fair vs. Not Fair
- Natural vs. Technological
- Dread vs. No Dread
  - Dread Risk: catastrophic potential, fatal consequences, uncontrollability, inequitable, and high risk to future generations

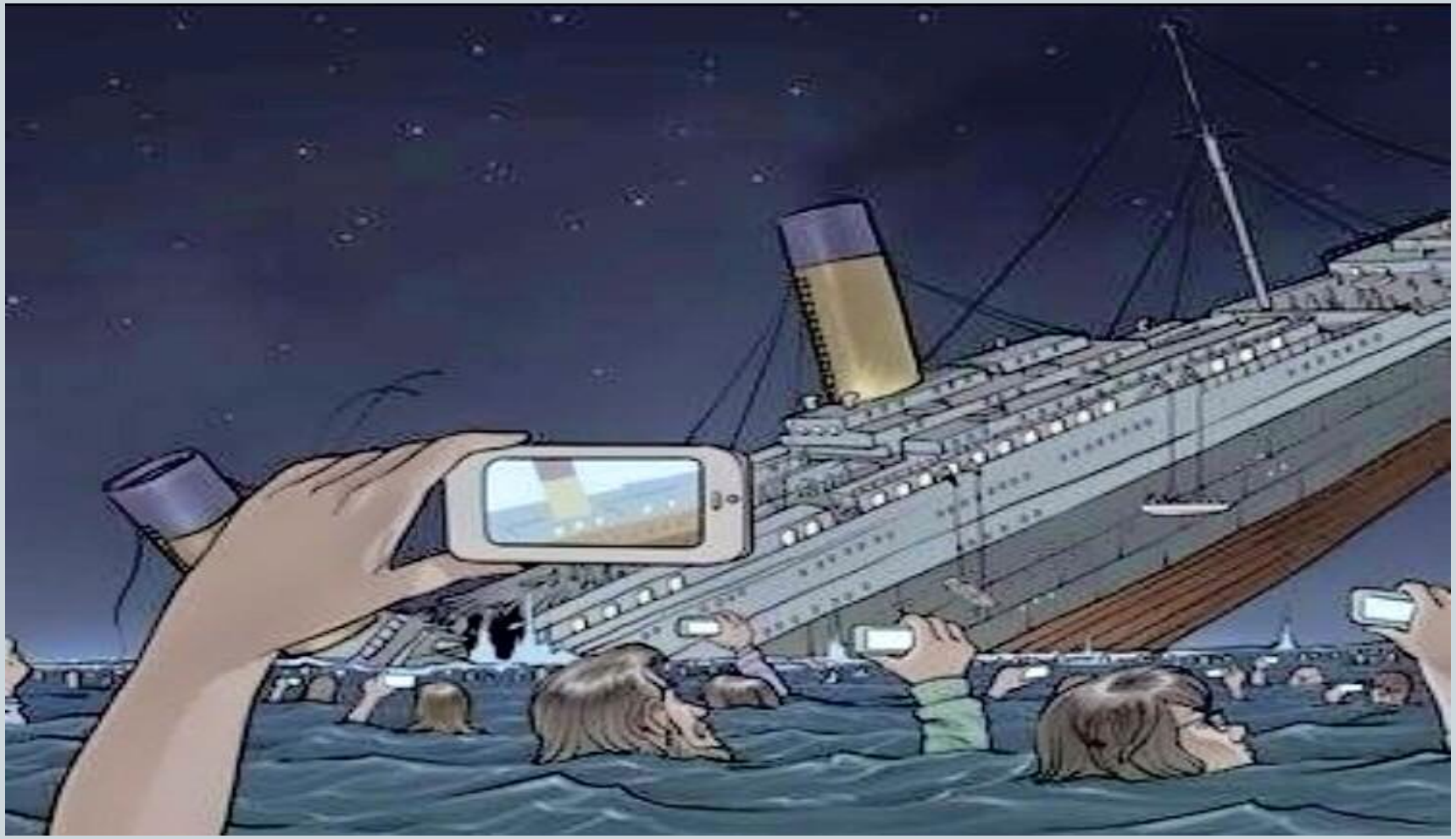
Check your assumptions at the door:

Emergency planning assumptions:

- Often fail to incorporate human behaviour
- Can be based on contradictory assumptions (e.g. panic followed by compliance).
- Overwhelming evidence that people become interdependent and co-operative and panic is rare.
- Assumptions of panic can lead to a focus on reassurance.
- Understand public response along a spectrum where under response can be as problematic as



What will the public do?



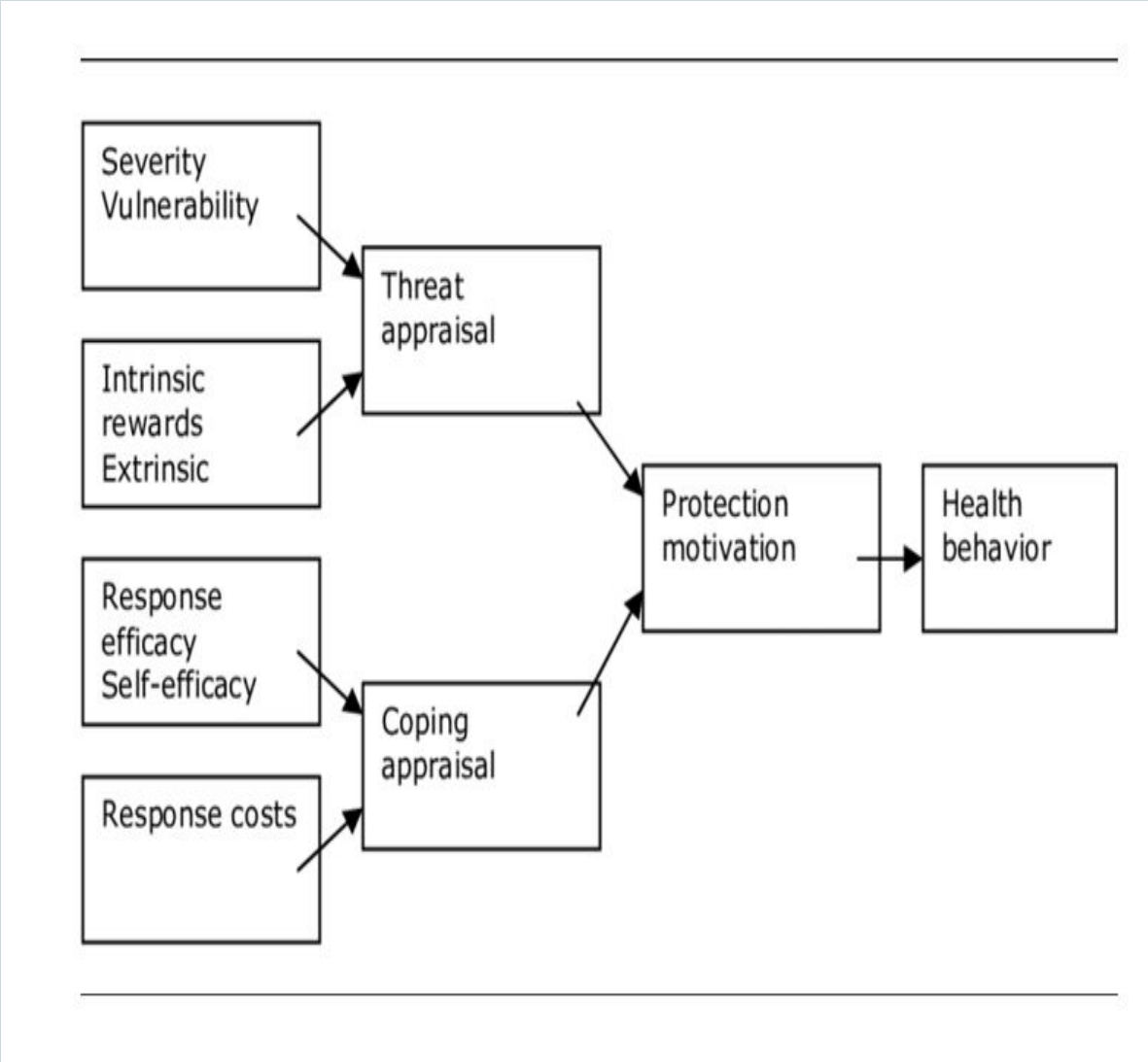
Will they panic?

There is some evidence for panic, particularly in situations where there have been fires in enclosed spaces (e.g. Iroquois Theatre fire in Chicago)

<u>However</u>, overwhelming evidence suggests that when faced with disasters and emergencies, people become interdependent and co-operative and panic is rare.

- 9/11 WTC evacuation - e.g. <20mins from 78th floor (Proulx & Fahy, 2003)
- 7/7 tube bombings – pro-social behaviour (Sheppard et al, 2006)
- Survivors of 11 emergencies – crowd sociality (Drury, Cocking & Reicher, 2009

Behavioural theory/evidence informing advice (PMT)



Adapted from Yardley 2021 presentation

Behavioural interventions

Must take into account perceptions about:

- The event
- The efficacy of recommended behaviours
- The ease of recommended behaviours
- The cost of recommended behaviours
- Those who are communicating (i.e. trust)

Effective health communication:

- Provide reassurance but not at the cost of detailed, actionable guidance
- Provide guidance via multiple modes
- Be explicit about protective behaviours and behaviours to avoid
- Address perceived response costs associated with following advice.

Rogers, 1975; Perace et al., 2012; Rogers & Pearce, 2013

COM-B and The Wheel of Behavioural Change (Michie et al., 2011)

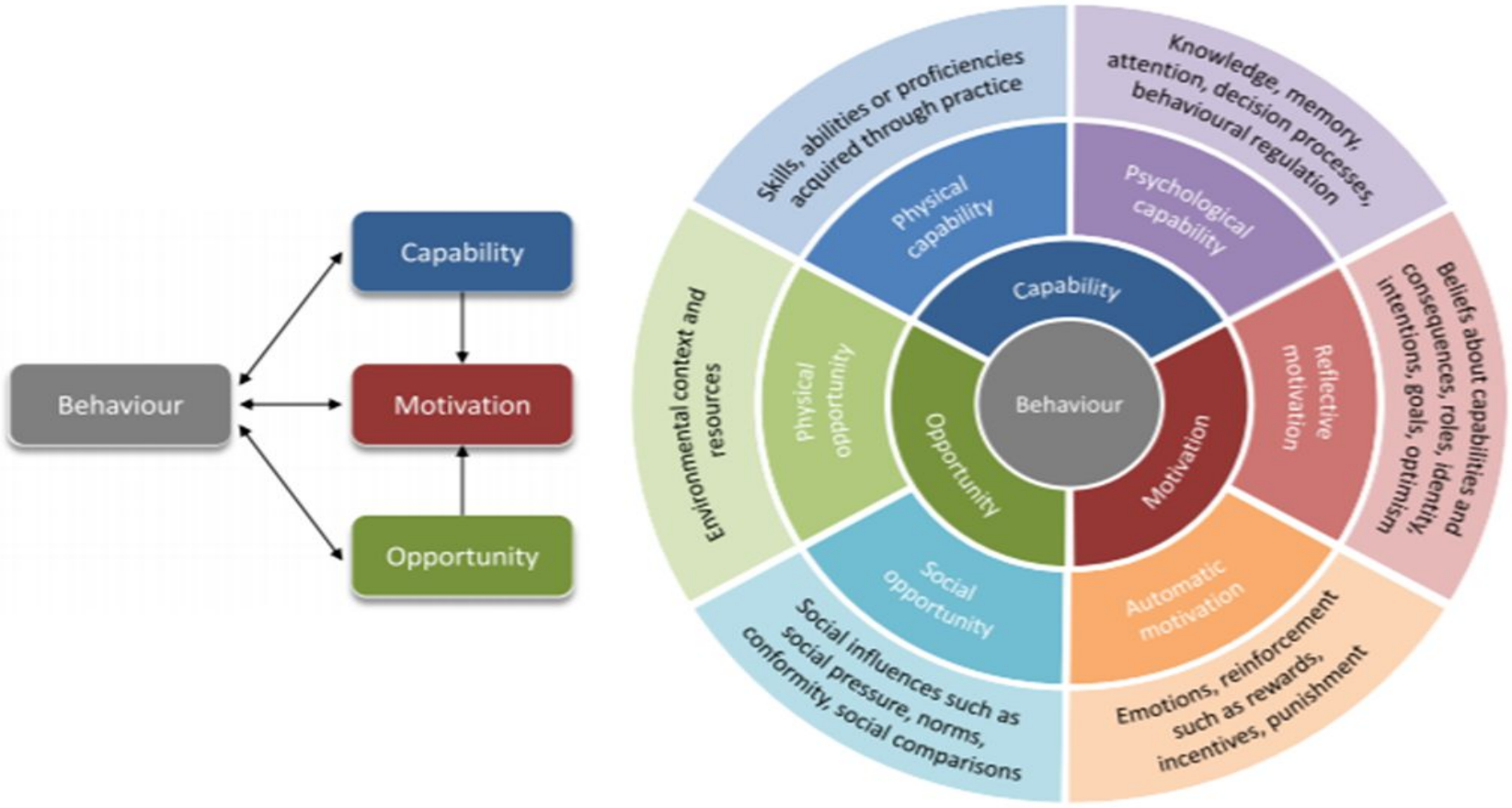


Fig. 1 The COM-B Model [15]

Image taken from McDonagh et al., 2018, p. 3

Principles for the design of behavioural and social interventions:

Principles for the design of behavioural and social interventions (20th April 2020):

Epidemiological/modelling principles (SPI-M):

- Reduce number of contacts per day.
- Reduce exposure of vulnerable groups.
- Reduce probability of infection per contact.
- Reduce number of susceptible people.

Behavioural Principles (SPI-B):

Seek to maximise the effectiveness of the above (not an exhaustive list).

- Provide a credible, rationale for guidance and any changes (transparency, rationale, feedback).
- Engage all sectors of society (co-create solutions, allow time for sector planning)
- Enable changes and provide support (harness organisational structures and processes, redesign shared indoor and outdoor spaces)

SPI-B behavioural and social considerations when reducing restrictions (10th February 2021):

This update to our April 2020 guidance on factors to consider when easing national restrictions maintains the principles targeted at:

- Maintaining public trust by defining criteria for selecting what activities to resume based on need, risk, and equity;
- Providing clear guidance that helps people understand and adhere to the changed restrictions; and
- The importance of trialling the changing restrictions in careful sequence, with time to analyse data to assess the impact of each change, and making of making this process public.

The Impacts of School Closures: Factoring in the Wider Impacts

The role of children in transmission and the impact of school closures

- Scenarios developed with SPI-M and DfE
- Populated responses to questions across scenarios (e.g. What messaging to pupils, parents or teachers should be prioritised in each scenario to reduce transmission – e.g. washing hands (hygiene) vs. reducing contact?)

- **Benefits of remaining in education: evidence and considerations (4th November 2020):**
- Picking up momentum on the wider impacts including:
  - Educational outcomes
  - Health, wellbeing and development
  - Vulnerable children and socioeconomic inequalities
  - Classroom learning outcomes vs Remote learning outcomes

- Multiple follow-up reviews as evidence comes in.

Benefits of remaining in education: Evidence and considerations
SPI-B and DfE.

In this note, SPI-B and DfE have outlined the key evidence and considerations associated with the closure of schools. These have been grouped by theme:

A. *Educational Outcomes*
B. *Health, Wellbeing and Development*
C. *Vulnerable Children and Socioeconomic Inequalities*
D. *Classroom Learning Outcomes vs. Remote Learning*

It is important to note that school closures cannot be understood in isolation and tend to be accompanied by other restrictions (e.g. mixing beyond school, cancellation of sporting activities) and increased pressure on households (e.g. parents working from home, financial pressures).

Overall conclusions

1. School closures put educational outcomes at risk, especially for disadvantaged students *(High Confidence)*. Existing inequalities *(High Confidence)* and attainment gaps *(Low/Medium Confidence)* are already being exacerbated. Opportunities for early identification of emerging learning problems are also missed during school closures *(High Confidence)*.

2. School closures cause impairment to the physical and mental health of children. Evidence suggests that the mental health of adolescents is particularly affected *(High Confidence)*. Cognitive, social, and emotional developmental outcomes are also at risk *(Medium Confidence)* as is physical health *(Low Confidence)*.

3. School closures have a particularly adverse impact on vulnerable children due to reduced access to essential services *(High Confidence)*. Other lockdown-related stressors for children and parents, such as economic uncertainty, are also likely to be exacerbated *(Medium Confidence)*.

4. Extended periods of remote learning can lead to poorer educational outcomes, although some sources suggest that in the short-term adverse outcomes may be limited *(Low Confidence)*.

Student engagement with testing

Student testing (ONS, 2020)

- 2/3 of students downloaded the NHS COVID-19 or Protect Scotland apps.
- Between 85% and 89% reported that they would request a test if they developed COVID-19 symptoms. Between 82% and 86% said that they would stay at home.
- 85% of students reported that they would be likely or extremely likely to share details of people they have been in contact with if contacted by NHS test and trace service.
- The most common reason for not getting a test was a belief that they only need to self-isolate wanting the test to go to someone else who needed it more, or if their symptoms had only been mild or improving.

Barriers to student engagement with testing (SPI-B, 2020)

- Barriers to student engagement with mass-testing programmes upon return to university may include [9]:
  - Uncertainty about whether to get tested
  - Low perceived risk of coronavirus infection in self and contacts
  - Concern about consequences of triggering self-isolation for self/others Concern about consequences of disclosing contacts
  - Practical and psychological barriers to self-isolation (SPI-B, "Key behavioural issues relevant to test, trace, track and isolate," 2020)

ONS, "Coronavirus and the impact on students in higher education in England: September to December 2020," 2020.

SPI-B: Return to campus for Spring term: risk of increased transmission from student migration (13th January 2021).

Picture sourced from https://dfemedia.blog.gov.uk/2020/12/03/university-testing-your-questions-answered/

Enabling student engagement with university mass-testing

Addressing common barriers to mass uptake through:

- **Access:** consider links with clinical training sites
- **Support:** a package of support including practical, emotional, and financial support
- **Communication:**
  - Include the rational/reasons for asking them to take certain actions.
  - Co-produce with a broadly representative group
  - Include the principles underlying self-isolation to help students understand why and how to adhere.
- **Co-design:** Bridging social, cultural, and structural barriers. High levels of engagement in health-related interventions are built on trust, shared goals, and perceived fairness.
- Consider creating social norms around testing for staff and student.
- The need for regular testing must be communicated clearly.

Support packages should include:

1. Financial support
2. Tangible, non-financial support
3. Proactive outreach to identify and resolve practice needs
4. Information
5. Educational support
6. Emotional support

Co-design and evaluation are needed to enhance the effectiveness of the six elements of support (see SPI-B, 2020. The impact of financial and other targeted support on rates of self-isolation or quarantine; and Principles for co-production of guidance relating to the control of COVID-19).

Flexible support packages: Recognise the diversity of student populations alongside the varied impacts of a positive test result. Some students will be unable to isolate due to caring responsibilities, others due to their household conditions, others due to their financial situation.

See also: SPI-B: Increasing adherence to COVID-19 preventative behaviours among young people (22 October 2020)

Improving motivation for protective health behaviours

- Focus on why/how/where people need to try to reduce infection risk, rather than ‘compliance’ with ‘rules’
- Provide positive feedback about
  a) the success of XXX behaviour XXX efforts in helping to reduce infections
  b) the benefits for everyone if we can maintain these efforts for a few more months (for opening up campus, creating opportunities for social events, and more)
- Emphasise that everyone has an important part to play, avoid singling out particular activities, settings, people
- Help people change their environments and form new social customs to prompt and sustain habits that will reduce the spread of infection
- Provide targeted support including practical, emotional as well as financial support
- Co-create guidance and positive solutions for infection control with input from diverse members of all the different target user groups and their representatives.
- Positive solutions must be equitable, reassuring, maintain social cohesion and support, and promote a shared sense of responsibility.
- Detailed guidance should provide clear and convincing explanations, and effective behaviour change techniques to support implementation.

Adapted from Yardley 2020 presentation and collective SPI-B publications

Model Behavioural Science and Social Science Collaboration:

- Upstream dialogue and engagements creates understanding of the tools, measures, evidence base and evidence gaps.
- BSci and SHAPE approaches can add nuance and bring detailed understanding about shared and varied behaviours within and across communities.
- Greater understanding of modelling assumptions, processes, and needs can help us identify relevant research or generate new evidence to feed into the modelling process.
- Modelling can help us target BSci and SHAPE interventions. Modelling can also aid testing and monitoring to help us understand the impact of interventions.
- Partnership and collaboration between the disciplines will make the evidence and advice provided during extreme events more accurate and effective.

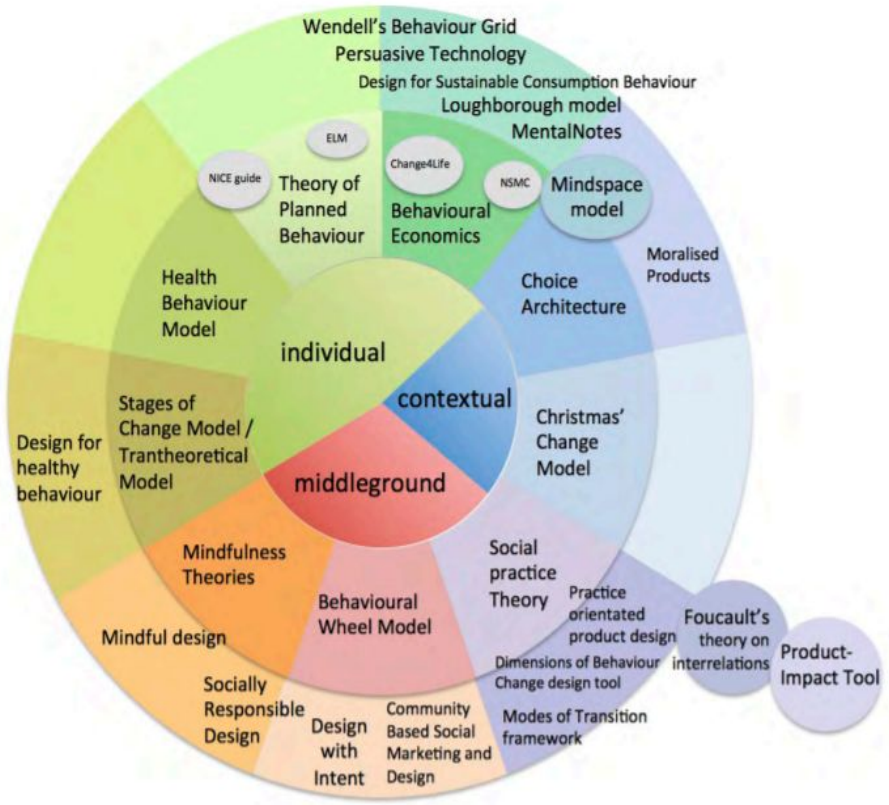


Figure 8: Categorisation of approaches in relation to behavioural theories.

Niedderer et al., 2014, p. 78.

Thank you

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