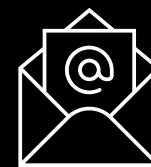


# The double dividend of safety: How feeling safe can make people healthier

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FACULTY OF HEALTH AND LIFE SCIENCES  
NORTHUMBRIA UNIVERSITY**



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University**  
NEWCASTLE



**THE WORLD IS A HAZARDOUS PLACE!**



## The Uncontrollable Mortality Risk Hypothesis:

People who are exposed to more risks beyond their personal control are less likely to look after their health.



Prof Daniel Nettle

Assume an individual who faces two kinds of hazards of dying each year: Extrinsic hazards occur with probability  $m$  and cannot be mitigated by behavior, whereas intrinsic hazards occur with probability  $i$ , but  $i$  depends on the amount of preventative health behavior performed,  $h$ . Specifically:

$$i = e^{-h} \quad (1)$$

The total probability of dying each year is the sum of the probabilities of extrinsic and intrinsic hazards occurring, and is given by:

$$r(h) = m + (1 - m)e^{-h}$$

which is:

$$r(h) = m + (1 - m)e^{-h}$$

Thus, life expectancy is given by:

$$l(h) = \frac{1}{r(h)}$$

The relationship between life expectancy and health behavior is shown in figure 1a.

Now assume that over the course of life, an individual performs a level of health behavior  $h$  that remains alive, and that the individual also performs other fitness-directed behaviors (e.g. mate status and allies, mating, parental effort etc.) that the individual performs, on average, per year of life. However, since time and energy are limited, the more effort the individual allocates to health behavior, the less can be allocated to all these other things. Specifically, performing a level of health behavior  $h$  means that the amount of other fitness-directed behaviors which can be undertaken is  $(1 - \alpha h)$ , where  $\alpha$  is a scaling parameter representing the degree to which performing health behavior impacts negatively on other components of fitness. Thus, overall fitness is a function of health behaviour, given by the expectation of life

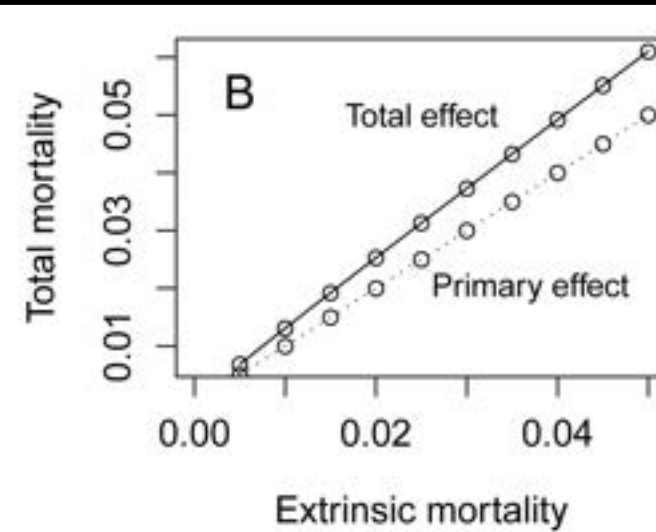
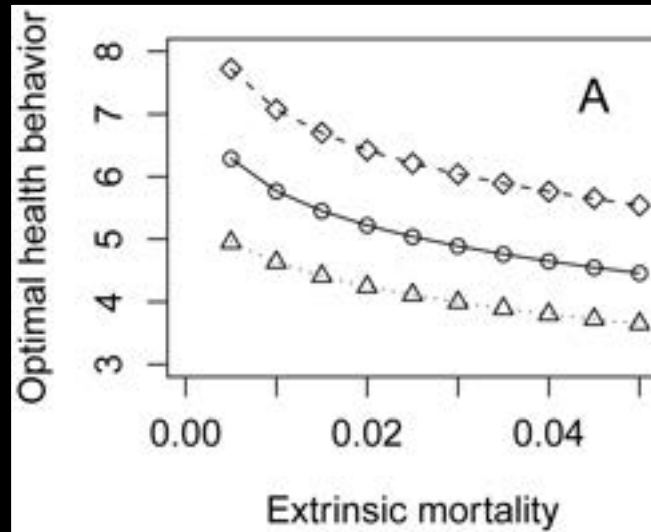
status and allies, mating, parental effort etc.) that the individual performs, on average, per year of life. However, since time and energy are limited, the more effort the individual allocates to health behavior, the less can be allocated to all these other things. Specifically, performing a level of health behavior  $h$  means that the amount of other fitness-directed behaviors which can be undertaken is  $(1 - \alpha h)$ , where  $\alpha$  is a scaling parameter representing the degree to which performing health behavior impacts negatively on other components of fitness. Thus, overall fitness is a function of health behaviour, given by the expectation of life

(equation 4) multiplied by  $(1 - \alpha h)$ . That is:

$$w(h) = \frac{(1 - \alpha h)}{m + (1 - m)e^{-h}} \quad (5)$$

Figure 1b plots  $w(h)$  against  $h$  for three values of  $m$  (with  $\alpha=0.1$ ), showing that fitness is maximised at an intermediate level of health behavior which varies with  $m$ . To find this

respect to  $h$ . Thus, at



$$i^* = m + (1 - m)e^{-h^*} \quad (8)$$

This quantity is plotted in figure 2b for values of  $m$  between 0.005 and 0.05,  $\alpha=0.1$ .

Scientific paper on the theory at <https://doi.org/10.1371/journal.pone.0013371>



***“If you believed you were likely to be a victim of a stabbing before the age of 30, would eating your 5 a day seem very important?”***



**Making people safer  
will also encourage  
them to take better  
care of themselves!**

**The double dividend of safety**

Nice hypothesis, but how do we know any of this is true?

Here's a quick overview of some of the evidence.



# Measuring perceived control over mortality risk (PUMR)



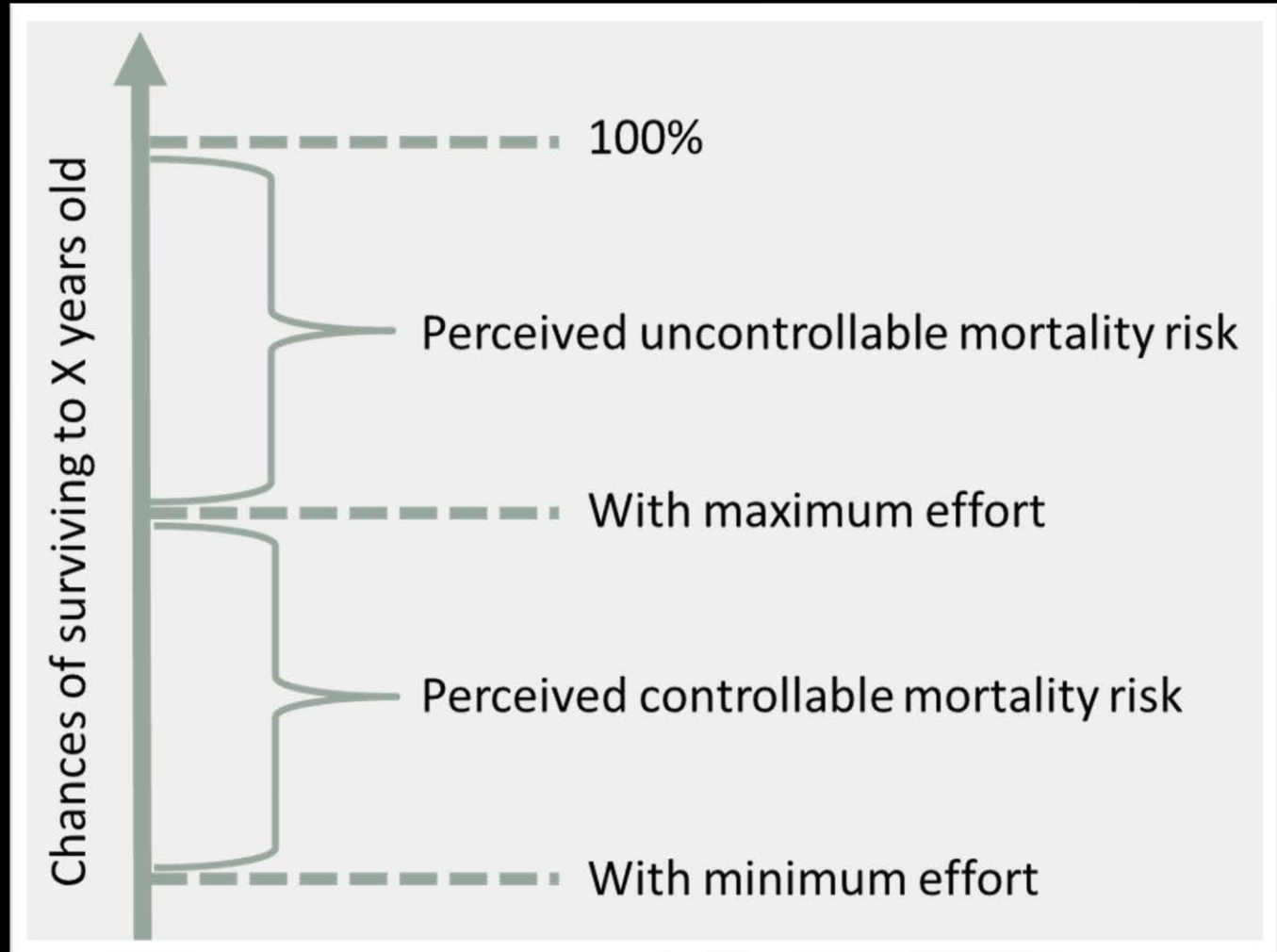
**PUMR measures the portion of a person's mortality risk, which they feel is beyond their personal control:**

[A brief guide to measuring PUMR](#)

*“If you made the maximum effort you could make to look after your health and ensure your safety, what do you think the chances would be that you would live to be 82 or more? 0 is ‘no chance’ and 100 is ‘definitely.’”*

**PUMR measures the portion of a person's mortality risk, which they feel is beyond their personal control:**

[A brief guide to measuring PUMR](#)



# Evidence from the USA

- 600 US respondents were surveyed.
- We asked our question about perceived control over mortality risk.
- We asked people about their health behaviour.
- We also accounted (statistically) for effects of age, gender, income and socioeconomic status (self-reported).
- There was a **substantial** association between our measure of uncontrollable mortality risk and health behaviour.

Effect sizes ( $\eta_p^2$ ) for reported health effort

Age = 0.002

Gender = 0.007

Socioeconomic status = 0.000

Income = 0.000

Perceived controllable mortality = 0.012

Perceived uncontrollable mortality = 0.362

socialsci

# Recent replications of the original study in both the UK and USA



Annals of Behavioral Medicine, 2024, 58, 192-204  
<https://doi.org/10.1093/abm/kad012>  
 Advance access publication 9 January 2024  
 Regular Article

OXFORD

## The Relationship Between Perceived Uncontrollable Mortality Risk and Health Effort: Replication, Secondary Analysis, and Mini Meta-analysis

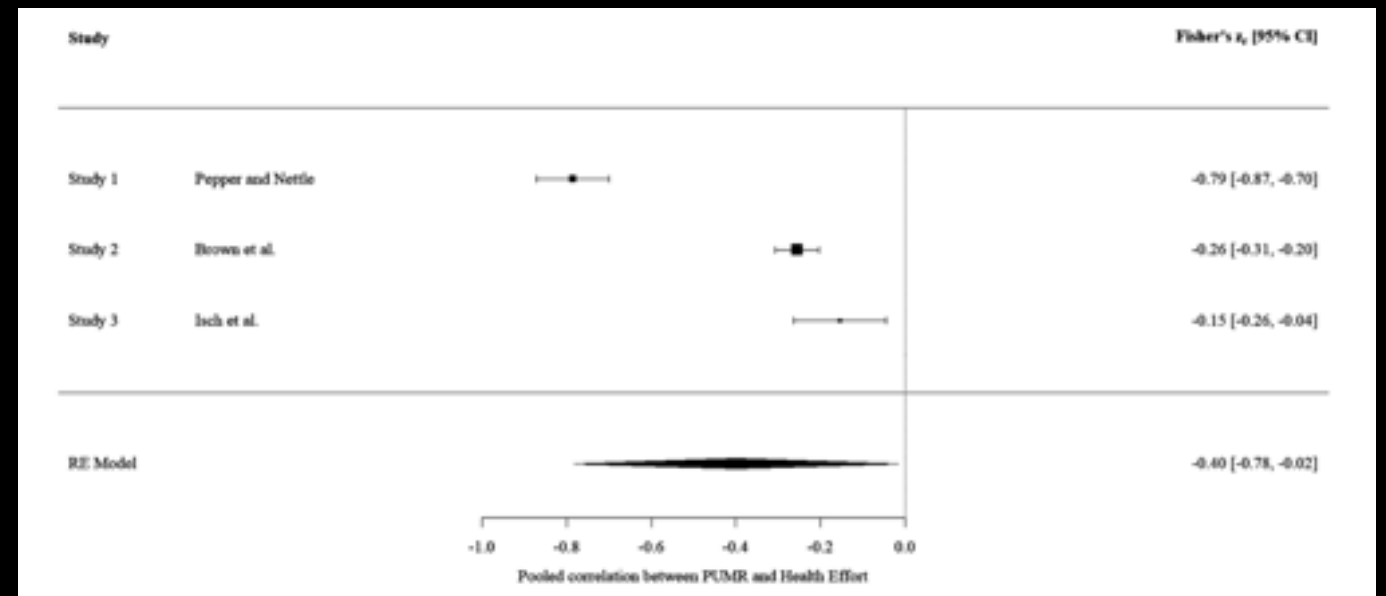
Richard Brown, MSc<sup>1</sup> · Gillian Pepper, PhD, MSc<sup>1</sup>  
<sup>1</sup>Psychology Department, Northumbria University, Newcastle, UK  
 Richard Brown | [richard.brown@northumbria.ac.uk](mailto:richard.brown@northumbria.ac.uk)

**Abstract**  
**Background** The Uncontrollable Mortality Risk Hypothesis (UMRH) states that those who are more likely to die due to factors beyond their control should be less motivated to invest in preventative health behaviors. Greater levels of perceived uncontrollable mortality risk (PUMR) have been associated with lower health effort in previous research, but the topic remains understudied.  
**Purpose** To examine the evidence for the UMRH by replicating a previous study investigating the effects of PUMR on social gradients in health effort, and conducting a mini meta-analysis of the overall relationship between PUMR and health effort.  
**Methods** We replicated Pepper and Nettle (2014), who reported a negative relationship between PUMR and health effort, and that the positive effect of subjective socioeconomic position on health effort was explained away by PUMR. We also compared the predictive effect of PUMR on health effort with that of dimensions from the Multidimensional Health Locus of Control scale—a well-used measure of a similar construct, which is frequently found to be associated with health behavior. Finally, we conducted a mini meta-analysis of the relationship between PUMR and health effort from the available research.  
**Results** PUMR was negatively associated with health effort, and mediated 24% of the total effect of subjective socioeconomic position on health effort, though this mediation effect was weaker than in Pepper and Nettle (2014). PUMR was shown to be a substantially stronger predictor of health effort than the relevant dimensions of the MHLC scale. Finally, our mini meta-analysis indicated a medium-sized negative relationship between PUMR and health effort.  
**Conclusions** Our findings offer support for the role of PUMR in mediating the relationship between subjective socioeconomic position and health effort. The results highlight the importance of measuring and understanding PUMR in studying socioeconomic inequalities in health behaviors. We discuss potential areas for future research, including determining the accuracy of PUMR, investigating influential cues, examining the role of media in shaping risk perceptions, and understanding individuals' awareness of their own perceptions of mortality risk.

**Lay summary**  
 Previous research suggests that people who are more likely to die due to uncontrollable factors are less motivated to look after their health. This is because they are less likely to live to see the long-term benefits of a healthy lifestyle. The purpose of this study is to examine and expand upon previous research investigating the relationship between perceptions of uncontrollable mortality risk and the amount of effort people devote to their health. Our findings support past research and show that the more people feel their risk of dying is out of their control, the less effort they put into looking after their health. Our analysis suggests there is a medium-strength relationship between perceived uncontrollable mortality risk and health effort, which we argue warrants further empirical investigation. The strength of this relationship emphasizes the importance of improving the safety of people's living environments and highlights the positive impact that this can have on health behaviors.

**Keywords** Health behaviors · Socioeconomic inequality · Uncontrollable mortality risk · Public health · Perceived control

With a mini meta-analysis...



So, there's a correlation, but how do we know that perceived risk *causes* differences in health behaviour?

Let's look at the evidence from behavioural experiments.

BBC Sign in News Sport Weather iPlayer TV R

**NEWS HEALTH**

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11 June 2013 Last updated at 07:29 [Share](#) [f](#) [t](#) [e](#) [p](#)

## Early deaths: Regional variations 'shocking' - Hunt

COMMENTS (1223)

By James Gallagher  
Health and science reporter, BBC News

The local variation in early death rates revealed in a new league table for England is "shocking" and must drive action to improve health, Health Secretary Jeremy Hunt has said.

Public Health England's [Longer Lives website](#), which ranks local authorities, shows people in north-west England are at the greatest risk of dying early.

Mr Hunt said the data could be used to tackle smoking, drinking and obesity.

Labour called for a "One Nation approach" to end health inequalities.

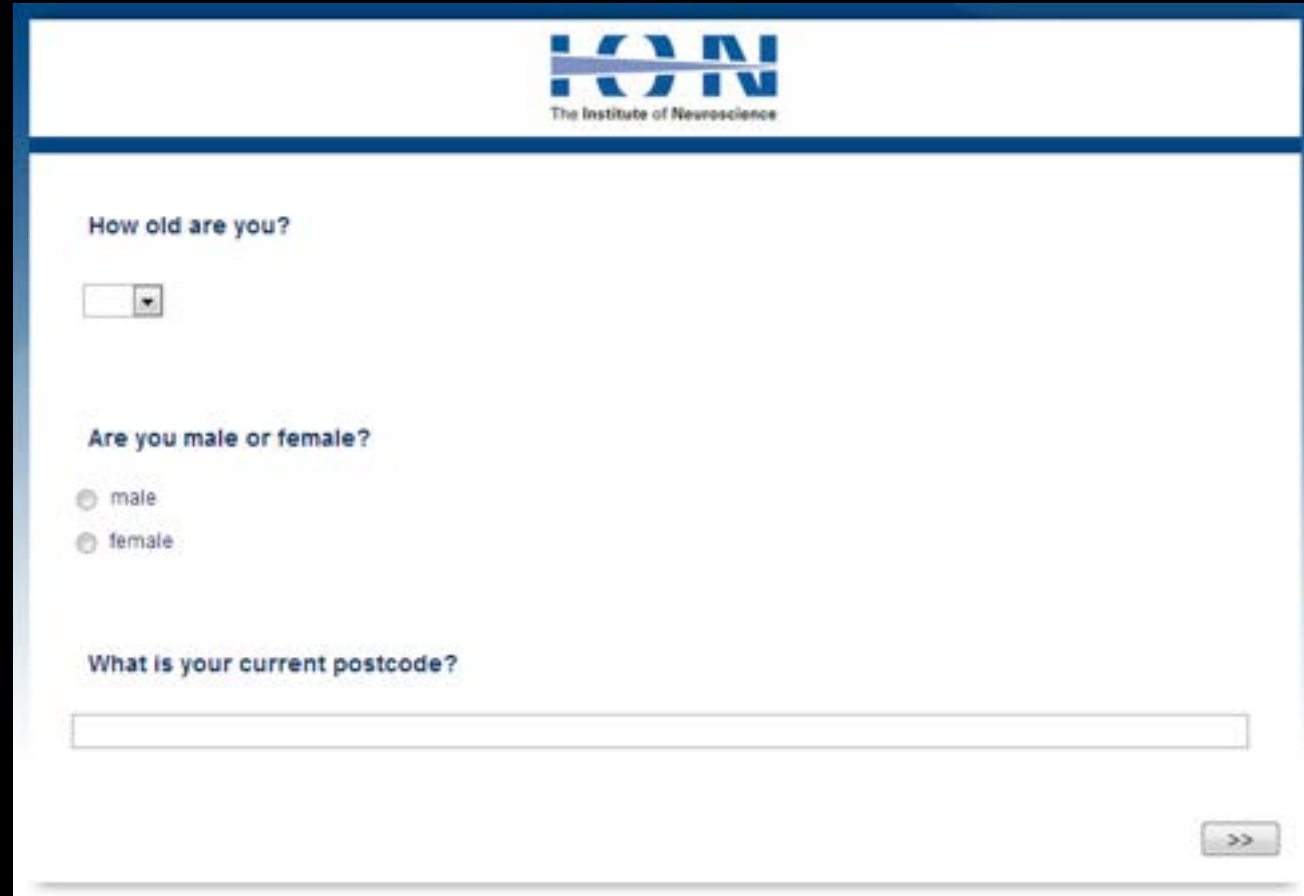
The league table uses a colour system to rate areas tackling premature deaths from red for the worst to green for the best, comparing the number of people under the age of 75 who died over a two-year period.

### Overall premature deaths

Related Stories

- Grim up north for public health?
- Why do the Italians live longer than us?
- North-south health divide warning

# Experimental evidence



The screenshot shows a web form with the following elements:

- Header:** The logo for 'ION The Institute of Neuroscience' is centered at the top.
- Question 1:** 'How old are you?' followed by a small input field with a dropdown arrow.
- Question 2:** 'Are you male or female?' followed by two radio button options: 'male' and 'female'.
- Question 3:** 'What is your current postcode?' followed by a long, empty text input field.
- Navigation:** A button with two right-pointing arrows ('>>') is located in the bottom right corner.



# Experimental evidence



Thanks for submitting your information. It may take a while to match it to health data for people of your age and gender in your postcode area.

Please wait a few moments.  
Thank you.

# Experimental evidence



Statistics indicate that, on average, **1** year-old **s** in your postcode area **( )** die 13 years younger than **s** of the same age in the rest of the UK. The reasons for this are unclear and may be due to **factors beyond individual control, such as traffic accidents and air pollution.** We want to understand more about why this is happening. Please answer the following questions about your health.

# Experimental evidence

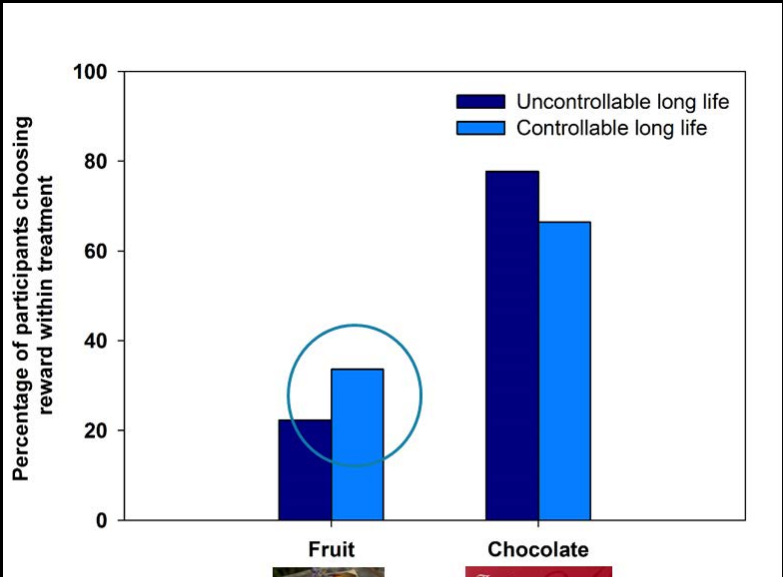
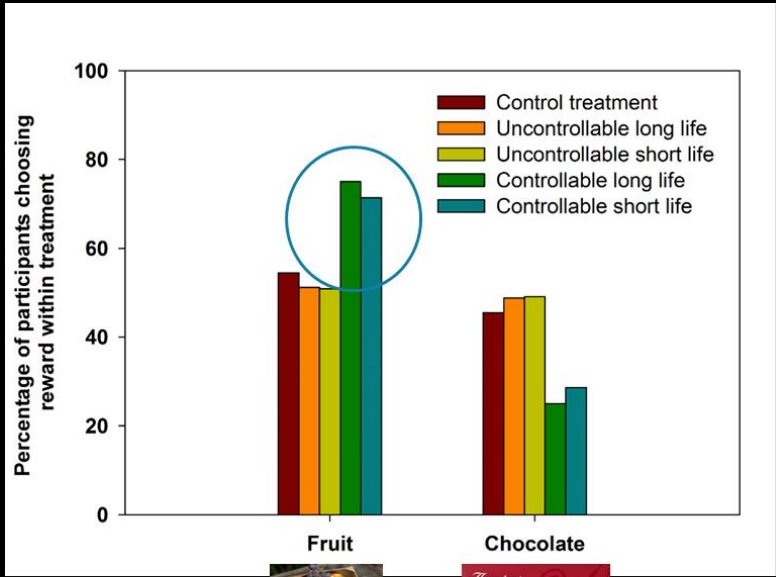
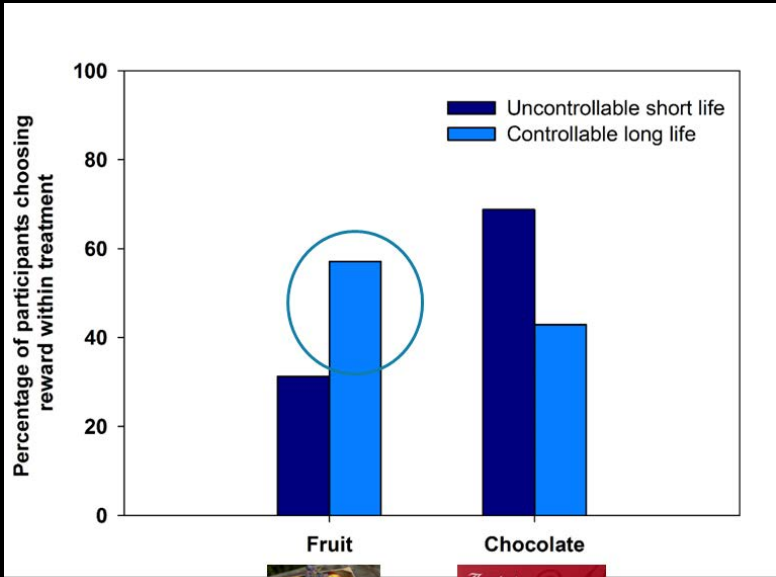


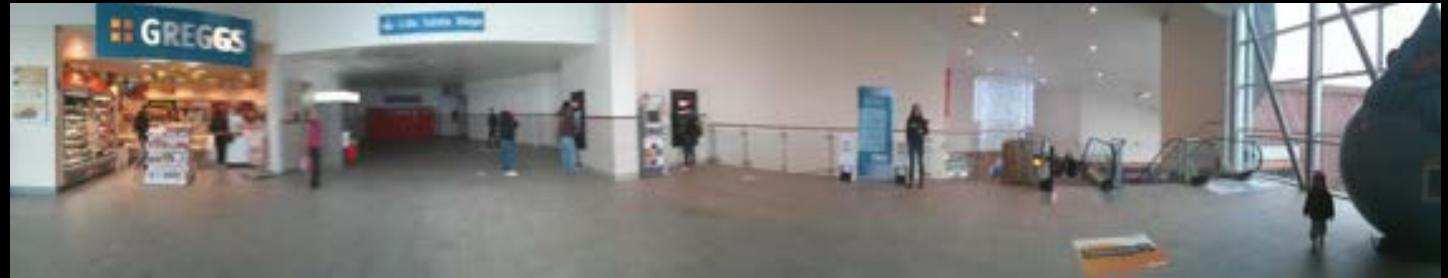
£11



£11

# CAUSAL EVIDENCE





### PRIZE DRAW!

3 x £100 gift cards to be won

**HOW TO ENTER:**

1. Circle your answer to the question opposite.
2. Enter your name, address and postcode in the box provided overleaf.
3. Put your card into the correct box for your preferred bonus prize (details overleaf).

Please do not enter more than once. Repeat entries will be discarded. You must be over 18 to enter.

**10 x BONUS PRIZES!**  
Choose fruit or chocolate boxes



## Newcastle University

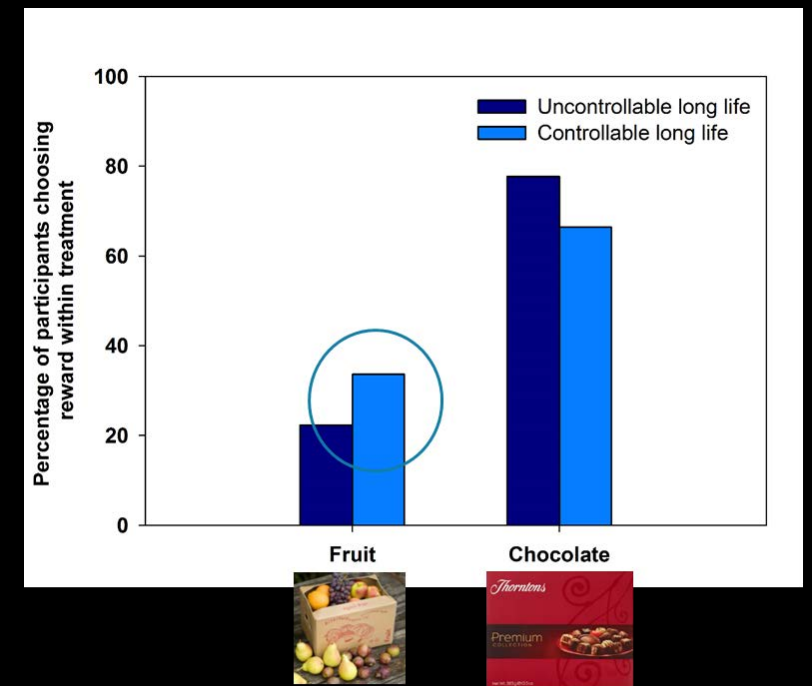
Our question: Recent statistics show that people in Tyne and Wear are living longer now than they were in the year 2000. Why do you think this is?

A) Because people have more control over the kind of healthcare they receive.

B) Because people are looking after themselves better.

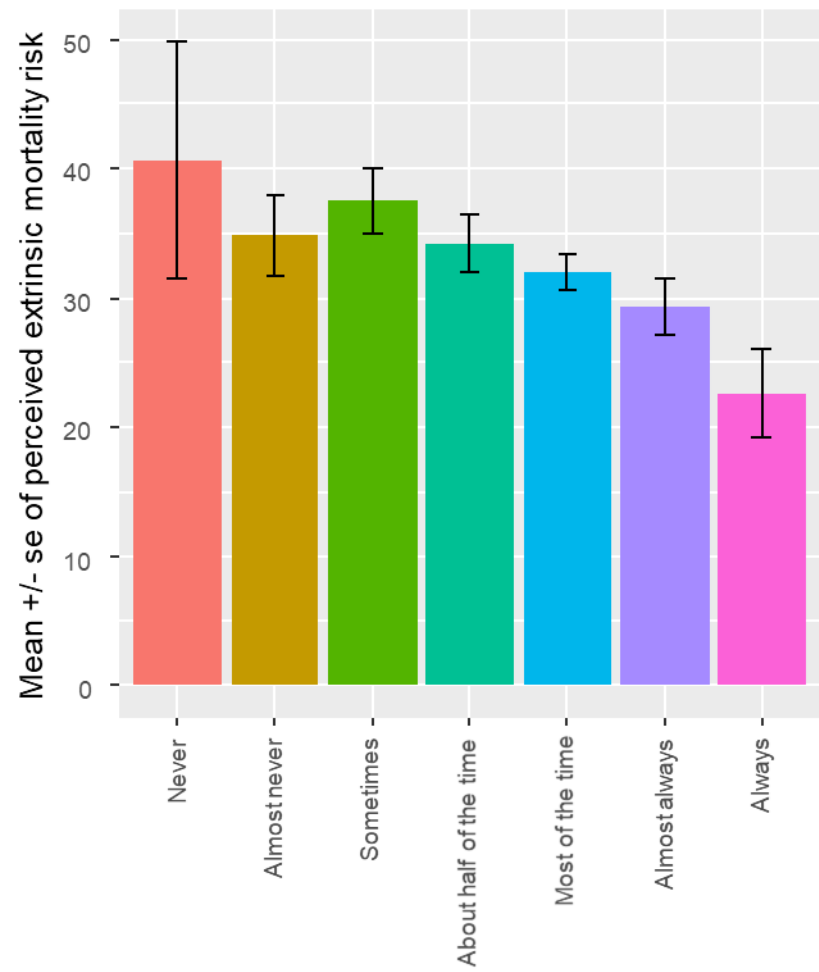
C) Both: people have more control over their care and are looking after themselves better.

This study has received ethical approval from the Newcastle University Faculty of Medical Sciences ethics committee (reference: 00651/2011). By completing this card you are giving your consent for your answers to be used in our study. We will not share your contact details with anyone else. We will only use them to deliver your prize to you if you win.

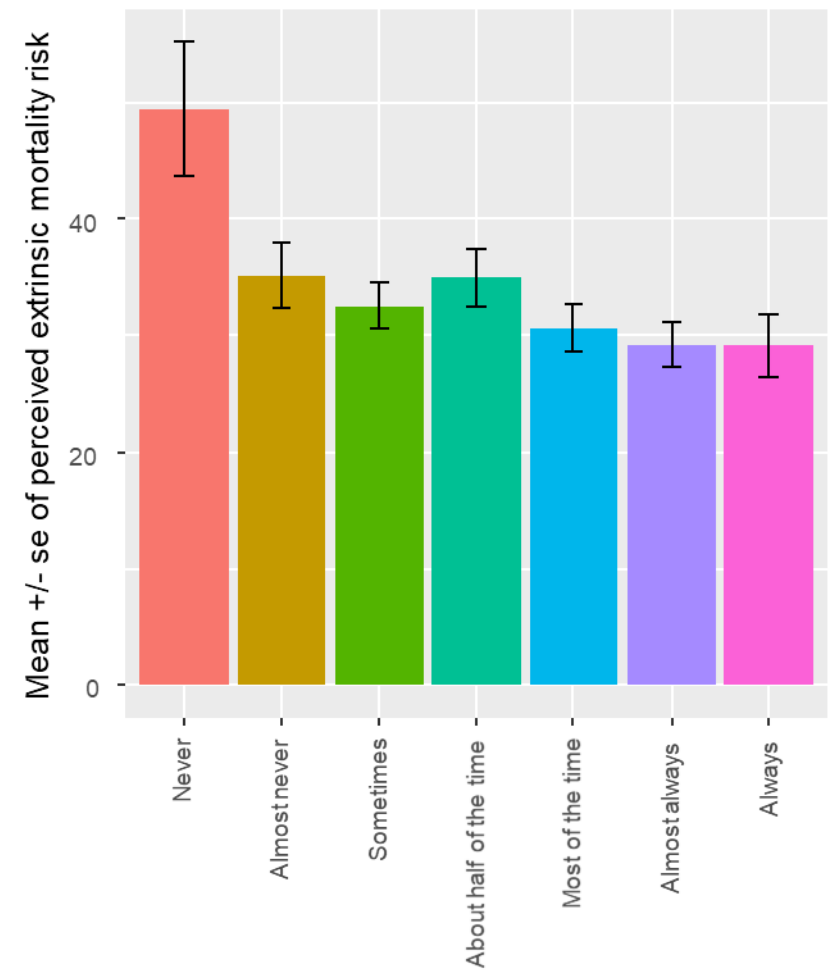




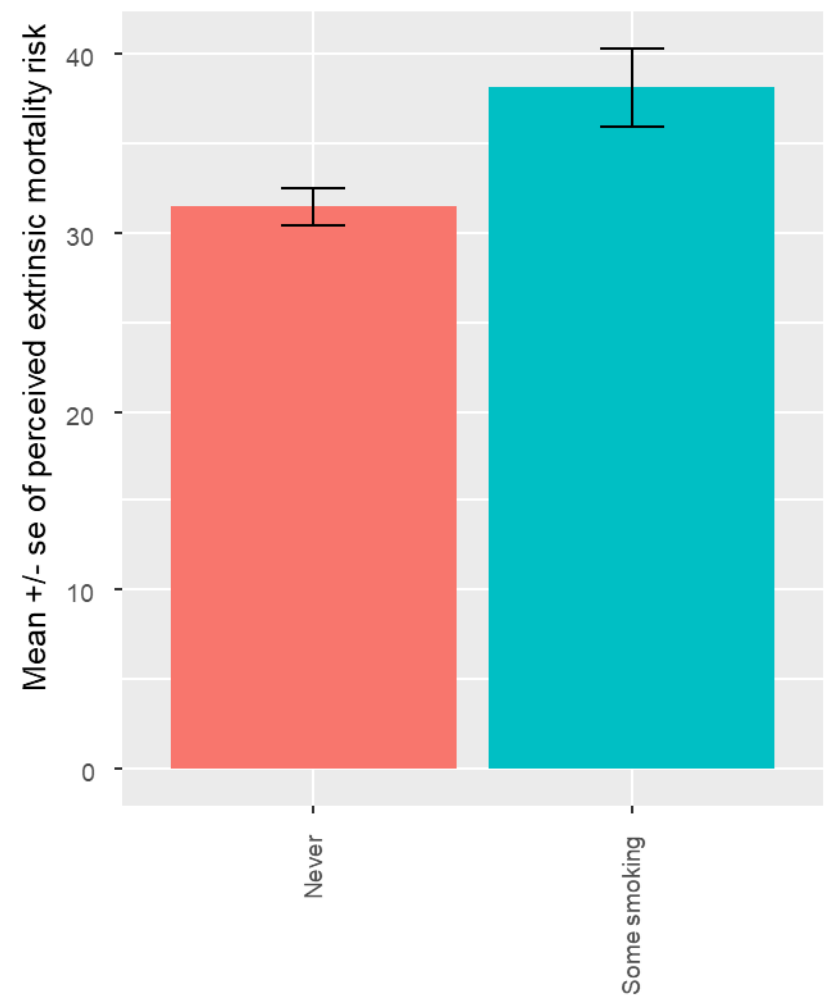
**DANGER!**



Compliance with Government diet advice



Compliance with Government guidelines on physical activity



Smoking

## Perceived Extrinsic Mortality Risk and Reported Effort in Looking after Health

Testing a Behavioral Ecological Prediction

Gillian V. Pepper · Daniel Nettle

Published online: 3 July 2024  
© Springer Science+Business Media New York 2024

**Abstract** Socioeconomic gradients in health behavior are pervasive and well-documented. Yet, there is little consensus on their causes. Behavioral ecology predicts that, if people of lower socioeconomic position (SEP) perceive greater extrinsic mortality risk than those of higher SEP, they should disinvest in their health. We surveyed North American adults for reported effort in looking after perceived extrinsic and intrinsic mortality risks, and measures of SEP. We examined relationships between these variables and found that lower subjective SEP lower reported health effort. Lower subjective SEP was also associated with perceived extrinsic mortality risk, which in turn predicted lower reported health effort. The effect of subjective SEP on reported health effort was completely mediated by perceived extrinsic mortality risk. Our findings indicate that perceived extrinsic mortality risk may be a key factor underlying SEP gradients in motivation to invest in health.

**Keywords** Extrinsic mortality · Health motivation · Behavioral ecology · Mortality risk

### RESEARCH ARTICLE OPEN ACCESS

#### A qualitative study of perceptions of control over potential causes of death and the sources of information that inform perceptions of risk

Richard Brown, Elizabeth Silence and Gillian Pepper  
Department of Psychology, Northumbria University, Newcastle, UK

**ABSTRACT** Investigating perceptions of control over mortality risk may be fundamental to understanding health behaviors and tracking socioeconomic gradients in health. Few studies have explored perceptions of control over different causes of death and there is a lack of qualitative risk research. Our aim was to examine participants' perceptions of control over potential causes of death and the sources that inform perceptions of risk.  
**Method:** We conducted semi-structured interviews with 24 participants (14 female and 10 male) and conducted a template analysis to analyze the transcripts.  
**Findings:** We identified six themes to represent participants' perceptions of control over potential mortality risks and the sources that inform these perceptions: Health-Related Mortality Risks, External Causes of Risk, Finding Balance, Family Medical History, Online Sources of Risk and Health-Related Information, and Health Misinformation. Dying from heart disease was broadly reported as being a controllable risk, whereas cancer was mostly discussed as uncontrollable. Gender-specific cancers were perceived as posing a significant risk to life, however controlling this risk was discussed in terms of screening and treatment, not prevention. Family medical history was discussed as an informative source for longevity predictions, but less so for specific causes of death. Most risk information is retrieved from 'Go Google', through trusted sources, such as NHS websites, are used for validation. Health misinformation online was seen as a problem experienced by other people, rather than the individual.  
**Conclusions:** Causal pathways between behaviors and specific causes may not be obvious to individuals. Messages emphasizing the broader links between diet, alcohol and general cancer risk may highlight the controllability of cancer risk through improved health behaviors. Furthermore, given the rise in health misinformation, and the belief that it is other people and not ourselves that are typically susceptible to believing misinformation online, further attempts are needed to combat this growing 'infodemic'.

**ARTICLE HISTORY**  
Received: 14 December 2021  
Accepted: 17 July 2022  
**KEYWORDS**  
Risk perceptions, health behaviors, information seeking, causes of death, health and illness

## Out of control mortality matters: the effect of perceived uncontrollable mortality risk on a health-related decision

Gillian V. Pepper and Daniel Nettle

Newcastle University, Institute of Neuroscience, Newcastle Upon Tyne, UK

### ABSTRACT

Prior evidence from the public health literature suggests that both control beliefs and perceived threats to life are important for health behaviour. Our previously presented theoretical model generated the more specific hypothesis that uncontrollable, but not controllable, personal mortality risk should alter the payoff from investment in health protection behaviours. We carried out three experiments to test whether altering the perceived controllability of mortality risk would affect a health-related decision. Experiment 1 demonstrated that a mortality prime could be used to alter a health-related decision: the choice between a healthier food reward (fruit) and an unhealthy alternative (chocolate). Experiment 2 demonstrated that it is the controllability of the mortality risk being primed that generates the effect, rather than mortality risk per se. Experiment 3 showed that the effect could be seen in a surreptitious experiment that was not explicitly health related. Our results suggest that perceptions about the controllability of mortality risk may be an important factor in people's health-related decisions. Thus, techniques for adjusting perceptions about mortality risk could be important tools for use in health interventions. More importantly, tackling those sources of mortality that people perceive to be uncontrollable could have a dual purpose: making neighbourhoods and workplaces safer would have the primary benefit of reducing uncontrollable mortality risk, which could lead to a secondary benefit from improved health behaviours.

**Subjects** Psychiatry and Psychology, Public Health  
**Keywords** Control, Mortality risk, Perceptions, Health, Behaviour, Decisions

### Perceptions of control over different causes of death and of risk estimations

Richard Brown · Elizabeth Silence · Gillian Pepper

Received: 11 January 2023 / Accepted: 31 March 2023  
© The Author(s) 2023

**Abstract**  
**Background** A large number of deaths could be avoided by improving health behaviors in their long-term health is influenced by how much they believe they can control their death believed to be uncontrollable, but likely to occur, may provide actionable target control beliefs and encourage healthier behaviours.  
**Method** We recruited a nationally representative online sample of 1500 participants in total, perceived personal likelihood of death, certainty of risk estimation, and perceive We also measured overall perceived uncontrollable mortality risk (PUMR) and perceive for National Statistics' categories of avoidable death.  
**Findings** Risk of death due to cancer was considered highly likely to occur but largely curable disease was considered moderately controllable and a likely cause of death. Drug both high in control and low in likelihood of death. However, perceptions of control on not to predict overall PUMR, with the exception of cardiovascular disease. Finally, the prevalence of drug and alcohol-related deaths in the UK.  
**Conclusions** We suggest that more can be done by public health communicators to encourage changes that individuals can make to reduce their general cancer risk. More work is engaging with preventative behaviours and maintaining a healthy heart. Finally, we call when reporting health risks to the public.

**Keywords** Risk perceptions · Health perceptions · Health behaviours · Avoidable death

## COVID-19: the relationship between perceptions of risk and behaviours during lockdown

Richard Brown · Lynne Coventry · Gillian Pepper

Received: 11 September 2020 / Accepted: 3 April 2021 / Published online: 13 May 2021  
© The Author(s) 2021

### Abstract

**Aim** Understanding COVID-19 risk perceptions and their impact on behaviour can improve the effectiveness of public health strategies. Prior evidence suggests that, when people perceive uncontrollable risks to their health, they engage in healthier behaviours. This article aims to understand the extent to which COVID-19 is perceived as an uncontrollable risk and whether this perceived risk is associated with health behaviour.  
**Subject and methods** We surveyed a nationally representative sample of 496 participants during 1 assessed perceptions of COVID-19-related risk, self-reported adherence to infection control measures Government, and general health behaviours. We predicted that increased perceived extrinsic mortality risk perceived to be uncontrollable would disincentivise healthy behaviour.  
**Results** Perceived threat to life was the most consistent predictor of reported adherence to infection control measures. Extrinsic mortality risk was found to have increased due to the pandemic, and was associated with lower adherence to infection control, physical activity, and smoking.  
**Conclusions** Our findings suggest that health messages that highlight threat to life may be effective in promoting infection control, but may also lead to a reduction in health-promoting behaviours. We suggest that messages to life should be accompanied by statements of efficacy. Further, messages evoking feelings of helplessness are ineffective in promoting compliance with anti-infection measures, without the potential for the unintended consequence of undermining healthy behaviours.



ORIGINAL ARTICLE | Open Access

### Individual characteristics associated with perceptions of control over mortality risk and determinants of health effort

Richard Brown · Elizabeth Silence · Gillian Pepper

First published: 23 October 2023 | <https://doi.org/10.1111/risa.14243>

SECTIONS

PDF TOOLS SHARE

### Abstract

People who believe they have greater control over health and longevity are typically more likely to invest in their long-term health. Investigating individual differences in perceived control over risk and exploring different determinants of health effort may help to tailor health promotion programs to more effectively encourage healthy behaviors. From a sample of 1500 adults, we measured perceived control over 20 causes of death, overall perceived uncontrollable mortality risk (PUMR), state-level optimism, self-reported health effort, and the accuracy of estimations of avoidable deaths. We found individual differences in perceptions of control over specific causes of death based on age, gender, and income. PUMR was predicted by socioeconomic variables expected to influence exposure to risk and resource availability. Higher levels of PUMR, not perceptions of control over specific causes of death, predicted self-reported health effort. The strength of relationship between PUMR and lower health effort was not moderated by state-level optimism. Age and education both positively predicted greater accuracy in assessing the prevalence of avoidable deaths. We suggest that PUMR may capture people's "general sense" of mortality risk, influenced by both exposure to hazards and the availability of resources to avoid threats. Conversely, perceived control over specific risks may involve more deliberate, considered appraisals of risk. This general sense of risk is thought to play a more notable role in determining health behaviors than specific assessments of control over risk. Further study is needed to investigate the degree to which PUMR accurately reflects objective measures of individual risk.

## Information seeking, personal experiences and their association with COVID-19 risk perceptions: demographic and occupational inequalities

Richard Brown, Lynne Coventry and Gillian Pepper

Psychology Department, Northumbria University, Newcastle, UK

### ABSTRACT

The impacts of COVID-19 are not evenly distributed in society. Understanding demographic and occupational differences in personal experiences and information seeking and how these shape perceptions of COVID-19 related risk may help to improve the effectiveness of public health strategies in the future. We surveyed a nationally representative sample of 496 participants during the first UK lockdown, in May 2020. We recorded data to assess people's experiences of the pandemic, examining how they varied with demographic factors such as age, gender, occupational status, and key worker status. We also recorded data on COVID-19 related information seeking, and how experiences and information seeking behaviours were related to perceptions of COVID-19 related risk. We found that key workers reported greater exposure to COVID-19 and more extensive experience of the virus within their social circles. Those key workers who perceived their personal protective equipment to be more effective felt that the virus was less of a threat to their lives. Trust in COVID-19 information was highest in information from the UK Government and NHS, and lowest in information from social media. We also found that men reported lower levels of perceived threat to life from the virus than women – a difference that mirrors the gender difference in occupational risk within our sample. Among those employed, lower occupational class was also associated with lower levels of perceived risk of infection and perceived threat to life. Workers who feel that they are insufficiently protected by their PPE experience increased levels of perceived threat, which may lead to less health behaviours. This highlights the need for employers to ensure that key workers feel they are adequately protected from COVID-19. Our findings highlight some of the inequalities in the distribution of access to information and discuss demographic differences in perceptions of risk.

### ARTICLE HISTORY

Received: 6 January 2021  
Accepted: 20 March 2021

### KEYWORDS

Risk perceptions, mortality risk, COVID-19, information seeking, key workers

### re, perceived uncontrollable mortality risk,

Peter M. Todd · Athena Aktipis · Gillian Pepper

June 2023  
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Mortality risk (PUMR) refers to people's beliefs regarding their risk of death due to factors theoretical models and empirical studies provide evidence that those with greater PUMR engage in healthier behaviors, but little is known about how accurately people estimate PUMR or risk exposure, an important consideration for interventions designed to address the link between PUMR and health behaviors. Here, we explore how objective risk indices and personal characteristics relate to PUMR. We conducted a series of pre-registered analyses on a US-representative longitudinal study (N = 915), using data from the Global Burden of Diseases, Injuries, and Risk Factors Study. PUMR is associated with objective measures of risk exposure, and that (Study 2) perceived PUMR, and more educated individuals report less perceived risk. Additionally, we find that perceived PUMR is relatively stable over a 4-month period (R = 0.7), indicating that behaviors influenced by PUMR are stable. Finally, we show that (Study 4) those who believe they are at greater risk of dying due to COVID-19 (i.e., greater PUMR) are less likely to engage in general health behaviors. Implications for PUMR, we can create data-driven policy solutions that lead individuals to engage in healthier behaviors and improved health behavior.

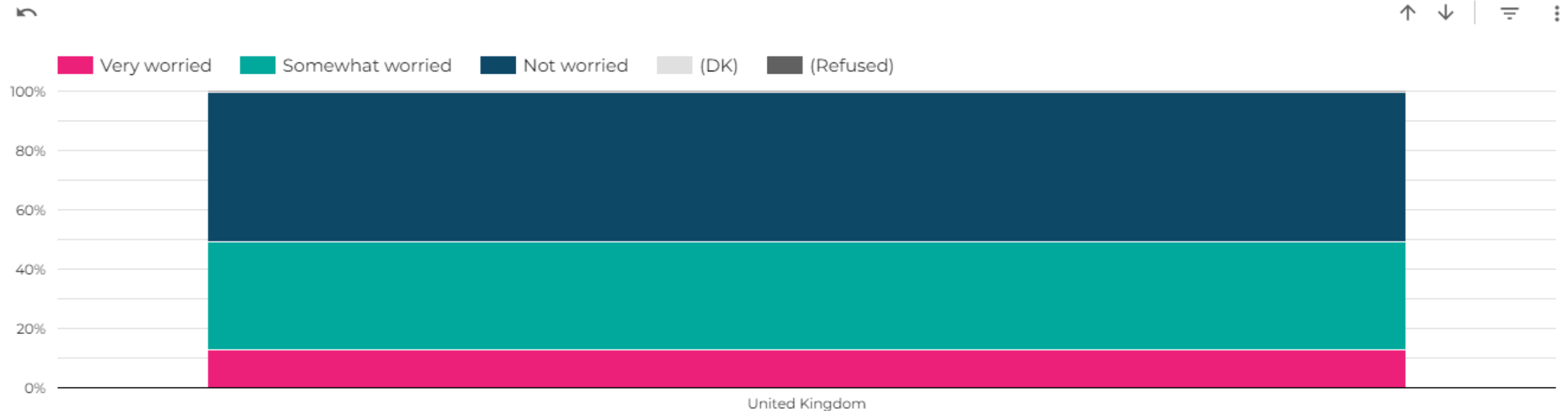
**Keywords** Information seeking · Mortality risk · Extrinsic mortality · Uncontrollable mortality



WHY SHOULD ANY OF THIS  
MATTER TO YOU?

# Data from the World Risk Poll

How worried are you about experiencing serious harm from violent crime?



This implies that we can make people healthier by reducing fear of crime and violence.

To get ahead of the curve, we need to start thinking about health behaviours when we work to improve safety.

# The Double Dividend of Safety Project

- We will engage with organisations who want to see if their work is providing the double dividend of safety.
- We will offer tailored workshops to 4 key stakeholder organisations, to support them to use the double dividend of safety in their work.
- Please get in touch to engage with us!



[doubledividend@northumbria.ac.uk](mailto:doubledividend@northumbria.ac.uk)



# Acknowledgements



Prof Daniel  
Nettle



Richard  
Brown



Prof Lynne  
Coventry



Dr Elizabeth  
Sillence



Calvin  
Isch



## Collaborators &

## FUNDING



Any questions? Any ideas?

