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Conducting economic  
valuation surveys during  
extreme events

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ENVIRONMENT DIRECTORATE

**Conducting economic valuation surveys during extreme events**

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Keywords: Choice experiment, Choice modelling, Contingent valuation, Guidelines, Nonmarket valuation, Questionnaire, Stated preference, Survey, COVID-19, catastrophic events, extreme events

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# Abstract

There is no guidance on how to deal with the effects of catastrophic events, like the COVID-19 pandemic, on stated preference survey responses; despite the possible impact, such events can have on stated values and survey responses. This paper provides a concise analysis of the likely effects of extreme events on stated preference surveys, focusing on the validity and temporal stability of estimated values, and offers a set of recommendations. These recommendations can also be of use for designing other types of household and individual surveys, beyond economic valuation surveys.

**Keywords:**

Choice experiment, Choice modelling, Contingent valuation, Guidelines, Nonmarket valuation, Questionnaire, Stated preference, Survey, COVID-19, catastrophic events, extreme events

**JEL Classification:**

C83, H41, Q51

# Résumé

Il n'existe aucune recommandation sur la manière de traiter les effets d'événements catastrophiques, comme la pandémie de COVID-19, sur les réponses aux enquêtes sur les préférences déclarées, malgré l'impact possible de tels événements sur les valeurs déclarées et les réponses aux enquêtes. Ce papier fournit une analyse concise des effets probables des événements extrêmes sur les enquêtes sur les préférences déclarées, en se concentrant sur la validité et la stabilité temporelle des valeurs estimées, et propose une série de recommandations. Ces recommandations peuvent également être utiles pour concevoir d'autres types d'enquêtes auprès des ménages et des individus, au-delà des enquêtes d'évaluation économique.

**Mots-clés** : Choix discrets, Modélisation des choix, Évaluation contingente, Recommandations, Évaluation non marchande, Questionnaire, Préférences déclarées, Enquête, COVID-19, événements catastrophiques, événements extrêmes

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# Executive Summary

1. Over the past thirty years, extensive guidance and best-practice documents on how to conduct stated preference surveys have been developed. Much of this body of work focuses on recommendations that aim to mitigate contextual effects from study design and method, such as the framing and wording of questions, sampling strategy and survey mode. For instance, a key focus has been how best to design the contingent scenario so that it is sufficiently understandable, plausible and meaningful, as well as consequential, in order to produce valid and reliable value estimates. Another strand of recommendations has focused on statistical design features of multi-attribute scenarios and on the econometric analysis of the data. The economic valuation literature has also built on, and extended, insights on best-practice survey design and implementation from several disciplines including marketing, psychology, behavioural science and survey methodology.
2. Despite this extensive body of work, surprisingly little attention has been paid to the wider external societal context in which economic valuation surveys are implemented. Specifically, there is little guidance on how to deal with the effects of catastrophic and extreme events on stated preference survey responses. This is an important gap in knowledge as stated values – and indeed survey responses – can be influenced not just by the internal questionnaire and scenario context but also by the external socio-economic context in which the valuation occurs. Catastrophic and extreme events, in particular, can be very disruptive and have profound and lasting effects on the lives of survey participants.
3. This paper provides a concise analysis of the likely effects of extreme events – such as the COVID-19 pandemic – on stated preference surveys. The paper pays special attention to the validity and temporal stability of estimated values and offers a set of recommendations for running surveys in the wake of catastrophes.
4. An examination of related valuation, psychological and behavioural literatures shows that extreme disruptive events have the potential to impact the valuation task through many channels. They can influence people's preferences, their ability to pay, as well as the multiple contextual factors related to the valuation task from salience of the topic in the media to emotional state of the respondent while conducting the survey. These insights can be summarised into five principal channels through which disruptive events might affect valuation surveys.
5. First, respondents' preferences and tastes might change. In relation to COVID-19, issues like health, nature and green spaces might have become more salient to some people and move up in their priority ranks so that their valuation of goods and services in these areas might increase. Conversely, the value of public goods that are unrelated and therefore less salient – for example in the media or through personal experience – might decrease. Second, respondents' ability to pay might change. In the wake of an extreme event, some people may for example lose their jobs, have extra expenditures and/or reduced income, or face increased uncertainty about their job and income earning prospects. Third, catastrophic events can influence variables that might in turn affect welfare measures, such as trust, risk attitudes, time preferences and mood or emotions. Trust in institutions might be particularly affected by disasters, so that the institutional setting in which the contingent scenario is described might be regarded differently post-disruption than it would have been previously. Fourth, extreme events might increase the instability of preferences, especially over goods and services where they may be poorly defined, and result in impulsive answers and random shifts in values. This could particularly affect non-use values associated with lesser-



known and complex public goods, about which survey respondents lack experience and knowledge. Finally, there may be disaster-related sample selection or response bias, where some people may be more likely than others to participate or not participate in the survey, depending on how the event affected them.

6. In the light of these possible effects, the paper discusses the validity of stated values elicited during extreme events (i.e. whether they are valid representations of welfare changes) and the temporal stability of such values (i.e. whether they are transitory and short-lived, or whether they are long lasting and reflect persistent preference changes). Stated values elicited via surveys are context-dependent: they depend not only on the context specified within a questionnaire, but also on wider economic, social, health and environmental conditions. If the context changes, as in the case of extreme events, then one can expect the values to change as well. In terms of validity, the key concern is therefore not whether stated economic values change as a result of disruptive events, which is expected, but whether they represent underlying true preferences at the time they were elicited, and whether they vary in line with expectations and with factors that can reasonably be expected to influence them (e.g. income). It is likely that at the peak of a disruptive event, such as the COVID-19 pandemic or an extreme weather event, the uncertainty might be too great and emotions too heightened for many respondents to be able and willing to engage with a survey, or to realistically articulate a well-thought-out value for a non-market good. However, in the post-peak period (e.g. when disease levels are past peak observed levels or when an extreme weather event has concluded), things are likely to become less uncertain and people start to adapt to the new circumstances (i.e. the so called “new normal” in the coronavirus case). Then there is arguably no strong reason why surveys should not go ahead and produce valid representations of preferences.

7. Perhaps a more relevant question for policy is the temporal stability or longevity of such values, i.e. whether the changes in values caused by disruptive events are short-lived or long lasting. Survey results elicited in the middle of a massive disruptive event could be valid representations of views only at the time they were elicited and may therefore have very limited applicability and generalisability post-event if views subsequently change. But it could also be the case that the disruptive shock causes some long-lasting shifts in behaviours and values, that will prevail post-event, due to enduring changes in habits, circumstances and tastes. Ultimately, policy makers and researchers will need to make a judgement based on available information as to how preferences for the policies they are interested in valuing might be affected by the extreme event and whether those changes might be transitory – which suggests a postponement of the survey work – or instead might prevail post event – which supports going ahead with the survey. Evidently, a key consideration is also what the object of the valuation is (and how affected by the event it is) and how the results are intended to be used (e.g. during or post event).

8. In addition to existing general guidance for best-practice stated preference surveys, the paper proposes one general guiding principle and seven specific recommendations for conducting surveys during and after major disruptive events. As a general principle, researchers and practitioners should exert caution when interpreting, generalising and extrapolating economic valuation survey findings elicited during or soon after an extreme event.

9. The seven specific recommendations are: (1) avoid conducting valuation surveys at the peak of the disruption; (2) ensure compliance with recognised ethics standards for survey research and the protection of human subjects, as well as research institutions’ policies for conducting research in emergency situations; (3) include a range of questions in the survey to measure the impact of the disruptive event and contextualise the values elicited; (4) include debriefing questions to assess how well-formed preferences are for the change being valued at the time of the survey; (5) pay particular attention to sample selection and non-response bias; (6) perform a comparative analysis of the answers of those highly affected by the event, those moderately affected, and those minimally or not affected; and (7) if possible, repeat the survey at certain intervals to check the evolution of values in rapidly changing environments, or include valuation questions in large-scale longitudinal studies to systematically track value changes over time.

# 1 Conducting economic valuation surveys during extreme events

## Introduction

10. The last thirty years saw the publication of very extensive guidance documents and best practice recommendations on how to conduct stated preference surveys (Mitchell and Carson, (1989<sup>[1]</sup>); Arrow et al. (1993<sup>[2]</sup>); Bjornstad and Kahn (1996<sup>[3]</sup>); Bateman et al. (2002<sup>[4]</sup>); Champ et al. (2003<sup>[5]</sup>); Alberini and Kahn (2006<sup>[6]</sup>); Johnston et al. (2017<sup>[7]</sup>); OECD (2018<sup>[8]</sup>)). Stated values are contingent on the setting of the valuation scenario and so a key focus of this body of work has been on how best to design the contingent scenario so that it is sufficiently understandable, plausible and meaningful (Mitchell and Carson, (1989<sup>[1]</sup>); OECD (2018<sup>[8]</sup>)) as well as consequential and incentive compatible (Johnston et al., 2017<sup>[7]</sup>) in order to produce valid and reliable value estimates. There are thousands of papers testing for bias and anomalies in contingent markets, discussing controversies, and developing ways of enhancing the validity of stated values (e.g. Carson (2012<sup>[9]</sup>); Kling et al. (2012<sup>[10]</sup>); Hausman, (2012<sup>[11]</sup>); Haab et al. (2013<sup>[12]</sup>)). Considerable work has also focused on statistical design features of multi-attribute scenarios and on the econometric analysis of the data.

11. The economic valuation literature has also borrowed insights on best-practice survey design and implementation from, amongst others, the marketing, psychology, behavioural science and survey methodology literatures (e.g. Kahneman et al. (1993<sup>[13]</sup>); Tourangeau et al. (2000<sup>[14]</sup>); Carlsson (2010<sup>[15]</sup>); Poe (2016<sup>[16]</sup>)). A large part of the discussion in this body of evidence deals with contextual effects within a questionnaire, such as framing and wording of questions, and question order, as well as the effects of sampling strategy and survey mode.

12. In contrast, very little attention has been paid in the economic valuation and related literatures to the wider external societal context in which economic valuation surveys are implemented. The issue is not covered in any detail in most valuation manuals and papers. Specifically, there is no guidance on how to deal with the effects of catastrophic and extreme events on stated preference survey responses. This is an important gap in knowledge as stated values – and indeed survey responses – can be influenced not just by the internal questionnaire and scenario context but also by the external socio-economic context in which the valuation occurs.

13. Catastrophic and extreme events in particular can have a profound and lasting effect on society, disrupting the lives of survey participants and the plans of those conducting surveys (Harter et al. (2006<sup>[17]</sup>)). Following Atkeson and Maestas (2012<sup>[18]</sup>), a catastrophic event is here defined as any unplanned disruption that causes loss of property and/or life. This paper will refer interchangeably to extreme, disruptive, extraordinary, disastrous or catastrophic events. The terms cover not only disease pandemics such as COVID-19, but also other climatic phenomena, such as extreme weather and other natural events (e.g. hurricanes, tsunamis, floods, wildfires, earthquakes, tornadoes, volcanoes, droughts), as well as disasters that have human causes, such as nuclear accidents, terrorist attacks, wars, mass shootings, civil unrest or riots, etc. Although any particular extreme event can be rare, such types of events do happen regularly across the world, making it all the more important to have some practical guidance for valuation practitioners.

14. This paper provides a concise analysis of the likely effects of extreme events – such as the COVID-19 pandemic – on stated preference surveys, focusing on the validity and temporal stability of estimated values, and offers a set of recommendations for running surveys in the wake of catastrophes. The recommendations can also be of use for designing other types of household and individual surveys, beyond economic valuation surveys.

## Brief review of the relevant literature

15. Economic values are a monetary representation of the welfare that arises from a specified change in a good or service. Stated preference methods, the main focus of this paper, are popular survey-based methods that seek to elicit the monetary value of non-market goods and services by directly asking people what value they attach to specified changes in those goods and services (OECD, 2018<sup>[8]</sup>).

16. There are two main types of stated preference techniques (Mitchell and Carson, (1989<sup>[11]</sup>); Bateman et al. (2002<sup>[4]</sup>); OECD (2018<sup>[8]</sup>)). Contingent valuation involves asking respondents directly to value a specified policy change. By means of an appropriately designed questionnaire, a hypothetical market is described where the good or service in question can be traded. Respondents are asked directly for their willingness to pay or accept for the changes being proposed. Choice experiments are a multi-attribute preference elicitation technique where respondents are presented with a series of scenarios, composed of different attributes (including a price attribute), varying at different levels. Respondents are then asked to choose their most preferred scenario and willingness to pay is inferred indirectly from the choices. The stated values obtained are based on respondents' intended behaviour. This is different from alternative non-market valuation techniques, such as revealed preference methods, where values are estimated based on observed behaviour as revealed in related markets (e.g. hedonic price method or travel cost method), or the subjective well-being valuation technique, where measures of welfare change are inferred from data on people's subjective well-being, by estimating the marginal rate of substitution between the non-market good and income.

17. Stated values, broadly considered, depend firstly on people's preferences for the item being valued (i.e. the desire to acquire a good or service), secondly on their ability to pay (i.e. the ability to actually purchase the good or service), and thirdly on the context in which the good or service is offered (e.g. the institutional setting described in the scenario, as well as wider societal effects present at the time the study is implemented). While some of these aspects have been the focus of much research, the role of wider societal effects – such as extreme events – in stated values formation is not well studied. In Mitchell and Carson's (1989<sup>[11]</sup>) classic book on contingent valuation there is only a brief reference to the effect of external factors on stated values. The authors highlight the importance of the societal context in which judgements are made and warn that *"the degree of controversy surrounding the provision of an amenity, the perceived views of important others on the topic and the credibility of the sources of authority invoked (explicitly or implicitly) may complicate the task of designing a valid scenario"* (p.234).

18. The same appears to be true in related literatures. In their book "Psychology of Survey Response" Tourangeau et al. (2000<sup>[14]</sup>) state that they treat question context as virtually synonymous with question order. They briefly note that *"in principle question context could have a much broader meaning, reflecting the purposes of the survey (as these were presented to the respondent), the climate of opinion at the time of the survey, the presence of other people during the interview, the characteristics of the interviewer, or even the weather at the time of the interview"* (p.200). There is some summary guidance on conducting surveys after disasters (Harter et al. (2006<sup>[17]</sup>)), but it focuses mostly on the operational logistics of conducting surveys in such difficult circumstances.

19. The rest of this section highlights some insights from related disciplines particularly from behavioural science, economics and market research, about how extreme events might influence economic valuation surveys.

20. Extreme disruptive events have the potential to impact directly the valuation task. Behavioural science has shown that people's decisions are affected by systematic (non-random) behavioural biases, which are often linked to features of the decision context. Indeed, people unconsciously rely on heuristics or mental shortcuts to guide their daily choices. Such biases and heuristics cause decisions to deviate from the "rational" choice model, which assumes stable, consistent, and complete preferences. Extreme events, such as epidemics and pandemics, weather and climate phenomena, like fires and floods, as well as terrorist attacks (Broska, Poganietz and Vögele, 2020<sup>[19]</sup>), can introduce an additional element of context dependence to the preference and welfare measures elicited via surveys. During such events, people may be physically and cognitively more fatigued, anxious and worried, having to deal with health issues, financial problems or property loss, as well as distracted with the course of events and under greater time pressure to make decisions. They may therefore be more likely to invoke certain types of heuristics and biases instead of taking the time to make reflective and reasoned judgments, allowing biases and heuristics to exert a greater influence on revealed and stated choices in surveys. Arguably, such behavioural anomalies found in hypothetical markets would also be found in real market behaviour, as stated preference methods try to mimic actual choices (Poe, 2016<sup>[16]</sup>).

21. One relevant example is "salience bias" that describes the tendency to focus on particular features of a problem or information that are more attention-grabbing or vivid, while ignoring those that are diffuse, difficult to quantify or less noticeable (Kahneman et al. (1982<sup>[20]</sup>), Allcott and Wozny (2014<sup>[21]</sup>)). Similarly, the "availability heuristic" describes our tendency to use information that comes to mind quickly and easily when making decisions about the future (Tversky and Kahneman, 1973<sup>[22]</sup>). Extreme events may be perceived as highly salient since they often come as a novel and disruptive shock, upending normal functioning and routines. Typically, they are extensively covered in the news, in online and social media networks, and can also be a topic of conversation in the household, at work and within other social groups. Consequently, information related to these events may also be easily retrieved from memory. Such salient extreme events, therefore, could potentially lower the willingness to pay or shift survey responses away from changes being valued if they are unrelated to the event, and compete for people's attention and resources. In contrast, changes or policies complementary to the event may elicit increased public support (for e.g. towards flood defences after a flood event, or towards public health services in the wake of COVID-19). Masefield (2020<sup>[23]</sup>) reports on opinion polls that show that people in England support putting nature recovery at the heart of COVID recovery plans. And in a recent paper about the effect of coronavirus on public awareness of nature and the environment, Rousseau and Deschacht (2020<sup>[24]</sup>) found that the pandemic led to a positive shift in public awareness of, and attention to, nature and biodiversity-related topics (e.g. birds, forest, nature), but not necessarily of environmental topics (climate change, water pollution, air pollution).

22. Extreme events in the wider society have not only direct effects but also indirect spill-over effects on preferences for the goods and services being valued. This can be due to the emergence of novel information, or to past information being framed in an unexpected light. For instance, Shreedhar and Mourato (2020<sup>[25]</sup>) found that UK residents are more likely to donate to wildlife conservation charities and are more supportive of wildlife conservation policies after viewing news articles describing the proximate cause of COVID-19 as the human destruction of nature and resultant trading of wild animals, relative to a control group. Most respondents ranked the stories presented in the news articles as unfamiliar and novel. Along similar lines, there is emerging evidence that people's experiences of clean air, an unintended consequence of abrupt lockdown policies to deal with COVID-19 in highly polluted cities, are associated with increased public online discussions focused on environmental protection, as well as local officials incorporating "green" industrial subsidies into post-COVID stimulus policies in China (Kahn, Sun and Zheng, 2020<sup>[26]</sup>). Relatedly, past studies have discussed the importance of personal experience and learning-by-doing on people's preferences and behaviour (Anzai and Simon (1979<sup>[27]</sup>); Hoeffler and Ariely, (1999<sup>[28]</sup>)). These patterns align with the broader fact that preferences and values are endogenous, i.e. they can evolve over time in response to extreme events, and political, socio-cultural and market institutions (Bowles, 1998<sup>[29]</sup>).

23. Catastrophic events can influence other related individual-level traits, such as risk attitudes or trust, as well as emotions, which in turn affect survey responses and stated values. For example, emerging work has found that extreme events can impact people's trust, time, risk and prosocial preferences. In an early article, Johnson and Tversky (1983<sup>[30]</sup>) found that reading news articles about disease and disasters increased subsequent risk perceptions, i.e. it caused respondents to judge the risk of related and unrelated events as occurring more frequently, ostensibly through an increase in negative mood (as more depressed and worried). More recently, Cassar et al. (2017<sup>[31]</sup>) found higher risk aversion and impatience (based on revealed preferences elicited through experimental games in surveys) amongst respondents from a village in Thailand that was directly hit by the 2004 tsunami, when compared to those from villages that were not affected. In addition, the experience of the tsunami appears to have led to higher levels of trust, possibly since subjects experienced a situation in which they received help from others. But Hanaoka et al. (2018<sup>[32]</sup>) found the reverse in Japan, i.e. men who experienced greater intensity of earthquakes became more risk tolerant after the Great East Japan Earthquake. Similarly, Abatayo and Lynham (2020<sup>[33]</sup>) found that fishers in the Philippines affected by the Typhoon Bopha were more risk-loving – a result driven by females – when compared to those who were not affected.

24. Revealed or stated values can be contingent on people's incidental emotional state at the time of taking the survey. Extreme events (even if experienced only vicariously through media coverage) can cause intense emotional reactions in the short term (either negative like dread, fear, sadness or anger, or positive, like happiness) and also changes in mood and well-being in the medium to long term (for example depression and anxiety). A large literature in behavioural science and psychology suggests that emotions affect people's decisions in a wide range of settings in fast and often impulsive ways (Loewenstein, 2000<sup>[34]</sup>). Affect, for instance, which can be conceptualised as feelings of 'good' (positive) or 'bad' (negative) feelings has been shown to intuitively drive decision-making in systematic ways though the affect heuristic (Slovic et al., 2007<sup>[35]</sup>). A classic example is that responses to risk tend to be strongly associated with how much "dread" an event evokes, so choices associated with cancer are seen as riskier and more in need of regulation than activities associated with less dreaded forms of illness or injury (e.g., accidents) (Ibid). Going by this tendency, it is possible that catastrophic events evoking more dread may lead to higher valuations of the associated costs than those, which may be equally harmful but experienced as less "dreadful".

25. Low or negative incidental moods, caused by contextual factors like amount of sunny days and daylight and even soccer outcomes, have been shown to impact economic outcomes like stock market returns, possibly through lowered risk-taking (Kamstra, Kramer and Levi, 2003<sup>[36]</sup>). Several studies have observed that anger in response to terrorism increases support for aggressive hostile policies (elicited through questionnaire surveys), while fear and anxiety are more likely to predict risk avoidance and plans for precautionary measures (Lerner et al. (2003<sup>[37]</sup>); Huddy and Feldman, (2011<sup>[38]</sup>)). Atkeson and Maestas (2012<sup>[18]</sup>) noted that the strong emotions felt during catastrophic events can be powerful motivators of public opinion and activism, and motivate attribution of blame typically to governmental agencies. However, despite this large body of work, very few studies have investigated how "incidental" emotions caused by particular events impact willingness to pay behaviour in other areas. Existing studies have mixed results. Lerner et al. (2004<sup>[39]</sup>) found that incidental sadness reduced willingness to accept prices for an object that participants were endowed with but it increased the prices they were willing to pay for the same object; while Hanley et al. (2016<sup>[40]</sup>) found no impact on willingness to pay to improve coastal water quality and fish populations, when subjects were exposed to unrelated film clips arousing, happy, sad or neutral emotion states.

26. Apart from the impact on people's attention, preferences, traits and emotions, disruptive events can also cause exogenous changes to people's employment status and financial circumstances. Shifts in income, for instance, may directly influence willingness to pay and survey responses through shifts in ability to pay as discussed in the following section. However, changes in income can also exert indirect influence by compounding and interacting with other anxieties and biases. These income effects can thus be non-

linear and intersectional if they affect social groups in systematically different ways. For instance, Drydakis (2015<sup>[41]</sup>) reports that higher unemployment during the financial crises in Greece was associated with significantly worse mental health outcomes, especially amongst women, compared to the pre-crisis period. The extent of such interaction effects can be substantial or minor, and may be either temporary or permanent, and can ultimately hinge on both the nature of the event itself and societal and policy responses to it. These additional sources of context-dependence, however, could mean that valuations elicited via stated preference surveys conducted during an extreme event – often taken to inform projects before they are implemented – might not be a good reflection of preferences post-event, since emotional states are temporary, leading to potential instability of preferences.

## Main effects of disruptive event on economic valuation surveys

27. Following on from the above review, one can see that extreme events can directly and indirectly influence people's preferences for the good or policy being valued, their ability to pay (which may differ across groups), as well as influence multiple contextual factors related to the valuation task from salience of the topic in the media to emotional state of the respondent while conducting the survey. These insights can be summarised into five principal channels through which disruptive events might affect valuation surveys.

28. First, respondents' **preferences and tastes might change**. In relation to COVID-19, issues like health, nature and green spaces might have become more salient to some people and move up in their priority ranks so that their valuation of goods and services in these areas might increase. Conversely, the value of public goods that are unrelated and therefore less salient – for example in the media or through personal experience – might decrease. Emerging work in other domains suggests that COVID-19 is indeed shifting preferences. For example, using large-scale cross-country surveys, Alsan et al. (2020<sup>[42]</sup>) find that respondents in 15 countries are willing to trade-off civil liberties for improved public health conditions during the pandemic, although those who are disadvantaged (e.g. economically) are less willing to make such trade-offs.

29. Second, respondents' **ability to pay might change**. In the wake of an extreme event, people may for example lose their jobs, have extra expenditures and/or reduced income, or face increased uncertainty about their job and income earning prospects, and there may be systematic differences in the size of these income effects across groups. All these eventualities would be expected to negatively affect willingness to pay, ceteris paribus. In contrast, some people may have received financial benefits during the crisis. In terms of observed behaviour, the consumer spending literature indicates that when faced with a negative shock, consumers tend to reduce spending. During COVID-19, this finding has been observed for many countries, including the United Kingdom, China, the United States and France (Chronopoulos et al. (2020<sup>[43]</sup>)). Figures from the UK Office for National Statistics (2021<sup>[44]</sup>) confirm that during the COVID-19 pandemic, there have been record declines in gross domestic product (GDP) in advanced economies, accompanied by large declines in household consumption expenditure. Since stated preference surveys mimic real market behaviour, the same average downward trend can arguably be expected for willingness to pay elicited in hypothetical markets.

30. Third, catastrophic events can have a **significant effect in a number of variables that might in turn affect welfare measures, such as trust, risk attitudes, time preferences and mood or emotions**. The direction of some of these effects is ambiguous (e.g. risk attitudes). Of note, trust in institutions might be particularly affected by disasters, so that the institutional setting in which the contingent scenario is described might be regarded differently post-disruption than it would have been previously. If some people lose trust in government institutions and attribute blame due to their perceived inability to deal with the extraordinary event or inability to protect those that the respondent cares about, they might be less willing

to pay for policies enacted by those same institutions. Such influence channels constitute additional sources of context dependence.

31. Fourth, extreme events might **increase the instability of preferences**, in cases where they may be poorly defined, and result in impulsive answers and random shifts in values. This could particularly affect non-use values associated with lesser known, and/or complex public goods, about which survey respondents lack experience and knowledge. Evidence has shown that where preferences are not well formed, survey responses can shift considerably even in response to minor changes in the questionnaire e.g. wording or order of questions (Tourangeau et al. (2000<sup>[14]</sup>)). So, the expectation is that in the presence of a major catastrophe, with resulting uncertainty and impacts on income and other variables as described above, such survey responses might become more impulsive and even less stable. Depending on the topic being studied, this could affect a non-trivial proportion of the survey sample judging from evidence from large-scale attitudinal surveys that show that many people do not have well-formed stable views about a range of issues (Tourangeau et al. (2000<sup>[14]</sup>)). In such cases, it is particularly important to ensure that the valuation scenario and willingness to pay questions are understandable, meaningful, incentive-compatible and consequential to reduce the chance of random errors (Mitchell and Carson, (1989<sup>[11]</sup>); Johnston et al. (2017<sup>[7]</sup>)). It is noted, however, that there is scant evidence on the impact of extreme events on preference stability. Thus, it is conceivable that, in some cases and for some goods, the reverse could also happen: due to increased uncertainty, people's preferences may become more consolidated around certain issues and therefore become more stable (e.g. during COVID-19, consistently strong preferences for public health care have emerged).

32. Fifth, there could be disaster-related **sample selection or response bias**, where some people may be more likely than others to participate or not participate in the survey, depending on how the event affected them. For example, in the case of COVID-19, those taken ill or caring for sick family members will have other things on their minds than answering surveys; while those suddenly unemployed or experiencing financial hardship might find answering a paid survey a more attractive proposition. In cases of natural disasters, some people may be facing displacement having lost their property and material possessions, making it very unlikely they would be in a position to answer a survey. In face-to-face surveys, interviewers may also be affected by the same issues and be unavailable or unwilling to conduct interviews. There are moreover ethical issues surrounding trying to conduct surveys in such extreme circumstances and safeguarding the rights and the welfare of respondents (and the researchers) is of paramount concern (Johnston et al. (2017<sup>[7]</sup>); Chenneville and Schwartz-Mette, (2020<sup>[45]</sup>)).

## How valid and stable are stated values elicited during extreme events?

33. This section discusses the validity of stated values elicited during extreme events (i.e. whether they are valid representations of welfare changes) and the temporal stability of such values (i.e. whether they are transitory and short-lived, or whether they are long-lasting and reflect persistent preference changes).

34. As noted previously, stated values elicited via surveys are context-dependent. This is in line with welfare theory that suggests that welfare estimates are influenced by a wide range of factors. It is well known that stated values are contingent on the information provided in the questionnaire; this has been widely studied in forensic detail by a large body of economic valuation literature. Yet much less studied is the fact that values are also influenced by the external context in which the valuation occurs. In terms of validity, the key concern is therefore not whether stated economic values change as a result of disruptive events, which is expected, but whether they represent underlying true preferences at the time they were elicited, and whether they vary in line with expectations and with factors that can reasonably be expected to influence them (e.g. income).



35. Having said this, it is very likely that at the peak of a disruptive event – such as the COVID-19 pandemic, a massive wildfire, an extreme weather event, a civil war or a terrorist attack – the uncertainty might just be too great and emotions too heightened for many respondents to be able and willing to engage with a survey, or to realistically articulate a well-thought-out value for a non-market good. Values expressed in such extreme circumstances might be impulsive, unstable, and more akin to random guesses than carefully considered valuations; they could therefore fail the basic principles of stated preferences, namely that individuals are able to express thoughtful preferences over goods and services and that they are attempting to maximise their utility. Logistically, conducting surveys at the peak of a disaster may also prove impossible if there are casualties, people are sick, homeless, inaccessible or there is a failure of the necessary infrastructure and technology (Harter et al. (2006<sup>[17]</sup>)). In such difficult contexts, the implementation of stated preference surveys must abide to recognised ethics protocols to ensure the rights and welfare of respondents are safeguarded (Johnston et al., 2017<sup>[7]</sup>)

36. However, in the post-peak period (e.g. when disease levels are past peak observed levels or when an extreme weather event has concluded), things are likely to become less uncertain and people start to adapt to the new circumstances (i.e. the so called “new normal” in the coronavirus case). Then there is arguably no strong reason why surveys should not go ahead and produce valid representations of preferences. In other words, there is no point waiting a long time to get back to some perceived prior “normal” reality. Large disruptive events such as COVID-19 can result in long-lasting changes in attitudes, priorities, tastes, habits and lifestyles. So, the fact that stated values post-event may be different than what they were before the event does not mean they are not valid: any differences may simply be a reflection that values have changed, shaped by the events and their aftermath. In fact, it is the values elicited before the crisis that may no longer be accurate representations of the new post-event reality.

37. The challenge here, however, is that it is difficult to predict the way in which preferences and values will change after a disaster. For example, in terms of willingness to pay for wildlife conservation, the wildlife destruction narratives typically associated with the origin of coronavirus may increase the salience of the issue and could lead to stronger preferences towards wildlife conservation (Shreedhar and Mourato, 2020<sup>[25]</sup>). On the other hand, job losses and financial uncertainty may depress ability to pay. Individual constraints may be further compounded by political support for recovery plans through “dirty” economic growth, which can further marginalise nature and climate policy. What is important is that survey instruments are revised and adapted to reflect the new circumstances (adding questions, revising the valuation scenario, increasing efforts to obtain a representative sample, etc.) to maximise the chances of uncovering accurate monetary representations of preferences.

38. It is relevant to reflect here on the likely difficulty of defining what is the peak of an extreme event and of understanding how long it will last, and what the shape of the recovery will be, when its cycle may be unknown or badly understood at the time where a decision needs to be made about running a survey or postponing it. There is no universal definition of a peak (e.g. the WHO definition of pandemic phases does not define a peak although it refers to the post-peak period, WHO (2021<sup>[46]</sup>)). What is considered the peak and how long it lasts is ultimately an empirical matter – it depends on the type of event and on the indicators of interest to the analyst. In the well-documented case of COVID-19 in the United Kingdom, for example, if one takes health as an indicator, an inspection of the graph depicting the number of daily hospitalisations reveals that the first wave of corona virus peaked in April-May and steadily declined in the following three months. Chronopoulos et al. (2020<sup>[43]</sup>) Looked instead at consumer spending as the outcome of interest and went on to identify 5 cycles in the COVID-19 pandemic for the United Kingdom, up until June 2020: incubation, outbreak, fever, lockdown and stay alert. It was during the lockdown stage (March-May) that consumer spending declined most markedly, so that stage could arguably be considered the peak for the consumer spending indicator, which in this case roughly coincides with the peak for the health effects. In this case, avoiding non-market valuation survey work from March-May would seem like a sensible precaution, on the basis that these two key indicators matter to people and are likely to affect preferences and ability to pay. Moreover, as this was the first coronavirus wave, the UK society was



arguably poorly prepared with ensuing significant disruption of services. This is of course unless the objective of the work is to see how peak events affect values.

39. To complicate matters, extreme events like pandemics have a cyclical pattern, characterised by a number of different phases, and the shape of the recovery can vary widely. For example, there could be: a single wave with a well-identified peak in terms of the outcomes of interest (for example hospitalisations, or lockdowns) followed by a swift recovery; a large first wave followed by a series of much smaller, but persistent waves (a slow burn scenario); multiple large waves over a prolonged period of time (a peaks and valleys type of scenario); or, what looks like the COVID-19 evolution in many countries, a first wave, followed by a much larger second or third waves, with higher peaks in terms of hospitalisations, accompanied by lockdown restrictions, followed by a slow recovery as vaccines are introduced. The impacts over time, i.e. during the peak and post-peak periods, may also vary geographically (for example across rural and urban centres which are more sparsely and more densely populated, respectively) and across population segments (e.g. across those who are more vulnerable due to prior long-term health conditions, older age and being active in key occupations).

40. The question then becomes whether one should avoid conducting surveys in the first peak only, when the impacts are more unexpected and disruptive, and societies are arguably less prepared, or whether one should also try to avoid peaks in subsequent waves. This is ultimately an empirical matter that depends on the specific societal circumstances and preparedness, the severity of the event cycles, how fast people adapt, the variables of interest, etc. The analyst has to look at the data on the evolution of the event, consider which indicators are relevant to the valuation scenario, the region and population being studied and how all these factors interact and relate to each other, in order to make an informed assessment of whether the relevant curve is flattening for those indicators, which would suggest the post-peak period has arrived and it is a more or less appropriate time to collect data. In the case of COVID-19 in the United Kingdom, it is arguable that the first wave would be the key one to avoid in terms of survey work, as it caught the country unaware, causing huge disruption and misery, before policies were put in place and people were able to adapt to live in the new circumstances.

41. Of course, the effects of the evolving reality can be seen not just in the valuation of non-market goods but in all other areas of economic activity that may have experienced rapid and substantial changes during the disruptive event. For example, for COVID-19, a large body of evidence is quickly amassing on how lifestyles, behaviours and habits have changed in transport, recreation, physical activity, eating habits, shopping habits, working practices, socialising, digital engagement, health and hygiene practices, etc. The online publication COVID Economics has so far published 71 issues (as of March 2021) showcasing the rapidly growing literature on the economics of the pandemic. As a result of the shock and the resulting policy and behavioural responses, many businesses have lost viability (travel, retail, catering, arts) while others are thriving (supermarkets, online deliveries, IT). Shifting economic values of non-market goods is just one manifestation of the large-scale changes that re-shape society after a catastrophic event, and it is yet to be seen how these multiple and simultaneous changes affect responses on different valuation tasks.

42. Perhaps a more relevant question for policy than the validity of elicited stated values is the temporal stability or longevity of such values, i.e. whether the changes in values caused by disruptive events are short-lived or long-lasting. On the one hand, survey results elicited in the middle of a massive disruptive event, such as the COVID-19 pandemic, may be valid representations of views only at the time they were elicited and may therefore have very limited applicability and generalisability post-event if views subsequently change. But on the other hand, it could also be the case that the disruptive shock causes some long-lasting shifts in behaviours and values, that will prevail post-event, due to enduring changes in habits, circumstances and tastes. This observation also applies to revealed consumer spending where changes in spending patterns are sometimes transitory and other times more permanent (Chronopoulos et al. (2020<sup>[43]</sup>)). The timing of the recovery post the disruptive event matters here: an L-shaped or slow recovery could have more lasting effects in habits, behaviours and values than a U-shaped or steep/fast recovery where it is arguably more likely that they could revert back to pre-event levels. In the case of

COVID-19, Pannell and Adamowicz (2020<sup>[47]</sup>) note that adaptive behaviour happened very quickly: old habits were broken, new habits established and some new ways of doing things emerged. Ultimately, whether an extreme event causes short or long-lasting changes in preferences and behaviours is also an empirical matter, which can be influenced by changes to the external and societal context as well as behaviour, preferences and values of respondents.

43. More broadly, tastes, habits, circumstances and contexts evolve and are updated all the time, even in the absence of disruptive events. It is highly unlikely that values expressed five or ten years ago will remain unchanged today, in absolute or relative terms. Evidently, in times of stability and continuity, the shelf-life, generalisability and predictive accuracy of stated values will be longer than in times of great change. This has important implications for value transfer studies (Champ et al. (2003<sup>[5]</sup>); OECD (2018<sup>[8]</sup>)). Just as it is inadvisable to use valuations from old studies for value transfer, at least without updating or adjusting the values, it is also inadvisable to use unadjusted valuations elicited before a major catastrophic event to predict values post-event, if it is anticipated that preferences, ability to pay and other variables might have experienced a long-lasting persistent change.

44. One way to pick up transitory value changes during an extreme event is through revealed preference studies, based on observed behaviour. A recent example is the study by Day (2020<sup>[48]</sup>), using recreational demand modelling. He estimates the value of greenspace in England during the first COVID-19 lockdown that lasted 12 weeks between March and June 2020. The study finds that because of the restrictions imposed on movement, the use value of greenspace dropped by GBP 150 million (just under 3% lower than pre-pandemic conditions) in that period. Day notes that the drop in value was relatively small because of adaptation behaviour: people seem to have increased their use of local greenspaces to offset the restrictions imposed on driving to recreation sites further afield. These potential changes in preferences have also emerged in the housing market via an increased demand – and therefore higher prices – for houses with gardens and those located near green and blue spaces since the onset of the pandemic (Romei, 2020<sup>[49]</sup>). These findings could be complemented with additional analysis of revealed data from online platforms, such as online news media, discussion forums and social media articles to monitor popular trends and sentiments (e.g. in Rousseau and Deschacht (2020<sup>[24]</sup>), and Kahn, Sun and Zheng (2020<sup>[26]</sup>)). That said, a particular feature of stated preference methods is to capture non-use as well as use values, thus it is likely that these alternative measures could constitute a part of, but fail to capture the full extent of changes in social value for a given good, item or policy.

45. Ultimately, policy makers and researchers will need to make a judgement based on available information as to how preferences for the policies they are interested in valuing might be affected by the extreme event and whether those changes might be transitory – which suggests a postponement of the survey work – or instead might prevail post event – which supports going ahead with the survey. Evidently, a key consideration is also what the object of the valuation is (and how affected by the event it is) and how the results are intended to be used (e.g. during or post event). The next section provides recommendations for running effective valuation surveys in the wake of massive disruptive events.

## Recommendations for conducting valuation surveys during extreme events

46. In addition to existing general guidance for best-practice stated preference surveys (Johnston et al. (2017<sup>[7]</sup>), OECD (2018<sup>[8]</sup>)) one general guiding principle and seven specific recommendations are proposed when conducting surveys during and after major disruptive events.

47. General principle: ***Exert caution when interpreting, generalising and extrapolating economic valuation survey findings elicited during or soon after an extreme event.*** Values are contextual and if the context changes, values will likely change too. So economic values stated at a time of deep crisis are specific to those set of circumstances and this is an important caveat when using those values for future predictions and value transfer exercises.

48. Specific recommendations are:

1. **Avoid conducting valuation surveys at the peak of the disruption** while conditions are deeply uncertain, where people might be ill, grieving, stressed and/or in fear, and services and livelihoods are greatly disrupted. The welfare of respondents and interviewers is a central concern in such circumstances. This is especially the case for goods and services that might be directly affected by the disruption (e.g. it would not be advisable and it would be possibly unethical to conduct a study on willingness to pay for home energy efficiency measures in situations where wildfires might have left many families homeless). Moreover, there could be substantial non-response bias at such a time. In general, it is recommended that planned surveys are postponed and implemented after the peak of the event. If the event has a cyclical pattern such as COVID-19, then it would be sensible to try to avoid at least the peak of the first wave.
2. **Ensure compliance with recognised ethics standards for survey research and the protection of human subjects, as well as research institutions' policies for conducting research in emergency situations.** Research ethics compliance is a requirement in any stated preference survey since it involves human subjects (Johnston et al., 2017<sup>[7]</sup>), but it is particularly important where surveys are conducted during or soon after an extreme event when safeguarding the rights and the welfare of respondents (and the researchers) is of paramount concern. Institutional approvals must be sought with the relevant ethics boards, and existing policies for conducting research in emergency situations need to be complied with (e.g. many universities prohibited research-related travel and in-person interviews during COVID-19). The research protocol, the survey instrument and the implementation strategy might need to be modified to allow for appropriate and feasible data collection and for informed consent to be obtained during an extreme event (Chenneville and Schwartz-Mette, 2020<sup>[45]</sup>). Careful piloting also needs to take place to test appropriate framings of the valuation scenario and the feasibility of the valuation task, and to ensure that the research is conducted in such a way that respondents and interviewers are protected and not put at risk.
3. **Include a range of questions in the survey to measure the impact of the disruptive event and contextualise the values elicited.** This is important to be able to assess the validity and indeed the stability of the results obtained. Questions might include assessing if and how respondents and their families were affected by the event and the resulting policy responses (e.g. via their health, jobs, possessions, restrictions to movement), how their lifestyle changed (working from home, wearing masks, shielding, spending/shopping habits, etc.), perceived severity of the event, perceived duration of the effects of the event, mitigation and adaptation measures, and level of resilience. It could also include questions on trust in institutions, political beliefs, attitudes to risk, uncertainty and ambiguity, as well as well-being, mood and emotions. One such example is the Coronavirus Anxiety Scale (Lee, 2020<sup>[50]</sup>). Such questions should normally be asked at the end of the survey. There can be trade-offs, however, as adding a large number of new questions can magnify the cost and cognitive burden of the survey and also have implications for sample size and power, so as always parsimony is important. Only information that is relevant to the survey and may affect the valuations needs to be included. Finally, it is not advisable to ask respondents to answer as if the extreme event had not happened, as that would be very unlikely to produce accurate estimates of value, because the scenario would no longer be plausible or realistic.
4. **Include debriefing questions to assess how well-formed preferences are for the change being valued at the time of the survey** (e.g. self-assessments of familiarity before and during the event, perceived complexity, difficulty in expressing an answer, uncertainty, etc.). It is plausible that those with strongly held, well-formed preferences may be less vulnerable to the contextual effects of extreme events, while those with less well-defined and stable preferences might change their values more readily.

Arguably, it could also be the case that those with higher knowledge might be more affected by context as they can better recognise the implications of the event (Tourangeau et al. (2000<sup>[14]</sup>)). Although this is a complex issue, debriefing questions may help to assess the generalisability of findings post-event and their usability in transfer studies. These questions are asked routinely in stated preference surveys, but they are particularly important in the context of an extreme event.

5. ***Pay particular attention to sample selection and non-response bias***, to minimise the real potential for selection bias amongst the sample. Extreme events impact people disproportionately (Pannell and Adamowicz, 2020<sup>[47]</sup>), and those who suffer the most may be less likely to respond to a survey. For example, in the case of COVID-19, the illness had a more severe effect on the elderly, on those with pre-existing conditions, and on those with public-facing jobs; while the policy response in the form of a lockdown resulted in a disproportionate negative impact on certain professions and sectors (e.g. arts, travel and hospitality) where people lost their jobs or were furloughed, and on those with caring responsibilities, who may have had to home-educate their children or take care of elderly relatives. The sampling strategy should try to ensure that such groups are represented, if and only if it is ethically acceptable to do so. In such cases, extra effort may need to be put into locating respondents, the survey mode may need to change and the survey instrument itself may need adjusting (e.g. a shorter survey).
6. In a cross-section survey, ***perform a comparative analysis of the answers of those highly affected by the event, those moderately affected, and those minimally or not affected***. This will provide indicative information on how the event might have affected certain groups, their attitudes, behaviours and values. It may provide the basis for correcting or calibrating average values collected during an extreme event, to adjust for the effect of the event, so that they can be applied to post-event situations. This is particularly useful in value transfer exercises (Champ et al. (2003<sup>[5]</sup>); OECD (2018<sup>[8]</sup>)). In value transfer, primary studies need to be screened for relevance and it may be that values obtained before an extreme event have changed so much that those studies are no longer relevant (as often happens with studies conducted many years previously). Alternatively, it could be that adjustments are possible using some form of calibration. The comparative analysis proposed here would help provide the information required to assess the extent of value change that might have occurred and the potential for meaningful adjustments in value transfer.
7. ***Valuation studies could be repeated at certain intervals to check the evolution of values in rapidly changing environments***. This could be achieved by running a survey during and then after the event. Better still, ***including valuation questions in large-scale longitudinal surveys, would allow researchers to track how values change over time in a systematic manner***. In a recent paper, Kühne et al. (2020<sup>[51]</sup>) argue that to fully understand the effects of a crisis there is a need for creating generalisable databases such as those from household panel surveys, that contain contextual information on socio-economic and health variables and that offer a “life-course perspective”. This is unlikely to be feasible for complex valuation scenarios that require lengthy descriptions but could arguably be done for simpler valuations of more familiar goods. Brynjolfsson et al. (2019<sup>[52]</sup>), for example, advocate the use of low-cost products such as Google Surveys to run simple valuation questions at regular intervals on large representative samples of internet populations and track changes in economic values for relevant goods and services. Other platforms, like MTurk (Amazon Mechanical Turk) and Prolific Academic (a crowdsourcing marketplace and an online survey panel respectively), or recruitment via social media platforms can also allow the implementation of large-scale low-cost surveys. That said, researchers need to be aware of the many challenges of using these channels (e.g. sample representativeness) and how to address them (e.g. see discussions in Newman et al. (2021<sup>[53]</sup>); van den Berg et al. (2020<sup>[54]</sup>); Zhang et al. (2018<sup>[55]</sup>); Boas et al. (2018<sup>[56]</sup>)), as well as considering how characteristics of the survey sample link up to the valuation task and the extreme event itself.

## Conclusion

49. Monetary welfare estimates such as stated economic values are context-dependent: they depend not only on the context specified within a questionnaire, but also on wider economic, social, health and environmental conditions. If the context changes, then one can expect the values to change as well. The methods that are being used to estimate monetary values, however, remain valid. Assuming best practice in survey design and implementation, the values elicited should also be valid and reliable representations of welfare at the time of the survey.

50. It is inadvisable to try to conduct non-market valuation surveys during the initial peak of a catastrophic event (assuming the peak can be identified, which may not always be the case), unless the objective is to see how values evolve at that moment in time. This is because there is likely to be great uncertainty, extreme emotions, grief and distress, as well as preference instability so that expressed values may not be carefully considered and thoughtful reflections of the underlying constructs. Ethics in the survey data collection must be considered and the welfare of respondents is of central importance: it is not advisable to approach people at moments of great distress. However, beyond the peak, well-designed stated preference surveys should be able to be effectively used to uncover valid and reliable monetary representations of welfare changes. Although the estimated values may be a valid representation of preferences at the time of the survey, it should be understood that such values evolve over time. And in the face of a major disruptive event, value-shifts can be sudden and significant. These shifts may be short-lived or long-lasting, depending on the shape of the post-event recovery. If the value-shifts are transitory, then their generalisability and predictive power is limited beyond the period of the event and its immediate aftermath. If they are long-lasting, i.e. reflect the “new normal”, then estimated values may be lasting accurate representations of the welfare generated by the non-market goods and services. While a good way of estimating and tracking how significant and permanent these value shifts are would be to undertake a repeated survey across multiple points in time, throughout the course of the event and post-event, complementary methods can also be used for example involving revealed preference data (e.g. from market transactions, mobility data, using online platforms, social media channels, etc.).

51. More generally, care should be taken when conducting stated preference surveys during or in the aftermath of a major disruptive event to ensure validity of the resulting welfare estimates. This paper has proposed one general guiding principle (exercising caution when interpreting the survey results and their generalisability), and seven key recommendations. These include avoiding the peak event period, abiding to research ethics protocols, including a range of additional control variables and debriefing questions in the questionnaires to see how responses are affected by prevailing conditions, mitigating sample response bias, comparing results within-sample based on sub-samples of affected and less affected respondents, and ideally conducting longitudinal, repeat valuation studies to systematically track evolving welfare estimates.

52. Reassuringly, the above analysis and conclusions mirror the views expressed by many environmental economists. In July 2020, Dr Benjamin Gramig (University of Illinois at Urbana-Champaign) started a discussion thread on the Land and Resource Economics Network (RESECON) on the validity of economic valuation surveys conducted during the pandemic. After examining the large number of responses received from environmental economists and practitioners involved in valuation work he concluded that “*there is nothing inherently wrong about valuation conducted using best practices under COVID*”, and “*we can expect COVID to influence survey/valuation responses (not validity of the values themselves, per say) and we should place the results in this context*” (Gramig, 2020<sup>[57]</sup>). He also notes that “*using specially developed questions to gauge respondent impact from COVID that facilitate comparisons within your survey sample between those affected [...] and those “unaffected” [...] was viewed as being highly desirable in addition to demographic and socio-economic controls we normally employ*”. The analysis in this paper fully supports these conclusions.

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