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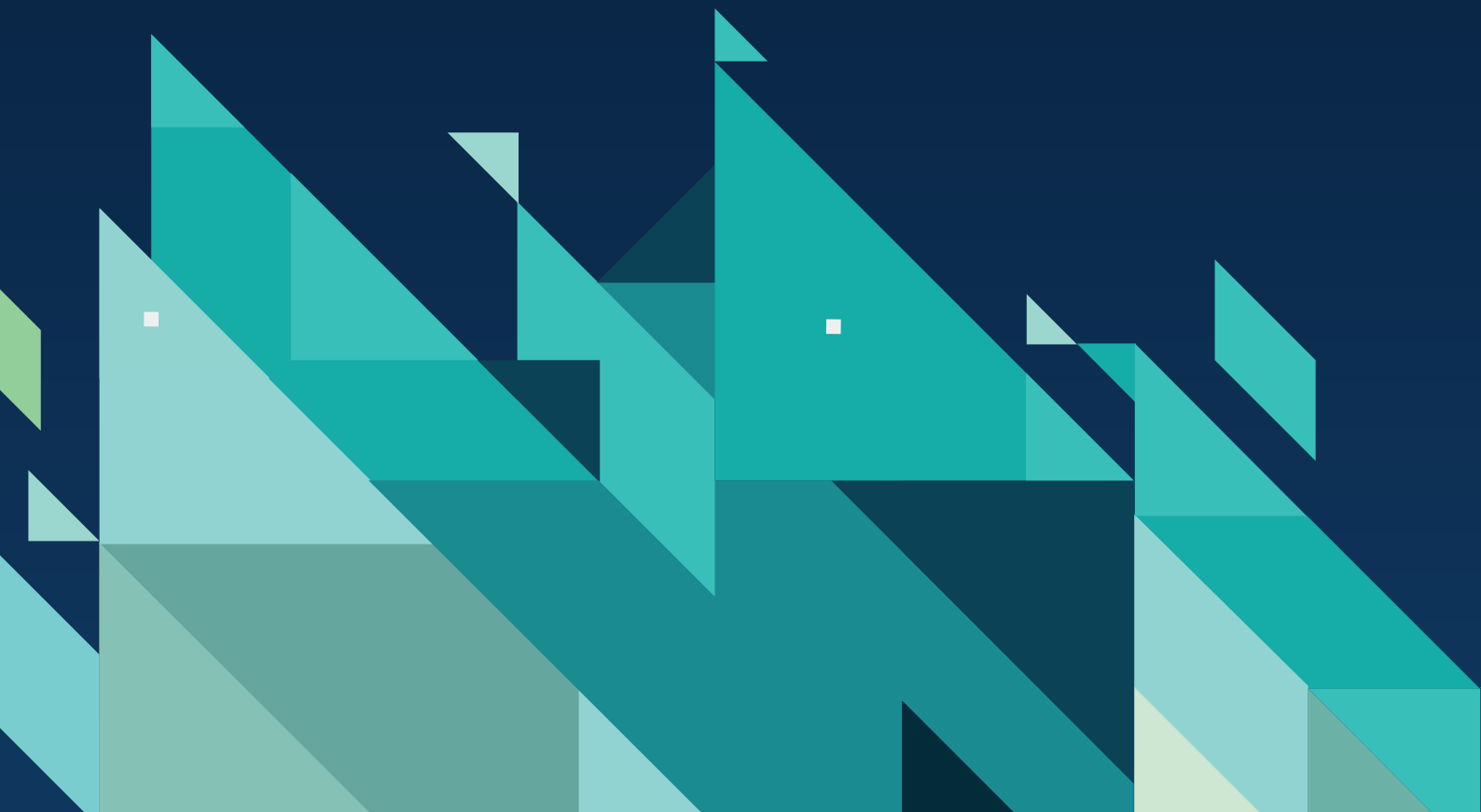
Promoting a nationwide collective response: lessons from the Social Activity Measure during the COVID-19 pandemic

PETE LUNN, SHANE TIMMONS AND DEIRDRE ROBERTSON



PROMOTING A NATIONWIDE COLLECTIVE RESPONSE: LESSONS FROM THE SOCIAL ACTIVITY MEASURE DURING THE COVID-19 PANDEMIC

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TABLE OF CONTENTS

ABBREVIATIONS v

SUMMARY vi

CHAPTER 1 INTRODUCTION 1

1.1 Background 1

1.2 Study aims 2

1.3 Collective action problems 3

1.4 Risk perception 5

1.5 Summary 6

CHAPTER 2 THE SOCIAL ACTIVITY MEASURE 7

2.1 Sampling 7

2.2 Adapting the Day Reconstruction Method 9

2.3 Psychological factors 11

CHAPTER 3 FINDINGS 14

3.1 Measures of social activity 14

3.1.1 Close contacts 14

3.1.2 Locations visited 16

3.1.3 Meeting people from other households 17

3.1.4 Mitigation activity 18

3.1.5 Combined risk score 19

3.2 Changes in risk score over time 21

3.2.1 Increasing social activity 21

3.2.2 Relationship with restrictions 21

3.2.3 Cases, hospitalisations or deaths? 24

3.3 Risk score and background characteristics 27

3.3.1 Risk score by age, gender and working status 28

3.3.2 Risk score by educational attainment and social grade 31

3.3.3 Risk score by nationality and residential location 32

3.4 Risk score and psychological factors 33
3.4.1 Risk score by worry, fatigue and the burden of restrictions 36
3.4.2 Risk score by perceptions of restrictions 37
3.5 Relative strength of influences on risk scores 41
3.6 Perceptions of risky behaviours 44
3.6.1 Perceived risk compared to risk score 44
3.6.2 Perceived risk and daily cases 45
3.6.3 Perceived risk from meeting other people 46
3.6.4 Perceived risk from close contacts 48
3.6.5 Perceived risk from visiting multiple locations 49
3.6.6 Perceived risk and mitigation behaviours 50
3.6.7 Summary of perceived risk 51

CHAPTER 4 DISCUSSION AND POLICY RECOMMENDATIONS 53
4.1 Risk communication 53
4.2 Coordinating collective action 55
4.3 Measurement 58

REFERENCES 59

APPENDIX A SURVEY STRUCTURE 62
APPENDIX B REGRESSION MODELS 64

LIST OF TABLES

Table 2.1 SAM questions for obtaining psychological variables to explore drivers of behaviour 12

Table 3.1 Individual-level correlations between the four components of the risk score 20

Table 3.2 Correlations between the nine psychological variables used in the analysis of drivers of behaviour 35

Table B1 Example regression exploring influences on risk score 64

Table B2 Example regression exploring influences on perceived risk of catching COVID-19 66

LIST OF FIGURES

Figure 3.1 Proportion of the population that had a close contact the previous day and the number of reported daily new cases of COVID-19 15

Figure 3.2 Mean number of locations outside of their own homes that individuals visited the previous day and the number of reported daily new cases of COVID-19 17

Figure 3.3 Proportion of the population meeting up with more than one person from another household per day and the number of reported daily new cases of COVID-19 18

Figure 3.4 Proportion of the population undertaking mitigation activity less than two-thirds of the time and the number of reported daily new cases of COVID-19 19

Figure 3.5 Distribution of risk scores over six-month periods 21

Figure 3.6 Mean risk score, the number of reported daily new cases of COVID-19, and major changes to public health restrictions 23

Figure 3.7 Monthly change in risk score plotted against monthly change in average daily new cases 25

Figure 3.8 Monthly change in risk score plotted against monthly change in hospitalisations 26

Figure 3.9 Monthly change in risk score plotted against monthly change in number of COVID-19 related deaths from previous month 26

Figure 3.10 Mean risk score over six-month periods by age group 28

Figure 3.11 Relationships over time between risk score and socio-demographic categories of gender, age and working status 30

Figure 3.12 Relationships over time between risk score and socio-demographic categories of educational attainment and social grade 32

Figure 3.13 Relationships over time between risk score and socio-demographic categories of nationality and urban location 33

Figure 3.14 Relationships over time between risk score and level of worry, reported fatigue and perceived importance of the burden of restrictions over preventing spread of infection 36

Figure 3.15 Components of worry (Quarter 4, 2021) 37

Figure 3.16 Relationships over time between risk score and self-reported understanding of how different activities affect the chance of COVID-19 infection, perception of how straightforward current restrictions were to follow and how coherent (versus contradictory) restrictions were 38

Figure 3.17 Relationships over time between risk score and perception of how much other people were following public health guidance, the perceived likelihood of being caught and fined for transgressing rules and confidence in the Government's handling of the pandemic 39

Figure 3.18 Time-trends of perceptions of the ease of following current public health restrictions, the coherence of the set of restrictions in place and confidence in the Government 41

Figure 3.19 Relationships between risk score and socio-demographic background characteristics for three time periods 42

Figure 3.20 Relationships between risk score and psychological variables for three time periods 43

Figure 3.21 People's perceptions of the riskiness of their own individual behaviour, by the risk score calculated from their actual reported behaviour 45

Figure 3.22 Perceived riskiness of individual's behaviour and the number of reported daily new cases of COVID-19 46

Figure 3.23 Relationship over time between the number of people from other households that an individual met in the previous 48 hours and the individual's perception of the riskiness of their behaviour over the previous 48 hours 48

Figure 3.24 Relationship over time between the number of close contacts an individual had the previous day and the individual's perception of the riskiness of their behaviour over the previous 48 hours 49

Figure 3.25 Relationship over time between the number of different locations an individual visited during the previous 48 hours and the individual's perception of the riskiness of their behaviour over the previous 48 hours 50

Figure 3.26 Relationship over time between the proportion of occasions that an individual undertook mitigation activity (wearing mask, cleaning hands, maintaining distance) when engaged in social activity outside the household during the previous 48 hours and the individual's perception of the riskiness of their behaviour over the previous 48 hours 51

ABBREVIATIONS

HSE	Health Service Executive
NPHET	National Public Health Emergency Team
OLS	Ordinary least squares (regression)
SAM	Social Activity Measure
SATA	Select all that apply (question format)

SUMMARY

This report makes use of a unique data-set, the Social Activity Measure (SAM), which was collected fortnightly over an 18-month period during the COVID-19 pandemic from January 2021 to June 2022. The aim of the analysis presented is to derive lessons for any future situations where the Government (and society more broadly) faces a situation that demands coordinated, national collective action, in the face of a threat.

Communication was obviously vital to coordinate the required behaviour change. Early in the pandemic, public health communications focused on how the virus spread and its potential risks. Over time, attention was also given to the implications for personal wellbeing and wider society, and the inherent trade-offs involved. The response required central communication from the Department of the Taoiseach and the Government Information Service, as well as coordination of communication across government departments. During the period of study, central government communication about COVID-19 was a daily occurrence.

To record people's everyday behaviour in detail, SAM adapted an established psychological method, the Day Reconstruction Method. The study also recorded participants' background characteristics and a range of psychological variables designed to measure their perceptions of the pandemic and attitudes towards it. The study was administered anonymously, online, to a nationally representative sample of 1,000 people in Ireland every two weeks.

The data consist of 36,000 surveys completed by over 8,000 different adults, who were recruited through two pre-existing online panels of survey respondents. The methods for constructing online survey panels entail possible selection effects, so two different panels were alternated over the 18-month period and cross-checks for consistency undertaken. Controls were also introduced to account for possible effects of repeat responding.

The results are organised into three sets of findings: (i) trends in social activity; (ii) influences on individual behaviour; and (iii) perceptions of individual risk.

The results show clear patterns in whether individuals had close contacts, visited multiple locations outside their own home, met with other people from outside their household and, when at external locations, took measures designed to mitigate the risk of COVID-19 infection. Each of these behaviours was strongly associated with the contemporaneous number of new daily cases of COVID-19. These relationships were not only strong, but also consistent across the study period.

The analysis combines each of these behaviours into an overall 'risk score' in order to analyse drivers of behaviour. It then demonstrates that the amount of risk people took in their daily behaviour was more closely linked to case numbers than to indicators of more serious disease, such as hospitalisations and deaths, even after the successful rollout of the COVID-19 vaccination programme. In general, behaviour changed slowly and cautiously, with no clear step-changes associated with events or policy changes, at least until the rapid lifting of restrictions in early 2022 once the lesser severity of the Omicron variant had been established.

A number of background characteristics were linked to the amount of risk people undertook in their daily behaviour. The most important of these was working status: working people took more risk than non-working people. Once this difference is accounted for, the analysis shows that as restrictions lifted, older adults took more risk than younger ones. Gender differences were small. People with higher socio-economic status took more risk than those with lower socio-economic status. There was no difference in the behaviour of people in different regions, although people living in urban locations had slightly higher risk scores than those in rural locations. Irish nationals undertook more risky behaviour than non-Irish nationals living in Ireland.

In general, however, these background characteristics were less important than psychological factors. The most important of these was a person's overall level of worry about COVID-19. Note that this does not imply that many people were living in fear; most people's worry about catching the disease personally was not that high. Rather, they had concerns about the health of family and friends, together with broader societal concerns about the healthcare system and the amount of the virus in the community and internationally. The implication is that most people believed that collective efforts to be cautious in behaviour would limit the transmission of the virus and have broad benefit.

During early 2021, while strong restrictions were in place, how tiresome people found it to comply with the restrictions was less important than how they viewed the trade-off between the effort of complying and the need to reduce spread of the virus. While fatigue was increasingly a factor as the pandemic wore on, it was far from the strongest. More important was whether people viewed the restrictions as straightforward to follow and whether they saw them as coherent rather than contradictory. Both of these public perceptions were, on average, positive and strongly correlated with confidence in the Government. All three had consistent relationships with behaviour and were much greater influences than people's perceived likelihood of being caught and fined were they to break restrictions; voluntary willingness to do the right thing was more important than deterrence.

People perceived greater risk the more socially active they were, but perceptions were biased. Risk perceptions focused more on behaviour than the likelihood of meeting an infected person. Perceived risk was based more on the nature of the behaviour than the frequency. People perceived increased risk from meeting someone from another household, but little additional risk from meeting a second, third or fourth person not from their household. Similarly, while risk perceptions were sensitive to having a close contact and visiting a location outside the home, they were relatively insensitive to the number of close contacts a person had or the number of locations they visited. This insensitivity to the frequency of a behaviour once it was deemed an acceptable risk suggests a degree of 'binary thinking' – something is either okay or it's not. Risk perceptions had a weaker relationship with mitigation while visiting locations (mask wearing, maintaining social distance, hand hygiene).

Based on the relationships uncovered across the 18-month period of SAM, the report draws some conclusions and policy implications designed to assist in the future in situations where the Government needs to coordinate collective action in the face of a threat.

The close relationship of the COVID-19 case numbers to behaviour confirms that putting accurate, numeric indications of risk into the public domain can strongly influence the public response. This may occur because members of the public respond to changes in the relevant number, but also because official communications become more urgent and focused when the number changes. In future situations, it may not be so easy to identify a number that relates so straightforwardly to levels of, and changes in, the apparent threat faced. Where it is possible, the publication of such a number is likely to be similarly impactful.

Risk perceptions were biased in predictable ways. People focused on the nature of behaviour rather than its frequency; they perceived less risk among family and friends; they underestimated the advantages of being outdoors. Provided research is deployed rapidly to identify misperceptions, policy can be designed to counter such biases through specific, simple rules.

One straightforward and vital policy implication that arises from observing the behaviours recorded in SAM is that, if the circumstances are right, **humans are able to cooperate on a massive scale to achieve collective outcomes**. Most notable in the current data is the cautious behaviour of young adults who, relative to older adults, had more to lose and less to gain by curtailing their activities to limit the spread of infection. Overwhelmingly, **cooperation was voluntary, with only a limited role for legal deterrents**. Nevertheless, this kind of mass voluntary cooperation is not possible without policy and the communication that surrounds it to coordinate the collective action.

Willingness to cooperate **depends on people perceiving that the actions asked of them will lead to the desired collective outcome**. This means that **actions required need to be kept as simple as possible and to be consistently applied and communicated**. The crucial point here is that the effectiveness of policy depends not only on how effective it would be *if everyone were to do what is asked of them*, but also on whether it can be understood by the general public as an effective solution to the problem, because this determines whether they *actually do what is asked of them*. Simpler policies may be more effective than more complex ones that in theory would be better but in practice will not be, because they are harder to communicate or to follow.

Simple, explicit rules have a role to play here, because they are easier to self-police, make conditional cooperation salient and are enforced among the public through social disapproval. Concrete rules help to sustain cooperative behaviours, regardless of whether there are official sanctions for transgression.

In sum, perhaps the most important lessons to extract from the current exercise concern how to support cooperative behaviour in a nationwide collective action problem. **Policymakers need to search for simple rules, whether legally binding or otherwise, that are easy to follow and that can be straightforwardly shown to generate the collective benefit if everyone follows the rule**. Where this is achieved, the COVID-19 pandemic shows us that the large majority are more likely to cooperate voluntarily and, to a substantial extent, to self-police the rule.

CHAPTER 1

Introduction

1.1 BACKGROUND

The COVID-19 pandemic presented governments around the world with a challenge that was unprecedented in the modern age. Modern societies, especially liberal democracies, place a high value on liberty and citizens' rights to make choices for themselves, independently of government. Freedom of choice is, of course, always limited to some degree, given the potential for individuals and groups to cause harm to others or to wider society; behaviour is constrained by the legal system. However, a very substantial proportion of the constraints that govern our everyday behaviour as citizens are determined not by the law, but by principles, habits and social norms. More broadly, our behaviour is shaped by culture. In large part, these constraints on behaviour are policed by a combination of personal ethics and forces of social approval and disapproval. Most of us care about how we affect other people, how our actions are perceived and what other people think of us. The challenge presented by the pandemic, as became rapidly apparent early in 2020, was that most of the normal, everyday social activity undertaken by individuals suddenly had implications for the safety of everyone else we came into contact with. The principles, habits and norms that guided our day-to-day behaviour needed to be radically and quickly revised in response to a new and dynamic threat.

In the most simple terms, especially prior to the development of a vaccine, behaviour was our best defence against the virus. This unavoidable fact presented governments with difficult issues. Could people be relied upon to change their behaviour *voluntarily*? Would people just do the right thing? Could governments not only communicate what needed to be done, but communicate it in a way that secured compliance from the large majority of citizens? Governments everywhere faced an emergency that required them to try to solve a massive, society-wide collective action problem. Coordination in the face of such a problem required effective and sustained communication. Moreover, government communication needed to be of different sorts. In the first instance, the public needed to understand the basic facts about how the virus spread and its potential risks. In Ireland, this communication came mostly from medics, scientists, the Department of Health and its agencies. However, once that basic knowledge had largely been imparted to the public, the focus quickly and inevitably shifted to the implications of the required behaviour change for personal wellbeing and wider society, and to the inherent trade-offs involved. Thus, from early in the pandemic and throughout, communication from the central coordinating parts of the Government was vital too.

What was the best way to communicate the changes required? Given an initial response, could behaviour change on the scale required be sustained? Would people respond adequately to mere guidance and informal rules, or would legal sanction and enforcement be needed? How might communication best secure cooperation without the need for such sanctions?

To some extent, even at the beginning of the pandemic, useful evidence for addressing these questions could be found in previous research in behavioural science. Rapid efforts were made to collate this evidence and its implications into a digestible form (Lunn et al., 2020a; van Bavel et al., 2020). Relevant pre-existing evidence is briefly summarised below as background to the present report. However, while some of this evidence had been collected during previous emergencies, none of it came from an emergency of the scale and scope of the COVID-19 pandemic. Thus, at least in part, governments were in uncharted waters. To decide on a course, evidence and feedback needed to be gathered and analysed in real time.

1.2 STUDY AIMS

It was in this context that the Social Activity Measure (SAM) was commissioned by the Department of the Taoiseach. The study was designed and undertaken by the Behavioural Research Unit at the Economic and Social Research Institute (ESRI). The central logic of SAM was that if behaviour was our best defence against the virus, then it would be useful to measure it in as much detail as possible on an ongoing basis. SAM adapted a data collection technique called the 'Day Reconstruction Method', originally developed by Kahneman et al. (2004). This method, described in more detail below, is designed to prompt more accurate recall of recent behaviour and daily life experience. The technique was used to develop a survey that could be undertaken anonymously online. SAM set out mainly to record social activity that was relevant to transmission of the virus, but also to measure individuals' perceptions, understanding and attitudes towards the pandemic. SAM could then be used both to track behaviour over time and to investigate some of the driving forces behind that behaviour.

SAM was carried out fortnightly, starting in late January 2021. In the end, a total of 36 waves of data collection were undertaken to the end of June 2022, after which the study was discontinued. The results of each wave were published as brief reports accompanied by slide-decks on the website of the Department of the Taoiseach (https://www.gov.ie/en/collection/a7ee4-see-the-results-of-the-social-activity-measure-behavioural-study/). Each of these brief reports naturally tended to focus on any immediate changes to behaviour or public perceptions, or on issues of particular relevance at the specific time. Given the timeframe available for analysing each wave, broader research questions that might be answered by taking

a longer-term perspective and using the data across the entire timespan of collection were rarely considered.

By contrast, the present report adopts that longer-term perspective. The SAM data cover 18 months of life in Ireland during a global pandemic. For the entire period, the public were provided with information about new COVID-19 case numbers and guidance in relation to appropriate and safe behaviour from a public health perspective. This type of information was mainly provided by the Chief Medical Officer, other members of the National Public Health Emergency Team (NPHET), the Department of Health and the Health Service Executive (HSE). For most of the period, many aspects of everyday life were subject to restrictions, based on rules and guidance that varied over time, aiming to balance assessments of risk associated with the constantly changing epidemiological picture against the social and economic sacrifices entailed by ongoing restrictions and guidance. Communication on these matters was much broader, involving central communication from the Department of the Taoiseach and the Government Information Service, as well as coordination of communication across government departments. During the period of study, central government communication about COVID-19 was a daily occurrence.

Given this picture, the SAM data may offer insight into how the public responded to communication of the risk, guidance and rules, as well as the communication of the collective need for everyone to coordinate their actions into a society-wide response that aimed to limit not only direct harms from the virus, but also indirect harms arising from the behaviour changes required. The aim of the present report is to extract from the data any lessons that can be learned in the event of future scenarios that might bear similarities to the pandemic. Most obviously, this includes the possibility of future public health emergencies of sufficient scale and scope to require a national response. In addition, parallels might be drawn to other potential kinds of emergency, such as financial, meteorological or environmental ones. Indeed, in principle, the data might be useful for understanding any future situation that requires the Government to lead a coordinated and collective public response in the face of a national-level threat. Some findings may even be helpful for considering efforts to coordinate behaviour change over longer timeframes, such as is envisaged in the policy response to climate change.

1.3 COLLECTIVE ACTION PROBLEMS

One reason for believing that the data contain useful lessons is that the pandemic forced upon the population what behavioural scientists refer to as a ‘collective action problem’. Problems of this sort are not uncommon. Solving such problems in future might be helped by any indications of what was driving behaviour during

a serious, national collective action problem like the pandemic. This subsection therefore offers a brief review that helps to contextualise the forthcoming analysis.

The essence of a collective action problem is that individuals' personal interests conflict with society's collective goals (Olson, 1965; Ostrom, 1990). A vital societal aim during the pandemic was to prevent (or at least slow) infection, but doing so required people to curtail their social and economic activity; we were required to make sacrifices for the public good. Failure to do so by any one individual would have little impact on the collective outcome and, in many cases, the personal risk to the individual would be low. Yet if, facing this calculus, large numbers of individuals decided not to cooperate, the societal outcome could be calamitous. Our incentives as individuals were hence at odds with our collective incentive as a society. It is important to understand, therefore, that the oft-repeated line that 'we are in this together' was not so much a piece of political rhetoric, or a social marketing strapline, as a straightforward, unavoidable and unpalatable fact.

Behavioural scientists have studied collective action problems of different sorts for some decades (albeit unfortunately under multiple different headings: social dilemmas, public goods games, tragedy of the commons, cooperation, prisoners' dilemma, common pool resource games). Hence, some useful research findings were available at the start of the pandemic. Most importantly, it was known that the majority of people, in the right circumstances, are willing to make sacrifices and to cooperate for the public good. The issue was, and remains, to learn what those right circumstances are.

At the beginning, comfort could be had from evidence that cooperation is more likely in situations of emergency (Moussaïd and Trauernicht, 2016; Drury et al., 2019). Indeed, cooperation in collective action is generally more likely as the benefit of the collective outcome increases. This implies that the more societal risk people perceive, the more willing they are to make sacrifices. Yet cooperation is not universal and far from inevitable. Most people are not simply altruistic in such circumstances, but instead behave as 'conditional cooperators' who will do the right thing provided that others do too (Chaudhuri, 2011; Thöni and Volk, 2018). Other relevant factors linked to greater cooperation include: common group identity; communication (especially clear articulation of how the behaviour will lead to the collective benefit); transparency about the cooperation of others; and a degree of punishment for those who do not cooperate.[1]

[1] The list of relevant literature on these matters is too large to be reproduced here. For review and references see Fehr and Schurtenberger (2018) and, in the context of the pandemic, Lunn et al. (2020a).

This evidence was very useful for framing communication to encourage cooperation, but these research findings were mostly derived from laboratory and field studies conducted on a small scale. Even the previous studies based on responses to emergencies were based on the behaviour of specific communities, not a nation caught up in a global pandemic. Thus, how these findings would translate to such a large-scale collective action problem was unknown. The data available for analysis in the current report permit some insights into what was driving people's behaviour over 18 months of pandemic life and, therefore, offer an opportunity to identify potential drivers of collective action on a national scale. Furthermore, to the extent that the abovementioned principles for encouraging collective action did apply, there are implications for policymakers devising central government communications in the face of collective action problems that might arise in future. For instance, communication can emphasise factors likely to promote cooperation, such as collective identity, collective benefit and the extent of positive cooperation, alongside government policy to deal with non-cooperation.

1.4 RISK PERCEPTION

A second reason to believe that the SAM data might provide some useful lessons for the future is that there are many policy issues that involve the public responding to communications about risk. During the pandemic, the risk we faced was both individual and societal. The virus meant that we all experienced some increased danger, albeit to greatly varying degrees, but it also threatened and damaged systems on which we all rely, most obviously the health service.

Fear is a strong and basic motivational force, yet also an unpleasant mental state. Risk perceptions have previously been found to drive behavioural responses in general (Sheeran et al., 2014) and specifically in relation to health behaviours (Brewer et al., 2007), although there is more mixed (and controversial) evidence about the impacts of messaging designed to generate behaviour change through fear (see Kok et al., 2018, and surrounding commentaries). The picture is further complicated by established research findings that demonstrate how public perceptions of risks are subject to strong biases. People are inclined to judge the likelihood of an outcome partly by how easily it springs to mind – the 'availability heuristic' (Kahneman and Tversky, 1973a) – but also by the emotions evoked by the specific type of risk (Finucane et al., 2000). The result is that the extent and type of media coverage and associated imagery have a substantive impact on assessments of risk.

Overall, public communication must balance the need to inform and thereby motivate against the danger of inciting unnecessary fear. The COVID-19 pandemic was an extended period of time during which risk communication was an almost

daily occurrence. From the start of the pandemic, the Department of Health released daily figures that included the number of new cases of COVID-19. Beyond this, there were multiple cross-departmental government communication campaigns, via both traditional and social media, that emphasised the level of risk and the behaviours that could be undertaken to reduce it. Other campaigns sought to maintain a level of caution as restrictions were eased and, when the risk from COVID-19 subsided, to communicate the reduction in risk and to support people to engage again in social activity. The SAM data present the chance to examine how the public's perceptions varied over the period, whether perceptions matched the level of risk associated with the background incidence of the disease, and whether risk perceptions were linked to levels of social activity and protective behaviour.

There are, naturally, some important factors that remain difficult to address even with high-quality survey data. These include the differential impacts of specific information campaigns, which might vary in the source of information, type of message and the precise context at the time of delivery. Although at different stages of the pandemic the research team behind SAM undertook a number of experiments to test the impacts of specific messages (e.g. Lunn et al., 2020b; Robertson et al., 2022), it is not possible to isolate the effects of individual communications on the kind of aggregate data collected by SAM, given the number and complexity of other possible factors.

1.5 SUMMARY

The SAM data allowed the research team to track the social activity of the general public in Ireland on a fortnightly basis during 18 months of a global pandemic. The present study set out not only to document trends in people's behaviour and their perceptions, but to try to unpick potential drivers of behaviour and perceptions. In doing so, a main intention was to gain insight into how policymakers can support collective action at a national level, if and when this might be required again in the future. Moreover, by comparing behaviour against underlying baseline levels of infection and hospitalisation, the study aimed to gain insight into the formation of risk perceptions and how these related to behaviour. All the while, people were acting in a context where the Government was undertaking widespread and repeated communication, not only of risk and public health guidance, but in support of collective action that balanced the risk from the virus against the sacrifices everyone was being asked to make to contain it.

CHAPTER 2

The Social Activity Measure

The fundamental idea of the Social Activity Measure (SAM) was to try to measure behaviour during the pandemic as accurately as possible. Data were collected fortnightly from a representative sample of 1,000 adults (aged 18 and over). The study was undertaken anonymously, online, and could be completed via computer, tablet or mobile phone. The questionnaire took approximately 15–20 minutes to complete. In total, 36 waves of data were collected, beginning in late January 2021 and ending in June 2022.

2.1 SAMPLING

The sample of adults aged 18 and over was recruited from two large online panels of survey respondents held and managed by two market research companies (RED C and Ipsos B&A). These two sample frames were used on alternate fortnights. In each wave, sampling was undertaken over a period of approximately eight days, spread over all days of the week, to match target socio-demographic quotas by age, gender, social grade and region. Respondents were issued with an email invite that allowed them to link to the study. The link could be used only once. The study was programmed using Gorilla Experiment Builder (Anwyl-Irvine et al., 2020).

In an ideal world, sampling for a study like SAM would be undertaken using random probability sampling, generating a fresh, randomly selected, cross-sectional sample every fortnight. Given the time and resource constraints, this was not possible. The sampling method departed from this ideal approach both in using existing online panels of respondents and, relatedly, in having some overlap in the sampling between waves, since respondents who had previously completed the survey could do so again in later waves. Both aspects merit a brief discussion of potential implications.

Regarding the first issue, there are upsides and downsides to using online panels of survey respondents. The clearest upside is practical: it allows data to be collected quickly from a relatively large sample. Indeed, for much of the pandemic, face-to-face data collection was not even possible. A further upside to online data collection is its relative anonymity. For certain topics, survey responses collected online are likely to be more honest than those collected through in-person contact (Chang and Krosnick, 2009), which can strengthen social desirability bias (Kreuter et al., 2008) – people responding untruthfully in ways that paint them in a more favourable light. The questions explored in SAM included some potentially sensitive issues to do with privacy, blame and whether people were following official rules. Thus, anonymous online participation was beneficial.

The obvious potential downside to using online panels concerns the potential for selection bias. Individuals who agree to participate in online panels and to undertake surveys may not be representative of the broader population. That is, even if online panels are representative in terms of demographic and socio-economic background characteristics, it remains possible that people who agree to join such panels differ from the general population in important ways, perhaps in their psychological traits, which might lead them also to respond differently. In the current case, specifically, there could be some link between willingness to be on an online panel of survey respondents and how people behaved during the COVID-19 pandemic or the views that they held about the pandemic.

Companies that construct online panels go to some lengths to ensure that they are representative of the broader population, in particular by ensuring internet access for participants from social groups with less access to broadband. International evidence suggests that improved online panel construction and more universal internet usage has improved the quality of data from online panels in recent years, such that they can give similar estimates to traditional probability sampling and random digit dialling (Ansolabehere and Schaffer, 2014; Coppock and McClellen, 2019; Walter et al., 2019; more detail can be found in Timmons et al., 2020, pp. 3–4).

Nevertheless, the possibility of selection bias was one reason why the research team chose to collect data from two different panels and to alternate them between waves. In this way, as waves of SAM built up, it was possible to check that results were consistent across the two different panels, which had been recruited by two different market research companies over different periods and using somewhat different methods. A number of additional checks were also performed at various stages of data collection. Some questions included in the study (e.g. self-reported compliance with public health guidance) were designed to be comparable with questions asked by other surveys conducted during the pandemic using other sample frames (e.g. the Amárach tracking survey for the Department of Health). Additionally, as the COVID-19 vaccination campaign was rolled out, vaccination rates recorded by SAM were compared against the rates reported in administrative data on vaccinations published by the Health Service Executive (HSE). All three of these checks – between the two sample frames, between SAM and other surveys, and between SAM and administrative vaccination data – produced encouraging matches between data sources that were reported in the fortnightly reports. Overall, therefore, while the representativeness of the SAM sample could not be guaranteed, we view the data generated with confidence.

The second issue in relation to data quality was the overlap between earlier and later samples. Again, there are both upsides and downsides to this. The benefit of having respondents who complete more than one wave is that this makes it

possible to track the behaviour or views of the same individuals over time. However, one potential negative impact is that experience of having completed the survey previously might affect how the survey is completed subsequently. One possibility is that respondents might recall how they answered a question previously and, wishing to appear consistent, ensure to answer it similarly again. While possible, this is perhaps quite unlikely, because the alternating sample frames used in SAM mean that participants would have had to recall some of their responses at least four weeks after they had previously provided them. Another potential issue is that respondents who are familiar with the structure of the study might try to avoid giving responses that they have learned generate additional follow-up questions. Because some of the SAM respondents in each wave had previously completed the study while others had not, it is possible to compare responses in order to check for any disparities. Lastly, allowing participants to respond in more than one wave could have potentially introduced another form of selection bias, if those who were inclined to undertake more waves behaved differently or held different views from those who undertook fewer waves. Again, it is possible to compare responses in the successive waves of SAM data to check whether and to what extent this might be a problem.

At the point when SAM began, in January 2021, it was not envisaged that the study would run for such a long period and that, therefore, the extent of repeat participation would be as great as it eventually was. In total, the data consist of 35,998 completed surveys, undertaken by 8,330 different adults. The median respondent completed three waves of the study over the 18 months. Since the impact of repeated responding can be checked in the survey findings, we control for the issue at various points during the data analysis. There is in fact some evidence that those who undertook SAM more times may have behaved slightly differently from those who undertook it fewer times. However, the size of this effect was small compared to the findings we report here and the statistical models that we present control for how many times participants had undertaken the study.

2.2 ADAPTING THE DAY RECONSTRUCTION METHOD

The survey itself adapted an established behavioural technique for collecting recall data, i.e. where responses rely on participants' memories of events over the previous day(s) or weeks. The 'Day Reconstruction Method' (Kahneman et al., 2004) is a method of 'prompted recall'. The technique works by initially asking respondents to go back through a day and to piece it together in their minds like a series of episodes from a film. The idea is that embarking on a mental journey back through a day in this fashion makes it possible to more accurately recall aspects of that day and how the individual felt. The technique has generally been used to investigate how emotions and feelings of wellbeing vary with daily routines and

events. In SAM, we adapted it to investigate behaviour relevant to the transmission of COVID-19.

After completing consent forms, participants in SAM were given a strong assurance that their responses were completely anonymous. They were then directed to think about the previous day. They were reminded which day of the week yesterday was and instructed as follows:

> … [T]*hink of the day as a series of stages (like scenes in a film) and make a quick note of anything you did outside of your home each morning, afternoon and evening. If you stayed at home but someone called to your home (e.g. visitor, plumber, etc), take note of this too. You don't need to go into detail but try to write a few words that will remind you of where you went, what you did and who you met.*

The study provided space for participants to jot down notes about any times they left their home in the morning, afternoon or evening, or whether at any point they had any visitors to their home. The responses given in this section of the survey were not used; the purpose was to prompt memory by mentally transporting participants back to the previous day and taking them through it chronologically. Once they had undertaken this exercise, participants were then presented with a list of potential locations, such as shops, workplaces, other homes, pubs/restaurants/cafés, etc., and asked to select any that they had visited. The list was designed and piloted to be fairly exhaustive, but also contained two 'other' categories (one indoor and one outdoor). After completing this task, the method was repeated for the day before yesterday. At this stage, the study had made no mention of COVID-19.

This first part of the study was designed to generate two lists of locations visited during the previous two days, as accurately as possible. These lists were then used to 'branch' the survey. For each type of location, participants were directed to modules that contained questions specific to the location. These modules established more detail about the location, such as the kind of shop people had been to, the type of hospitality venue (pub, restaurant or café), the precise outdoor location (park, farm, cemetery, etc.) or indoor location (church, library, airport) they had visited, and so on. Participants completed a module for each location they had been to. If they had visited a type of location more than once, this was recorded and one occasion was selected at random for obtaining more detail. For all locations, participants were asked detailed questions about how many people from other households they had arranged to meet there, how long they had been there, whether soap or sanitiser was provided for cleaning their hands, whether they had used it, whether they maintained a two-metre distance from other people, whether they wore a mask and, for all indoor locations, whether the

building was well ventilated. Each module also contained some questions specific to the location. For instance, throughout the study, shops were the location that had the highest number of visitors. The survey module for shops asked participants whether they had to queue, whether staff wore masks and whether other customers wore masks. Similarly, the module for cafés, pubs and restaurants asked specifically whether the participant had sat inside or outside, or just collected takeaway. The SAM questionnaire was to some extent adaptable across waves. In later waves, once vaccine certificates had been issued and were supposed to be checked on doorways, participants were asked whether their certificate had been checked. Later waves also inserted questions in the workplace module about hybrid working and working from home. In this part of the study, questions were asked in a factual and neutral fashion; there were no evaluative questions that sought to obtain any opinions or attitudes in respect of the behaviours undertaken. Later waves, as businesses and locations opened up, did ask at the end of the modules how safe people had felt and how risky they had thought the environment was.

In this way, the study built up a detailed picture of where the individual had been and what it had been like. There are advantages to using this combination of a prompted recall method to establish where respondents had visited and a branched survey to gather detail only about places they had been. The method allowed SAM to gather much more information than would have been possible from a standard linear survey, as respondents only answered questions about the few (if any) locations where they had been. The approach also permitted more accurate aggregation of behaviours. For instance, rather than asking respondents whether they wore a mask in public places, or how often they did, the analysis could aggregate their behaviour from responses to questions about what they did in a specific time and place. As well as being more likely to be accurate, the technique built up a picture not only of individual behaviour, but also of how behaviour varied across different types of location.

2.3 PSYCHOLOGICAL FACTORS

Once the study had obtained information about all of the locations visited in the previous two days, all respondents were asked a set of questions designed to explore their perspective on the pandemic. The aim of these questions was two-fold. First, many of the questions were designed to measure psychological factors that it was important or useful to track. These included how worried people were, their overall subjective wellbeing, their expectations for the future and whether they were willing to take (or had taken) a vaccine. Many of the questions asked in this final section of the survey were asked in all 36 waves of SAM, but some varied over time in order to give insight into specific policy concerns that arose; e.g. willingness to vaccinate children, understanding of specific guidelines, use of

antigen tests. Second, a battery of questions was designed to permit investigation of factors that might be linked to behaviour and, in particular, how much social activity people were engaging in and how much risk they were willing to take. The aim was to try to understand the drivers of behaviour and, in doing so, to offer policymakers insights that might assist in designing effective policies on public health restrictions and guidance, as well as matching communications to people's perspectives on the pandemic.

Table 2.1 provides a (non-exhaustive) list of the questions and scales that were deployed to obtain relevant psychological variables for analysing the drivers of behaviour. Each of these questions was designed with a specific potential effect in mind.

Table 2.1 SAM questions for obtaining psychological variables to explore drivers of behaviour

Question	Scale
How worried are you personally about COVID-19?	1 (Not at all) – 10 (Extremely)
How tiresome are you finding it to stick to the public health guidelines?	1 (Not at all tiresome) – 7 (Very tiresome)
When thinking about the approach to the pandemic more generally, what is more important to you: preventing the spread of the virus throughout the community or the personal burden/inconvenience of restrictions?	1 (Preventing the spread of the virus more important) – 7 (Personal burden more important)
How well do you feel you understand how different activities affect your chances of catching and spreading COVID-19?	1 (Not very well) – 7 (Very well)
How confusing or straightforward do you find it to understand what is and is not allowed under the current restrictions?	1 (Very confusing) – 7 (Very straightforward)
Taking the current restrictions together and thinking about their purpose, how contradictory or coherent (i.e. what's allowed and what's not allowed makes sense as a set), do you find them?	1 (Very contradictory or inconsistent) – 7 (Very coherent or consistent)
To what extent do you think other people in general follow the recommendations from the Government to prevent spread of coronavirus?	1 (Not at all) – 7 (Very much so)
How confident are you in the Government's current handling of the COVID-19 pandemic?	1 (Not at all confident) – 7 (Very confident)
How likely do you think you would be to get caught and receive a fine if you were breaking COVID-19 restrictions in the following ways? [5 scenarios]*	1 (Very unlikely) – 7 (Very likely)

Note: * This question was fielded only while relevant restrictions were in place in 2021. The five scenarios (wearing no mask on public transport, wearing no mask in a shop/business, travelling beyond limits, attending a prohibited gathering, organising a prohibited gathering) were combined into an average 'deterrence' score.

Some of these potential drivers in Table 2.1 were relatively straightforward: fear; attention; understanding (of guidance and of transmission); fatigue; confidence in the Government; and deterrence. Others were somewhat more complex. In small-

scale collective action problems, cooperation is more likely when people can see that if everyone behaves a certain way, the beneficial collective outcome will occur. Hence, the perceived coherence of the relevant behaviours may matter and a question was designed to obtain this. In such problems, personal and collective incentives are at odds, so there was a question about the specific trade-off between the personal burden of restrictions and the collective benefit of reduced spread of the virus, referred to hereafter as the burden–spread trade-off. Cooperation is also generally more likely when people perceive that others are cooperating, so a question explored this perception.

In addition to collecting these psychological variables, SAM finished by collecting a set of standard socio-demographic background characteristics. These included age, gender, educational attainment, employment status, social grade (based on the occupation of the chief income earner), household composition, nationality and region.

CHAPTER 3

Findings

The results are organised into three sections. The first concentrates on public behaviour at an aggregate level. It provides a descriptive account of how different kinds of social activity changed over the 18-month period and how this related to the prevailing epidemiological situation, public health guidance and ongoing government communications. The focus is on what was driving the overall level of social activity undertaken by Ireland's population as a whole. The second goes into detail about how social activity varied according to individuals' socio-demographic background characteristics and their individual psychology. This section uses statistical models to try to identify the primary factors behind individual differences in behaviour and how these varied over time. The last section then examines individuals' own perceptions of the amount of risk they were taking, how perceptions varied across the period of study and which factors influenced them.

3.1 MEASURES OF SOCIAL ACTIVITY

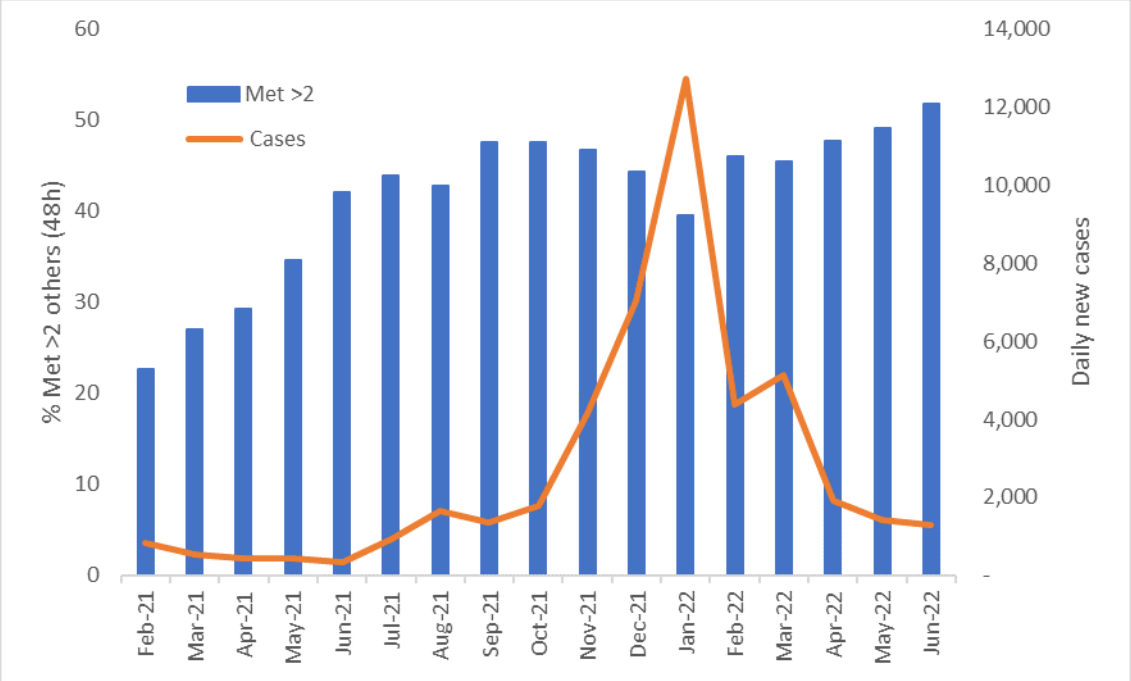
There are multiple ways to measure activity from the perspective of the likelihood of disease transmission. This section considers the incidence of close contacts, the number of different locations that individuals visited, the number of people from other households that they arranged to meet, and how much mitigation activity they undertook during social encounters. Regarding these latter mitigation activities, we concentrate on whether people maintained a two-metre distance from others, whether they cleaned their hands and whether they wore a facemask. After describing the patterns of each of these measures of activity, we focus on a composite measure that combines all of the four measures (close contacts, number of locations, number of meetings and mitigation) into an overall 'risk score', which we then use for further analysis.

3.1.1 Close contacts

The Social Activity Measure (SAM) allowed the research team to evaluate the number of close contacts with members of other households that each individual had during the previous day. Having a 'close contact' was defined as spending more than 15 minutes with someone at a distance of less than two metres, or more than two hours with someone in a room that was not well ventilated – the definition used by the Health Service Executive (HSE). Note that respondents were not asked directly whether they had close contacts. Rather, the study asked them in detail, for every location they visited, whether they had met other people, for how long, whether they had maintained a two-metre distance and in what context. The research team then aggregated these responses to determine whether each encounter constituted a close contact.

The blue bars in Figure 3.1 show the proportion of people who had at least one close contact the previous day over the 18 months. The data are presented on a monthly basis, such that each point estimate is drawn from two waves of data collection – one from each online panel. Superimposed on the close contact data is the contemporaneous mean number of daily new cases of COVID-19 recorded during the same month, as publicised on a daily basis by the Department of Health.

FIGURE 3.1 Proportion of the population that had a close contact the previous day and the number of reported daily new cases of COVID-19



The pattern is worth considering in some detail. January 2021 followed a large spike in cases, hospitalisations and deaths from COVID-19. Ireland's population was living under 'Level 5' restrictions. People were confined to a 5km radius of their homes (unless travel was essential), schools were closed, non-essential retail establishments were closed, workers worked from home wherever possible, hospitality and sporting venues were closed, and gatherings and visits to other homes were not permitted. At this time, 15 per cent of the population was having a close contact each day. The majority of close contacts occurred in workplaces, although SAM recorded some close contacts that took place in other people's homes, in violation of the restrictions. During this first quarter of 2021, the number of daily new cases of COVID-19 fell substantially, as the restrictions successfully reduced transmission of the virus. Figure 3.1 shows that the proportion of the population having at least one close contact increased somewhat before Level 5 restrictions began to be eased in April 2021. Over the following six months, restrictions were gradually eased and the first vaccine dose was rolled out to the

population, beginning with people in older age categories. The proportion having close contacts increased fairly steadily throughout this period, with a temporary reduction in August that coincided with a rise in cases. However, when case numbers increased sharply in the autumn, the proportion having close contacts fell back. It only increased again after January 2022, as case numbers fell and the lesser severity of the Omicron variant was established.

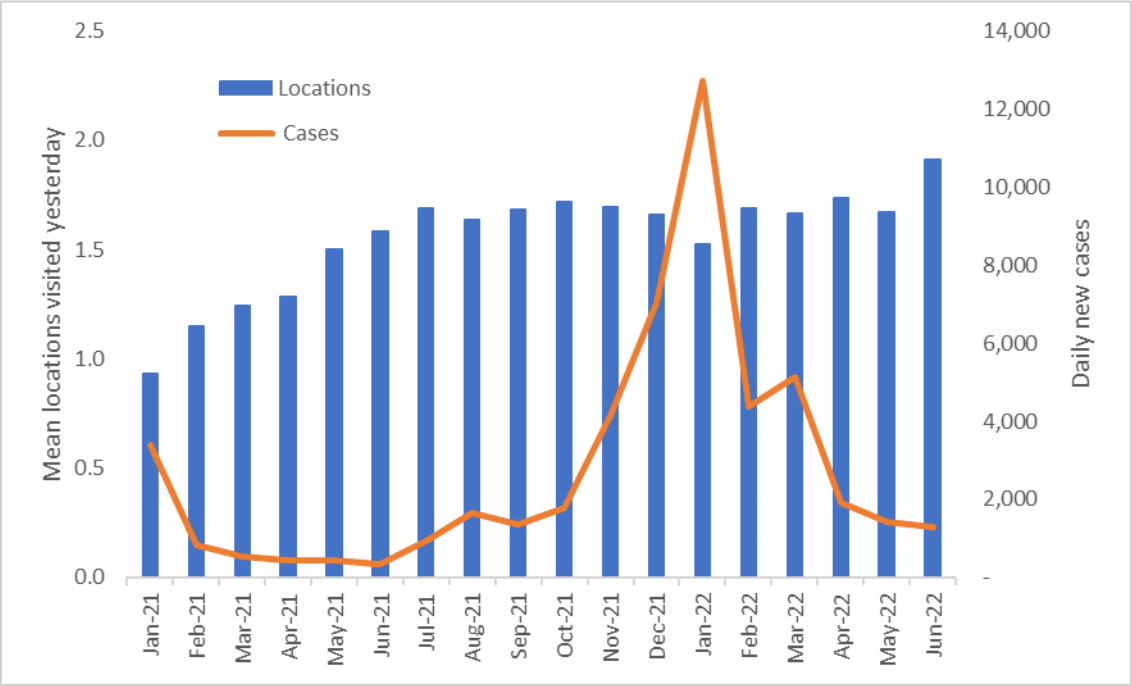
Looking across the 18 months, there is a strong suggestion that the likelihood of individuals having close contacts was inversely related to the number of reported cases of COVID-19; when cases went up people reduced their close contacts and vice versa. While it is not possible based on these data to establish a causal relationship, it is worth noting that the opposite relationship would be predicted based on how close contacts affect the likelihood of transmission – increasing close contacts would drive up cases (albeit with a time lag). The data are more consistent with the proportion of close contacts responding to the epidemiological situation.

Since this relationship will be examined further and in some detail in forthcoming charts, it is worth considering how the linkage might operate. Much of the variation in Figure 3.1 occurred during periods where restrictions and guidance remained unchanged. Hence these data are consistent with the notion that the Government's strategy of openly communicating the daily epidemiological situation resulted in a situation where people responded to changes in the apparent level of risk independently of changes in rules and guidance. At this simple descriptive level, the data are also consistent with previous work on collective action problems indicating that cooperation is more likely the greater the perceived collective reward – in this case risk reduction. However, it is important on observing this relationship not to presume a direct causal link between the reported numbers and people's behaviour. During times when case numbers were rising, ongoing communication from medical experts and from central Government was likely to urge greater caution and to emphasise the need to behave in ways that lowered collective risk. The evident correlation between the case numbers and people's behaviour might not have arisen in the absence of this communication.

3.1.2 Locations visited

Figure 3.2 shows the mean number of locations visited each day, again with the number of new cases superimposed upon it. The pattern is similar. An inverse relationship with cases is again apparent. The closeness of the relationship is perhaps less pronounced than for close contacts in Figure 3.1, although the increase over the 18-month period may be affected by a natural tendency to return to the number of locations outside the home that people visited on a daily basis during normal times, which is not known.

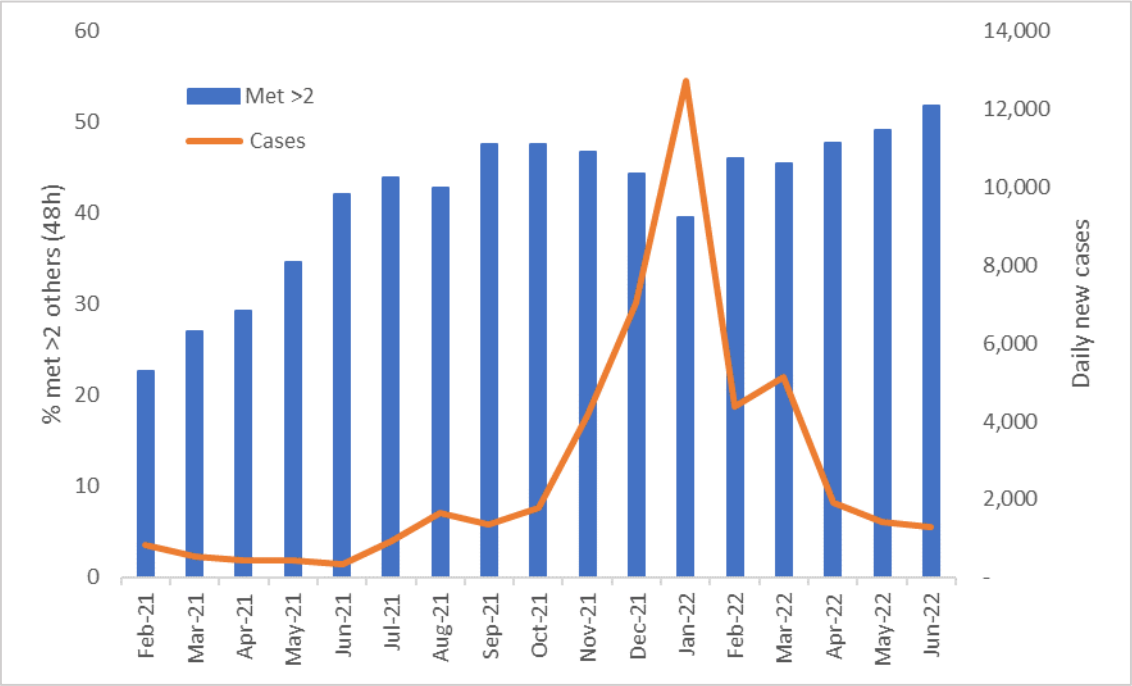
Figure 3.2 **Mean number of locations outside of their own homes that individuals visited the previous day and the number of reported daily new cases of COVID-19**



3.1.3 Meeting people from other households

Figure 3.3 plots the proportion of the population meeting up with at least one person from outside the household per day (two or more over a 48-hour period). Perhaps unsurprisingly, the pattern is very similar to that for close contacts, with a strong suggestion of an inverse relationship with case numbers. If anything, the relationship appears a little stronger, with dips in upward trends that coincide precisely with temporary increases in cases in August 2021 and March 2022.

Figure 3.3 **Proportion of the population meeting up with more than one person from another household per day and the number of reported daily new cases of COVID-19**

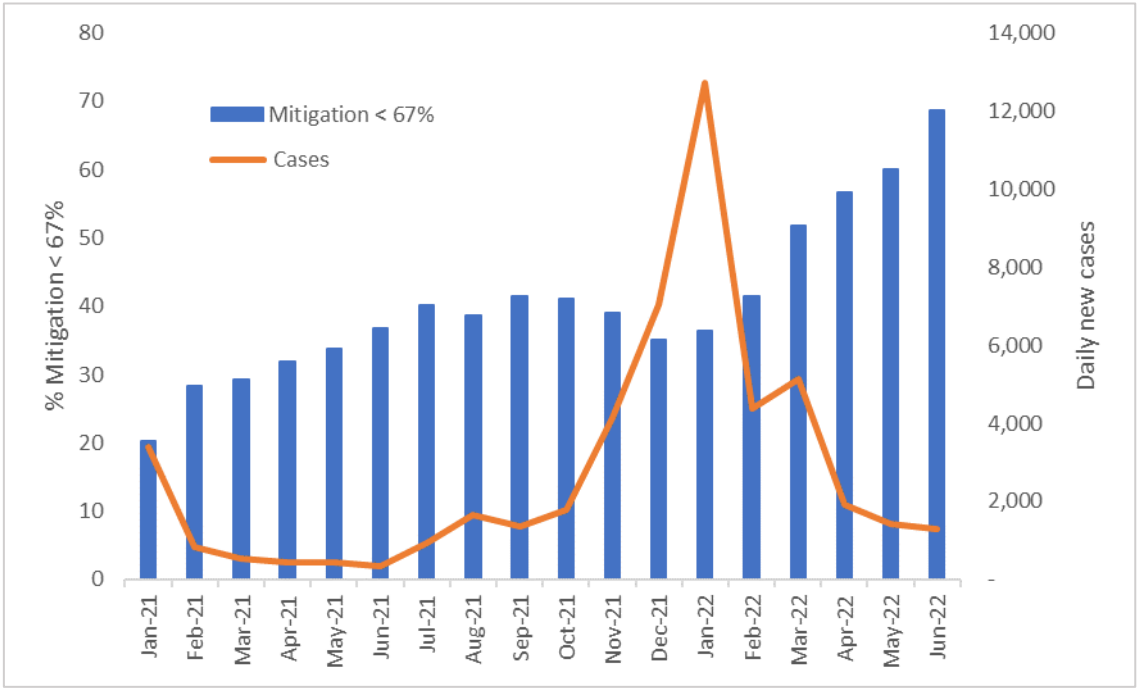


3.1.4 Mitigation activity

Figure 3.4 displays a similar analysis for mitigation behaviours. For each location that an individual visited during the previous 48 hours, SAM recorded whether they maintained a two-metre distance from others, whether they cleaned their hands (with sanitiser or soap) at the location and whether they wore a facemask. We transformed the answers to these questions into a percentage score that captures how often each individual engaged in these three mitigation behaviours as a proportion of the opportunities to do so (i.e. three at each location visited). Figure 3.4 plots the proportion of the population that undertook mitigation behaviours two-thirds or less of the time. This changed substantially over the course of the 18-month period, from just 20 to 69. As with the other risk measures above, there is a strong suggestion that mitigation behaviour was related to reports of daily case numbers. However, there is also a noticeable difference in the pattern in 2022. At the end of February, mandatory wearing of facemasks was relaxed across the public locations where regulations were still in place, most notably on public transport, although official guidance recommending people to wear masks remained. It is noticeable from Figure 3.4 that the removal of this specific rule was followed by a more rapid change in behaviour than can be seen across the other measures. This is consistent with findings from previous research on collective action suggesting that many people are 'conditional cooperators' who will do their bit for the collective effort provided they see others doing so too. Wearing a

facemask is the most immediate and visible signal of people making an attempt to mitigate the virus. Once some people stopped wearing masks, the conditional cooperators were also likely to stop. The situation changed rapidly from one where almost everyone engaged in regular mitigation to one where only a minority did so.

Figure 3.4 **Proportion of the population undertaking mitigation activity less than two-thirds of the time and the number of reported daily new cases of COVID-19**



Note: Mitigation activity: wearing mask, cleaning hands, maintaining distance.

3.1.5 Combined risk score

Figures 3.1 to 3.4 suggest that all four selected measures of activity had a relationship with the reported number of new daily cases. However, since SAM only recorded detailed behaviour over the previous 24–48 hours, any one of these measures of social activity recorded at a specific time might not fully reflect an individual's approach. People's activity levels would be likely to fluctuate from day to day, depending on the day of the week, opportunities, daily routines, moods, etc., resulting in some individual-level measurement error in how much risk an individual might take across their social activity as a whole. Indeed, Table 3.1 does show that each of the four measures in the SAM data is positively correlated with the others at the individual level: people who met up with many people were also less likely to mitigate, more likely to have a close contact and more likely to visit multiple locations. However, it also shows that these correlations are fairly modest. No one variable captures activity as a whole. This makes sense. Individuals who were more concerned about contracting the virus might adapt their behaviour in multiple ways, not all of which would be captured by recording their behaviour at

one point in time. In simple terms, these risk measures are measured with noise. For more detailed analysis, it is therefore helpful to generate a single aggregate measure of overall social activity that combines the four measures and, in doing so, reduces (though does not eliminate) the noise. To accomplish this, we calculate a measure that we refer to as a 'risk score'. We simply assign one point for each of the four behaviours. The risk score for each individual therefore varies between zero and four, where zero indicates little or no social activity, and hence little risk of contracting or transmitting COVID-19, and four indicates the most possible activity and highest level of risk.

Table 3.1 Individual-level correlations between the four components of the risk score

	Close contact	2+ locations visited per day	>1 person met per day	Mitigated < 2/3
Close contact	1			
2+ locations visited per day	0.24	1		
>1 person met per day	0.42	0.32	1	
Mitigated < 2/3	0.49	0.22	0.23	1

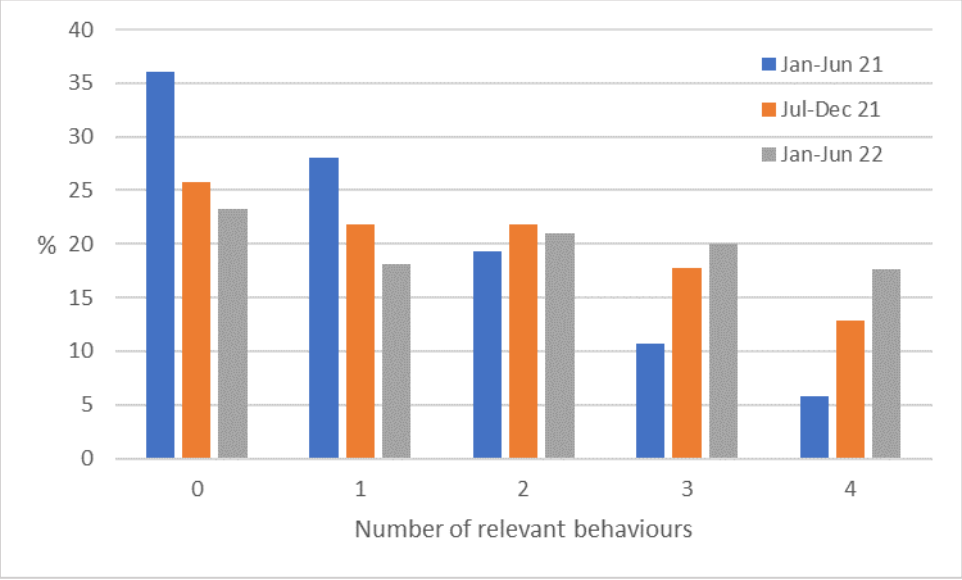
Although we refer to this as a risk score, the actual amount of risk taken at any one time might vary, depending on the background prevalence of the virus, the specific variants that were in circulation or dominant, the phase of the vaccine rollout, and so on. The risk score is intended only to proxy the social activity relevant to the risk of transmission undertaken by an individual, where a higher score implies greater risk than a lower score. It is also important to understand that this score does not map to a medical or public health definition of risk. Each of the four measures is a self-reported proxy for risk and the overall risk score simply combines the measures, assigning equal weight to each. In reality, the risk associated with meeting up with people from outside the household or having a close contact would have depended on who those other people were and when the meeting took place. Similarly, the risk associated with visiting multiple locations would have depended not only on the type of location but specific properties of that location, while mitigation behaviours would have varied in effectiveness depending on the surrounding environment. Despite these limitations, there is a strong logic for combining the self-reported behaviours into a single risk score: a combination of multiple approximate measures of an underlying propensity is likely to generate a better measure of that propensity. Hence, a combined risk score is likely to permit a more sensitive exploration of relationships between behaviour and other variables, as undertaken in the following sections.

3.2 CHANGES IN RISK SCORE OVER TIME

3.2.1 Increasing social activity

Figure 3.5 shows how the distribution of risk scores evolved by splitting the 18-month period into three six-month periods. The distribution shifted strongly to the right, as more and more of the population increased their level of social activity and reduced precautions intended to mitigate spread of the virus. It is nevertheless notable that for the first six months of 2022, more than one-in-five of the population were still avoiding close contacts, visiting fewer than two locations outside of their homes per day, meeting up with no one from outside their household in a 48-hour period and engaging in the three specified mitigation activities more than two-thirds of the time when outside the household. This may strike an observer as quite a high level of caution, given the dominance of the more benign Omicron variant at that time, and the associated lifting of public health restrictions. The figure may also appear surprising, given the contemporaneous increases in activity and traffic within towns, cities and communities, coupled with a visible reduction in mitigation activities. However, it needs to be borne in mind, firstly, that we do not know the level of social activity during 'normal times' and, secondly, that (by definition) the minority continuing to be cautious were the people the majority were least likely to encounter.

Figure 3.5 Distribution of risk scores over six-month periods



3.2.2 Relationship with restrictions

Armed with this more sensitive measure of overall risk taken through social activity, Figure 3.6 plots the mean risk score each month, again with the number of new daily cases superimposed. In addition, the timings of the main changes to public health restrictions are indicated. Unsurprisingly, given the relationship

between each of the components of the risk score and the number of new daily cases already described, the same inverse relationship is apparent for the risk score. There was a strong increase in activity as cases fell in the spring and early summer. The greatest monthly increase occurred between May and June, following the lifting of the intercounty travel ban and the opening of non-essential retail. However, social activity levelled off as cases began to rise again in July. Perhaps surprising is how little overall activity changed following some major changes in restrictions in summer and autumn 2021, such as the return of indoor dining and the reopening of pubs. Although the recommendation to work from home where possible remained in place, there were many restrictions on different types of events and businesses that were gradually lifted over this period; the chart shows only the larger headline changes that applied to broad sectors. Nevertheless, the pattern suggests ongoing caution linked to the increase in daily case numbers, despite the lifting of restrictions and the successful rollout of COVID-19 vaccines, which were made available to 18–34 year olds in July.

Figure 3.6 Mean risk score, the number of reported daily new cases of COVID-19, and major changes to public health restrictions

Note: Mean risk score factors: whether the individual had a close contact the previous day, visited two or more locations per day, met up with more than one person from another household per day, took mitigation actions less than two-thirds of the time. Major changes to public health restrictions: easing of restrictions in green.

In summary, this analysis suggests that the dominant forces driving social activity were gradually increasing that activity as, firstly, more people were vaccinated and, secondly, public health restrictions were lifted, but with activity tempered by the concurrent epidemiological situation. Behaviour change was cautious and slow; large step-changes in response to specific developments did not occur.

3.2.3 Cases, hospitalisations or deaths?

Thus far, while the patterns of behaviour depicted and described above indicate a link between social activity and the daily numbers of new COVID-19 cases throughout the period, we have limited insight into the nature of the link. It is worth noting that the inverse (or negative) relationship displayed (i.e. as cases went up, people reduced social activity, and vice versa) is likely to have been dampened by the more simple positive force linking activity to cases: greater activity would have increased infection. Hence, the apparent relationship shown may somewhat understate the correlation between higher case numbers and more cautious behaviour.

Importantly, the association displayed remains correlational; it is not clear that the public were responding specifically to the case numbers. Moreover, as a steadily greater proportion of the population received their vaccinations during 2021, it became apparent that the primary benefit of vaccination was defence against severe disease, rather than reduced infections. Given this, public and policy attention might have somewhat shifted away from daily cases numbers, which had received a lot of attention at the beginning of the pandemic and throughout 2020, and focused instead on indications of more serious disease, such as hospitalisations and deaths. These figures were also reported on a daily basis and were themselves strongly correlated with the number of cases. A greater focus on hospitalisations rather than cases would also be expected if, in addition to the risk of contracting COVID-19, one of the main concerns was pressure on the health service.

The consistency and sensitivity of the SAM data allow us to carry out an analysis that sheds some light on which of these pieces of the epidemiological picture were most strongly correlated with behaviour. We compare the rates of change in the month-on-month risk score with the rates of change in cases, hospitalisations and deaths. Before calculating the differences, we first take the log of the number of cases, hospitalisations and deaths. We do this because, from a psychological perspective, it is known that people do not code numeric information linearly but proportionally. That is, the difference between 50 and 100 is psychologically similar to that between 500 and 1,000, rather than being ten times smaller. By logging the data, we transform them to match this proportional psychological coding. We then take the month-on-month differences and plot them against the month-on-month

differences in mean risk score. By doing this separately for cases, hospitalisations and deaths, we can see which had the stronger relationship with social activity.

Figure 3.7 shows the outcome of this analysis with respect to the number of cases. There is a negative (downward sloping) relationship, showing how in months when the case numbers went up, social activity went down, and vice versa. The relationship is consistent. The R^2 figure of 0.46 implies that changes in daily cases numbers can account for almost half of the variation in social activity. Figures 3.8 and 3.9 repeat the same analysis for hospitalisations and deaths respectively. There is also a downward sloping relationship between social activity and hospitalisations, but the relationship is weaker. Meanwhile, Figure 3.9 reveals no discernible relationship at all between social activity and the number of COVID-19 related deaths. The upshot of this analysis is twofold. First, the primary epidemiological measure linked to public behaviour in 2021 and the first half of 2022 remained the number of new daily case numbers. Second, this relationship was remarkably consistent.

Figure 3.7 Monthly change in risk score plotted against monthly change in average daily new cases

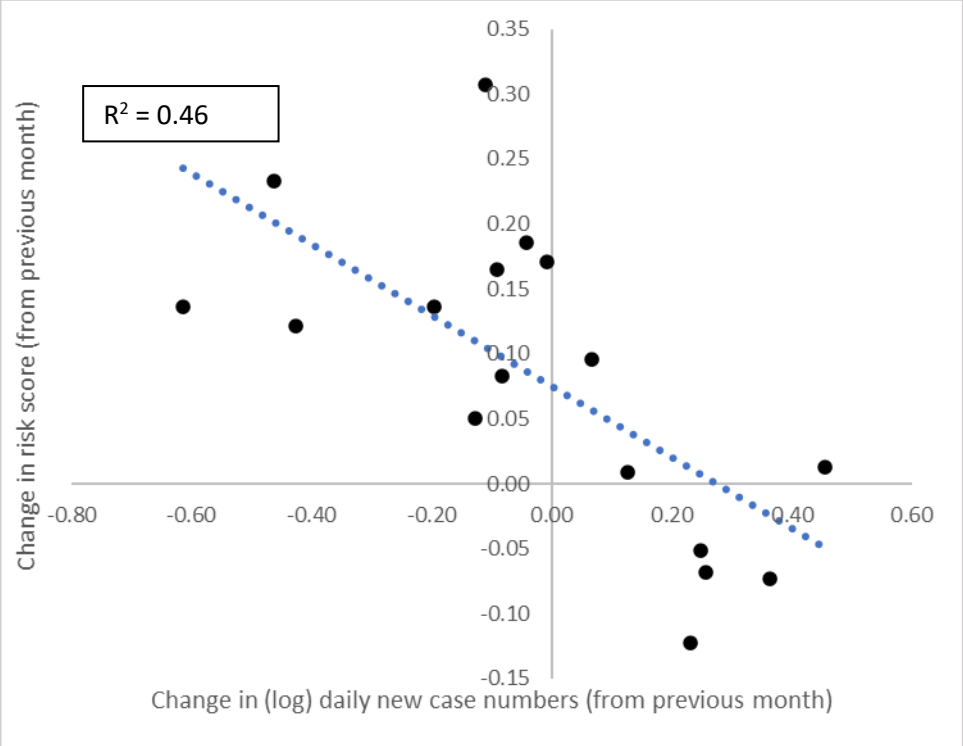


Figure 3.8 Monthly change in risk score plotted against monthly change in hospitalisations

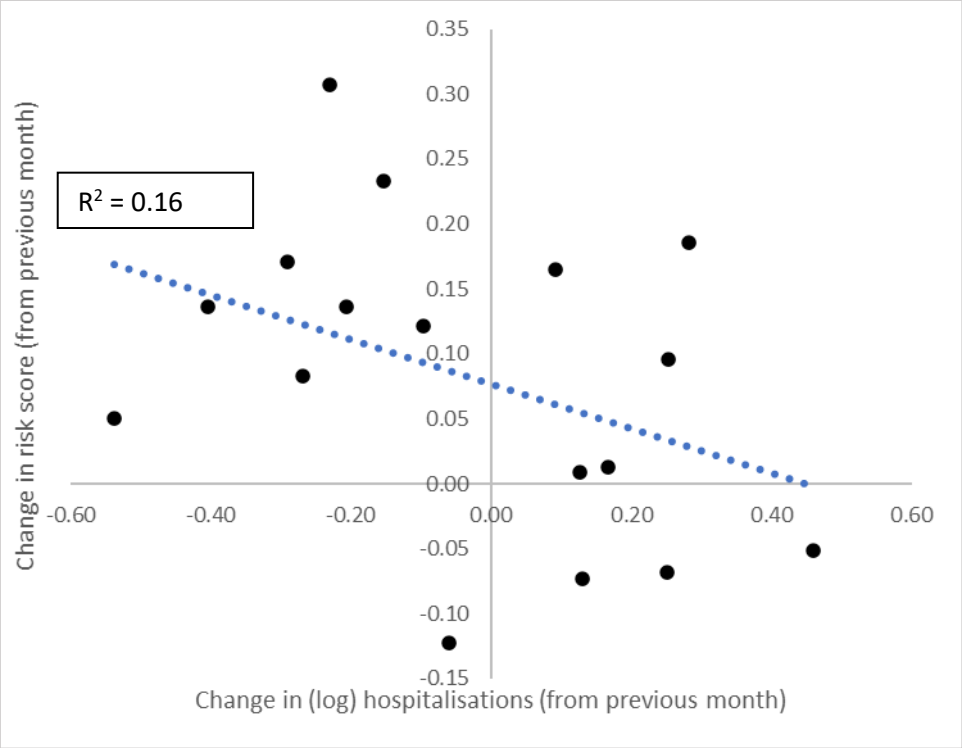
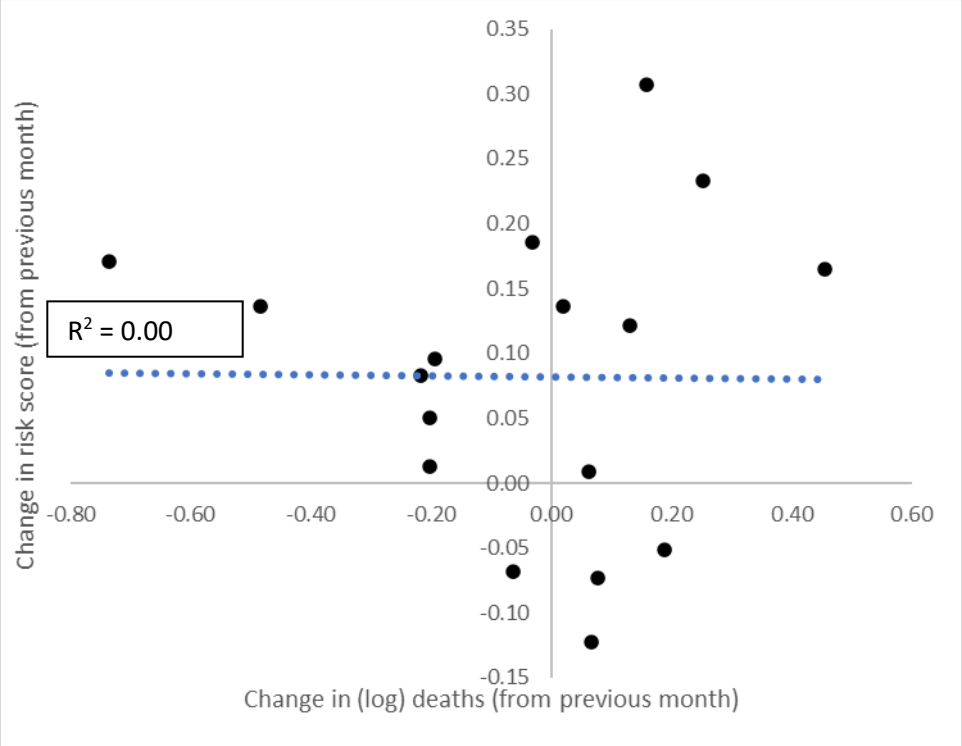


Figure 3.9 Monthly change in risk score plotted against monthly change in number of COVID-19 related deaths from previous month



3.3 RISK SCORE AND BACKGROUND CHARACTERISTICS

The analysis in the previous section concentrated on measures of the aggregate behaviour of the population. However, as is apparent from Figure 3.5, throughout the study period there was substantial variation in social activity between individuals. To some degree, this variation is likely to have reflected individual circumstances and characteristics that would be largely impervious to public policy. Some people's jobs unavoidably require them to meet many people or come into close contact with others. People also differ in their willingness to take personal risk. Yet, as is known from the previous research on collective action described in the opening section, when decisions require people to choose between their own personal benefit and wider societal benefit, willingness to make sacrifices for the public good may depend on multiple factors. These include perceptions of the scale of the benefits, common group identity, communication of the common collective response, perceptions of whether others are contributing to the collective solution and sanctions for those who transgress. Whether and how these factors would operate in the context of a pandemic was unknown. Moreover, these factors were previously identified in small-scale collective action problems, so how they might translate into the context of a pandemic is not straightforward. Importantly, many of these factors were also potentially influenced by communications from central Government (and elsewhere). Group identities and perceptions are not fixed characteristics of people, but depend on the context that individuals find themselves in and how this context is described.

This section investigates variation in behaviour across individuals and how this related to the psychological variables collected by SAM (and listed in Table 2.1). These variables were, in part, designed with research on collective action in mind, although the perceptions and attitudes that they measure are of interest in their own right. The analysis employs statistical models designed to estimate the relationships between the psychological variables and behaviour. Throughout the section, we focus on the risk score outlined in the previous section as the primary measure of behaviour.

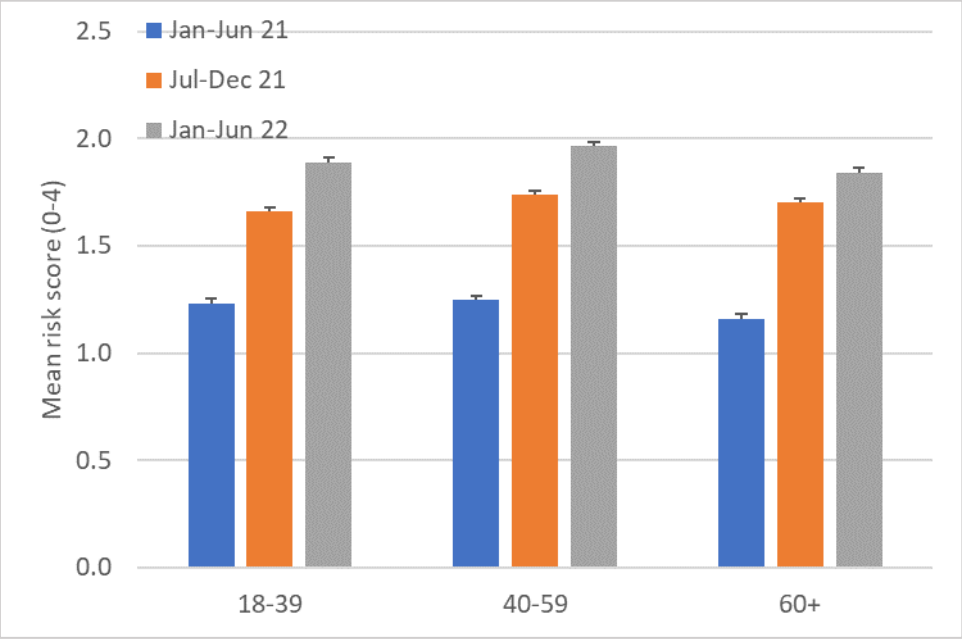
Before testing the influence of the psychological variables, we first set the scene by showing how behaviour between January 2021 and June 2022 related to a standard set of socio-demographic background characteristics. The variables that we consider are gender, age, educational attainment, social grade (the standard A–E measure based on the occupation of the chief earner in the household), nationality and urban (versus rural) residency. We also tested whether behaviour varied by region and by whether the household contained children, but because there were no consistent effects of these variables on social activity, they are not discussed further. The lack of variation in behaviour across regions, in particular, is worth noting. Public comment and debate sometimes assumed that such

differences existed, perhaps especially when comparing the Dublin region with the rest of the country. The data suggest otherwise.

3.3.1 Risk score by age, gender and working status

A more surprising aspect of the data is that there was very little difference in social activity by age. Differences might be expected for several reasons. Most obviously, older people were at greater risk from COVID-19 than younger people. There was also some media focus on younger adults following highly publicised violations of the public health restrictions that involved videos of parties and night-time behaviour, although other highly publicised violations involved public figures who were typically middle-aged or older. Multiple data sources, including SAM itself, also showed that younger adults suffered from lower average wellbeing during the pandemic, which may have made the sacrifices asked of them more arduous. Nevertheless, Figure 3.10 shows that the differences in risk score between age groups were minimal. The chart splits the 18 months of data collection into three six-month periods and compares three age groups. People at all ages increased their social activity, with only slightly lower activity among the oldest (60+) age groups. This finding is robust. It holds whether data are categorised into more than three age groups and regardless of how the time is broken up into shorter periods.

Figure 3.10 Mean risk score over six-month periods by age group



Analysing the influences on behaviour properly requires a multivariate statistical approach. This example of the influence of age helps to illustrate. While Figure 3.10 reveals that older people were slightly less socially active, this may not have been

due to age itself, but to other differences between older and younger adults. Older people are less likely to be in work and, on average, have lower educational attainment. Work in particular may have been a strong influence on behaviour. Statistical techniques that control for such differences are needed to uncover the stronger associations in the data. To try to disentangle the various factors, we therefore employ regression models that simultaneously control for all the socio-demographic background characteristics listed above. Our approach is to estimate a model for each of the 18 months and to track how the coefficients associated with each variable change on a month-by-month basis, to indicate which characteristics were most strongly associated with behaviour.

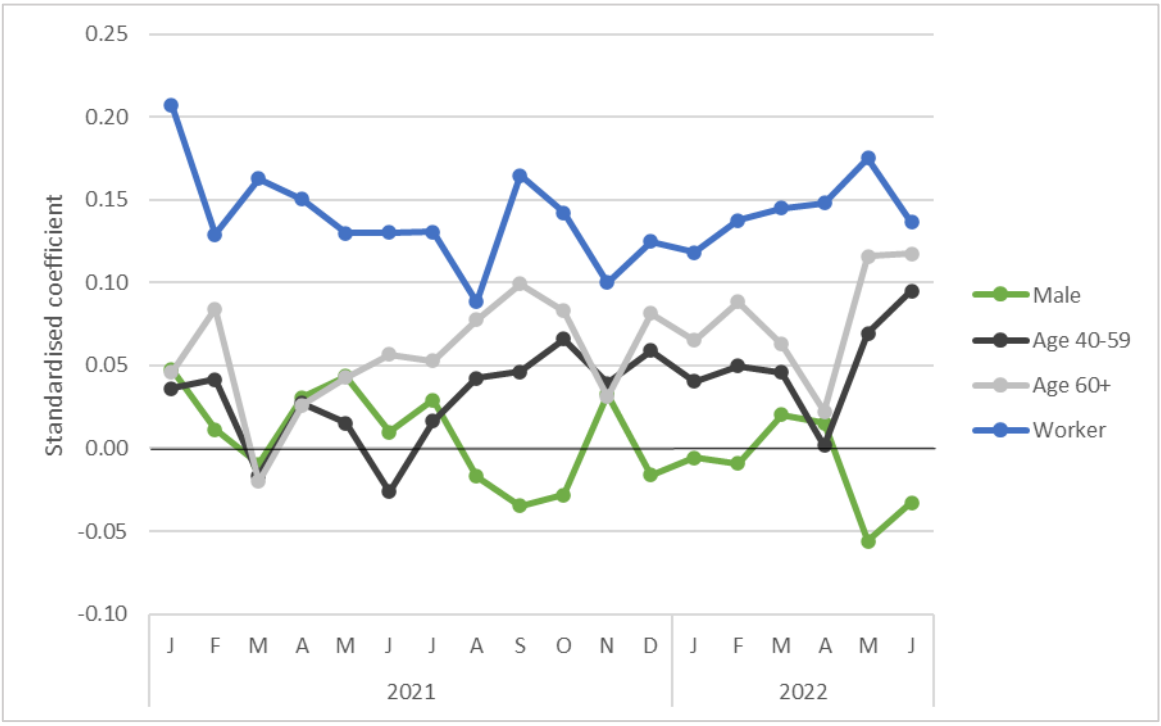
As described in the methods section, respondents typically completed more than one round of SAM, so the monthly estimation approach ensures that the reported outputs are based on models where each individual only contributes a single data point. The models also control for how many previous rounds of SAM the participant had undertaken. For ease of interpretation, the output that we report is derived from ordinary least squares (OLS) regressions with standardised coefficients. This means that the coefficients estimate how a one standard deviation increase in the independent variable related to an increase in risk score measured in standard deviations in the given month (where the overall standard deviation of the risk score is approximately 1.4 points). An example model and additional technical details are supplied in Appendix B. The results are not specific to this method and are very similar if, instead, the analysis is undertaken by ordinal logistic regression.

To allow the results to be easily discerned, we separate the coefficient plots into multiple charts. However, all of the effects reported derive from models that simultaneously control for gender, age, working status, educational attainment, social grade, nationality and urban (versus rural) residency, as well as the number of waves of data collection that respondents had previously undertaken. We make little reference here to tests for statistical significance of the results. While the relationships between social activity and all of the variables that we report are statistically significant in at least some months, wherever a coefficient is consistently above or below zero across multiple months, the relationship can be regarded as significant. Our focus is instead on the relative sizes of consistent effects.

Figure 3.11 plots the progression of coefficients for gender, age and working status. Note that the interpretation of this chart (and those) that follow involves making a *relative* comparison. Each category is compared against a reference category. For instance, the line for male indicates the difference in risk score associated with being male relative to being female. The results reveal very little difference in social activity between men and women until the very last two months of the study

period, when public health restrictions were lifted and the Omicron wave had abated. In these last two months, women were somewhat more socially active than men (although we do not know how this might compare to 'normal times'). Overall, gender differences were small.

Figure 3.11 Relationships over time between risk score and socio-demographic categories of gender, age and working status



Notes: Standardised coefficients measure difference in risk scores relative to female, age 18–39 and non-workers. Positive coefficients imply more risky behaviours

.

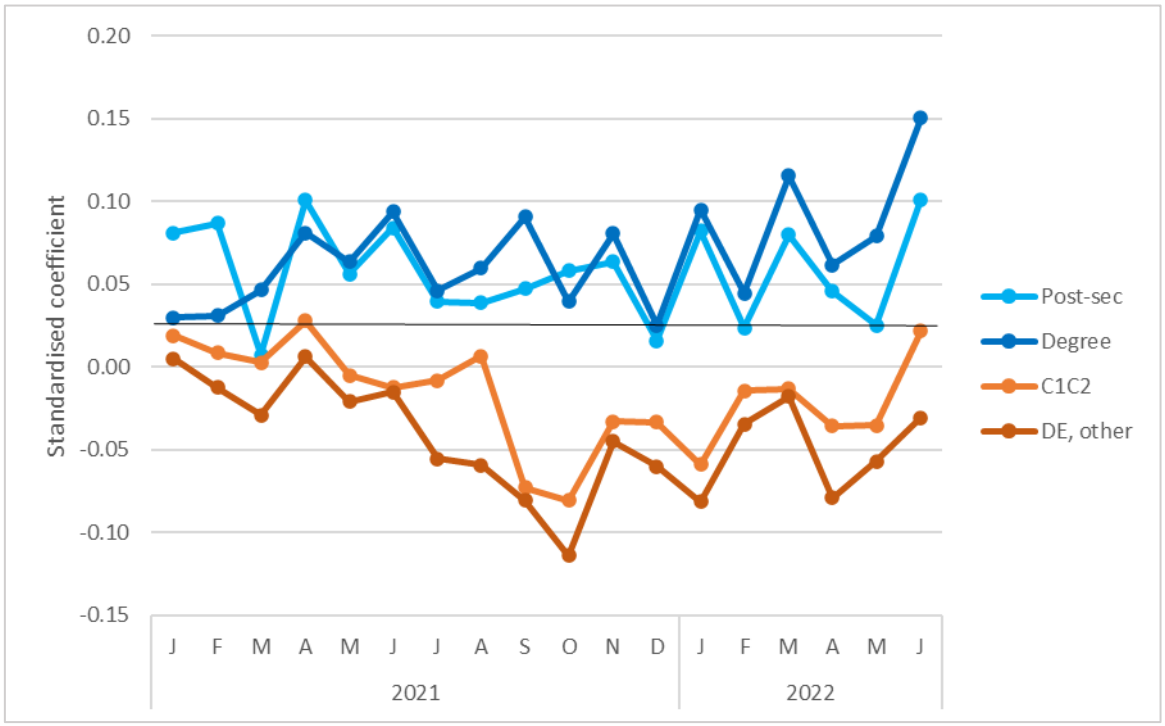
The patterns for age and working status are more striking. Work has a strong association with risk score. Note that the coefficients compare the behaviour of people in work to people not in work, controlling for other socio-demographic variables, regardless of how often they attended the workplace. The models show that, of all the background characteristics tested, being a worker was most strongly linked to greater social activity. Interestingly, once other socio-demographic background characteristics are controlled for, the relationship between age and social activity looks different. Further exploration of the data suggests that it is controlling for work, specifically, that changes the picture. There is essentially no influence of age on risk scores at the beginning of the period, when Level 5 restrictions were in place. However, from approximately the middle of 2021 onwards, the coefficients suggest that older adults tended to be more socially active than younger ones, with those over 60 being the most active. This pattern, while perhaps initially surprising, is not inexplicable. Older people were the first to be vaccinated and the fortnightly SAM data reported at the time suggest that many people waited for their vaccination before returning to activities. Also, for much of

2021, with hospitality venues closed or restricted, apart from work, much social activity centred on outdoor locations, social visits to homes and small family gatherings, all of which may fit more easily with the lifestyles of older adults. It is also noticeable that the differences between the age groups in Figure 3.11 narrowed in the lead up to Christmas 2021 and in spring 2022, coinciding with increases in cases.

3.3.2 Risk score by educational attainment and social grade

Figure 3.12 performs a similar analysis for two socio-economic indicators: educational attainment and social grade. The educational attainment coefficients compare people with a degree and those with a post-secondary qualification below degree level with the reference case of people with only second-level educational qualifications. The reference case for social grade is people in grades A and B (people in managerial, administrative, professional occupations). The coefficient plots reveal that there was little difference in behaviour under Level 5 restrictions, but that from spring 2021 onwards the behaviour of different socio-economic groups diverged. People with higher educational attainment were more socially active, while people in lower social grades were less socially active. These socio-economic effects, while consistent, were smaller than those associated with working. It might be a reasonable contention that during 'normal times' people in higher socio-economic groups will visit more locations outside the home, simply because many locations are associated with spending income. Evidence on socialising suggests that income is positively related to time spent with friends but negatively related to time spent with family and neighbours (Bianchi and Vohs, 2016). However, a gradual return to normal cannot in any event be the full story, because the greatest differences between social grades occurred in autumn 2021; people in higher social grades were apparently quicker to return to activity. More generally, the findings indicate that any suggestions that people in more middle-class neighbourhoods were sticking to restrictions more assiduously than people in more working-class neighbourhoods were wide of the mark.

Figure 3.12 Relationships over time between risk score and socio-demographic categories of educational attainment and social grade



Notes: Standardised coefficients measure difference in risk scores relative to having only second-level education and belonging to social grades A and B. Positive coefficients imply more risky behaviours.

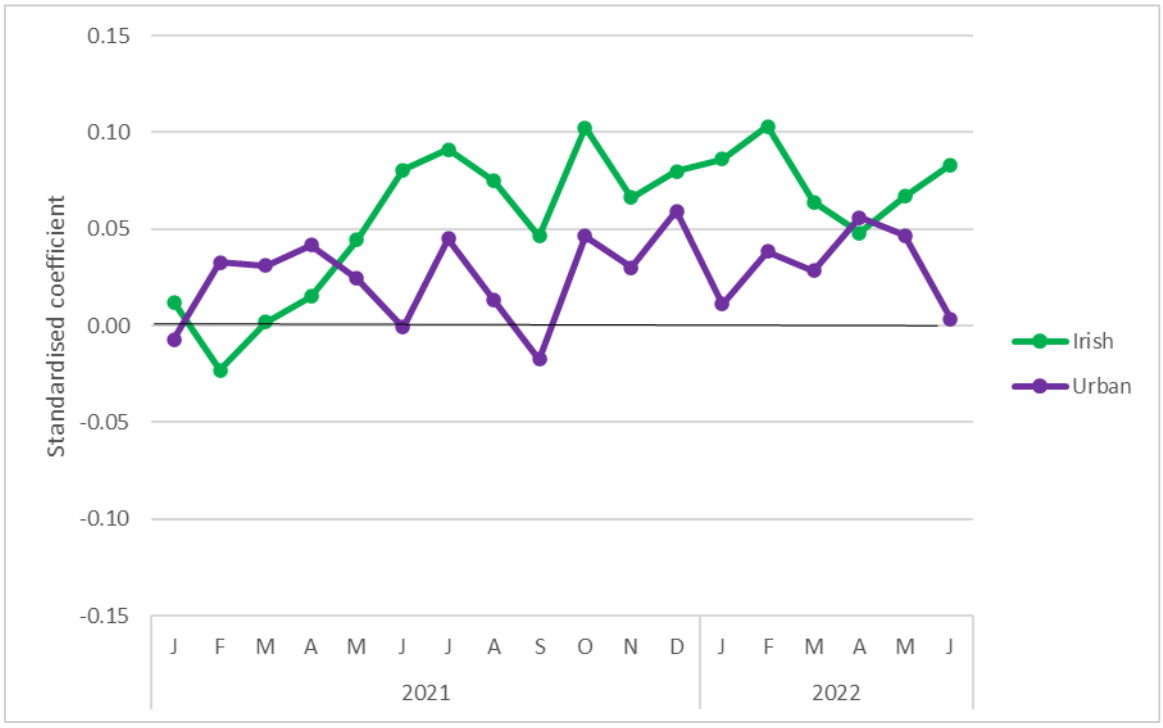
3.3.3 Risk score by nationality and residential location

Figure 3.13 completes the analysis for socio-demographic background characteristics by plotting the coefficients for Irish nationals (relative to non-Irish) and urban (relative to rural) residents. Again, Level 5 restrictions acted as a leveller, as there were minimal differences early in 2021. As the year progressed, social activity increased more rapidly among Irish than non-Irish nationals. While apparent, the effect is small compared to the effect of working. As described earlier, there are no indications in the SAM data of consistent regional differences. However, Figure 3.13 does reveal that there was a small difference in the social activity of people living in urban versus rural areas, with the former inclined towards a slightly higher risk score.

It is the nature of analyses of this sort that they highlight differences. The technique deployed is designed primarily to test for relative variation in associations. Interpretation of the results therefore requires not only paying attention to differences that are consistent, but also to the scale of these differences. Among Figures 3.11 to 3.13, the variable that has the strongest association with behaviour is working status. Nevertheless, based on the estimated relationships, variation in working status accounts, on average, for less than a half-point difference on the 0–4 scale of risk score. This helps to give an idea of the strength of the weaker relationships, which are consistent but account for even less of the overall variation

in risk scores between people apparent from the distributions in Figure 3.10. To summarise, while people with different socio-demographic backgrounds did tend to have different levels of social activity, these differences were a relatively small contributor to the overall amount of variation in behaviour.

Figure 3.13 Relationships over time between risk score and socio-demographic categories of nationality and urban location



Notes: Standardised coefficients measure difference in risk scores relative to non-Irish nationals and people living in rural locations. Positive coefficients imply more risky behaviours.

3.4 RISK SCORE AND PSYCHOLOGICAL FACTORS

If background characteristics were a relatively minor factor in how people behaved, what about psychological factors? One difficulty in analysing the psychological measures in SAM is that some of them are quite highly correlated with each other. Table 3.2 provides the correlation matrix for the nine psychological variables introduced in Table 2.1. There are a number of significant correlations, but the strongest concern the relationships between the two variables that measured people's perceptions of the restrictions and the variable measuring people's confidence in the Government, which is also correlated with perceptions of whether others were complying with restrictions. Fatigue is correlated with how much importance people place on the burden of restrictions versus limiting the spread of infection. These associations are not surprising, but they do somewhat limit the ability to disentangle the contribution of the different psychological factors to social activity. The approach we adopt initially is to add the psychological variables to statistical models one at a time, always controlling for all

of the socio-demographic characteristics already described and the number of times individuals had previously completed the survey. We also look specifically at the relationships between perceptions of restrictions and confidence in the Government.

Table 3.2 Correlations between the nine psychological variables used in the analysis of drivers of behaviour

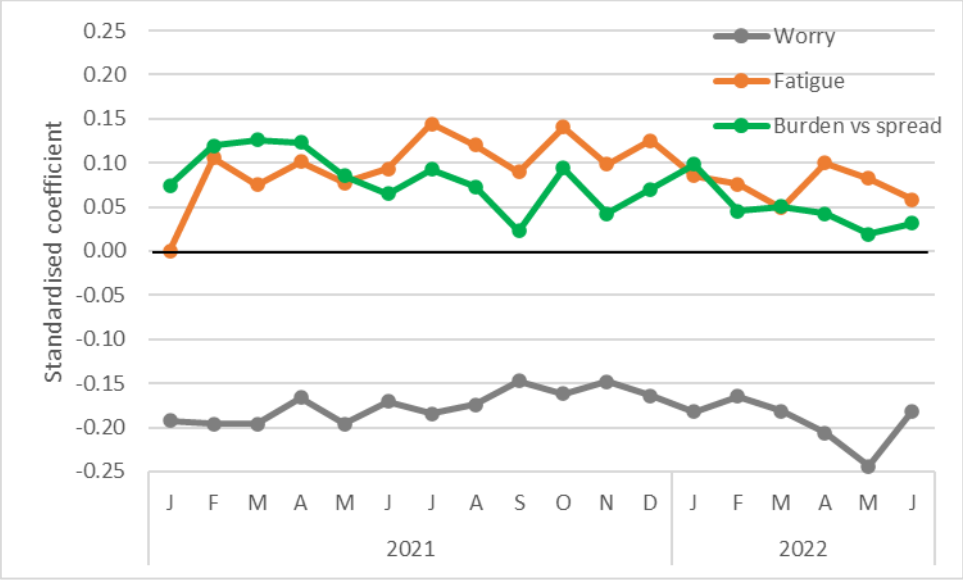
	Worry	Fatigue	Burden vs spread	Understand	Straight-forward	Coherent	Others comply	Deterred	Confidence in Govt
Worry	1.00								
Fatigue	-0.11	1.00							
Burden vs spread	-0.35	0.36	1.00						
Understand	0.12	-0.08	-0.20	1.00					
Straightforward	0.22	-0.23	-0.22	0.22	1.00				
Coherent	0.24	-0.26	-0.22	0.13	0.69	1.00			
Others comply	0.06	0.02	-0.05	0.08	0.25	0.29	1.00		
Deterred	0.10	0.06	0.03	0.01	0.10	0.11	0.10	1.00	
Confidence in Govt	0.17	-0.21	-0.19	0.08	0.47	0.60	0.32	0.08	1.00

Note: See Table 2.1 for questions and response scales.

3.4.1 Risk score by worry, fatigue and the burden of restrictions

Figure 3.14 plots the standardised coefficients for worry, fatigue and the trade-off between the burden of restrictions versus spread of infection. Of all variables tested, an individual's general level of worry about COVID-19 emerges as the strongest and most consistent predictor of risk score across the study period. The consistently strong and negative coefficient implies that the greater the overall threat people felt from the disease, the more likely they were to avoid having close contacts, meeting people and visiting locations, as well as to undertake mitigatory behaviours when they did leave home. This effect is likely to be one of the main reasons for the strong association between daily case numbers and behaviour.

Figure 3.14 Relationships over time between risk score and level of worry, reported fatigue and perceived importance of the burden of restrictions over preventing spread of infection



Note: Positive coefficients imply more risky behaviours

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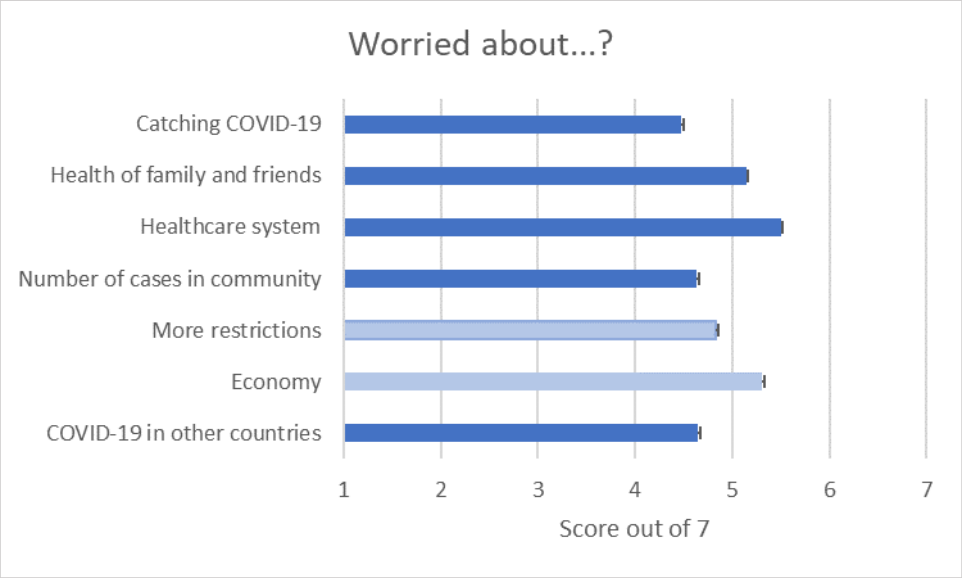
It is important to understand that this overall level of worry is not the same as an individual's worry about catching COVID-19 personally. In the final quarter of 2021, SAM asked respondents not only to rate their overall level of worry, but also to rate their level of worry with respect to specific consequences. Figure 3.15 shows mean levels of these different components of worry. Among the components of worry that were strongly correlated with overall worry (dark bars), concern about the healthcare system and about the health of family was greater than concern about contracting the disease personally. General concern about the number of cases in the community and in other countries also featured highly. The mean levels of worry about the economy and about the possibility of more restrictions were also both above the mid-point of the seven-point scale, although these two components were only weakly correlated with the overall level of worry. This analysis indicates that while people certainly had some concern about catching COVID-19, rather than personal fright, the worry that people were expressing

related to the implications of the virus for society more broadly. Thus, the strong relationship between worry and behaviour apparent in Figure 3.16 should not be read as an indication that many people were somehow living in fear.

Figure 3.15 Components of worry (Quarter 4, 2021)



Note: Dark bars indicate components strongly correlated (0.5–0.9) with overall level of worry; light bars indicate components only weakly correlated with overall worry (< 0.2–0.3).

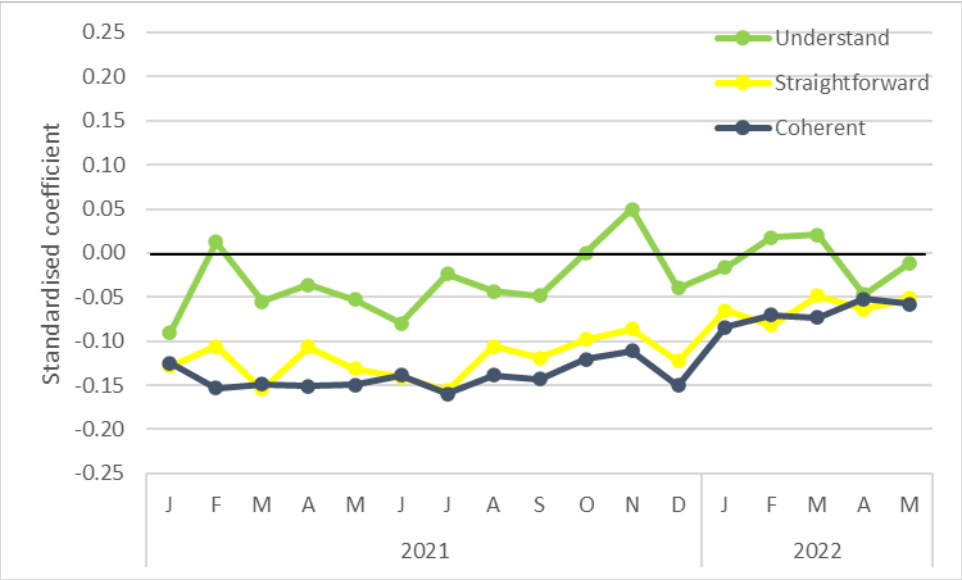
3.4.2 Risk score by perceptions of restrictions

The relationship between the coefficients for fatigue and the burden–spread trade-off in Figure 3.16 require more detailed consideration. People who found restrictions to be more tiresome were also more socially active. Yet, in the early part of the study period, with Level 5 restrictions in place, the stronger influence on social activity was how people traded off the burden of restrictions against reducing the spread of the virus. Once Level 5 restrictions were lifted, behaviour was no longer so constrained by rules, with greater emphasis placed on 'personal responsibility'. Then, simple fatigue became the stronger influence and how people traded this off against containing the disease, although still a factor, became a weaker influence. An implication is that the presence of the rule was important in making people pay attention to the trade-off at the heart of the collective action problem of combatting COVID-19, however uncomfortable that may have been for some. We return to this idea of the role of rules in co-ordinating collective action later.

Figure 3.16 shows how perceptions of the restrictions in place were also an important influence on behaviour. A large amount of evidence in behavioural science supports the view that behaviour change is more likely when the desired behaviour is made simpler and easier. In keeping with this, those who found the restrictions straightforward and not confusing tended to take less risk. Similarly,

yet distinctly, people who thought that the restrictions in place were consistent rather than contradictory also had lower risk scores. This finding matches what might be expected from broader results on collective action problems described in the opening section, whereby cooperation is more likely when repeated communication makes it clear how the collective response can generate the required collective outcome. Of the two effects, the association with the perceived coherence of the restrictions is stronger than the association with how straightforward they were to follow – when both variables are included in models, it is the dominant effect.

Figure 3.16 Relationships over time between risk score and self-reported understanding of how different activities affect the chance of COVID-19 infection, perception of how straightforward current restrictions were to follow and how coherent (versus contradictory) restrictions were

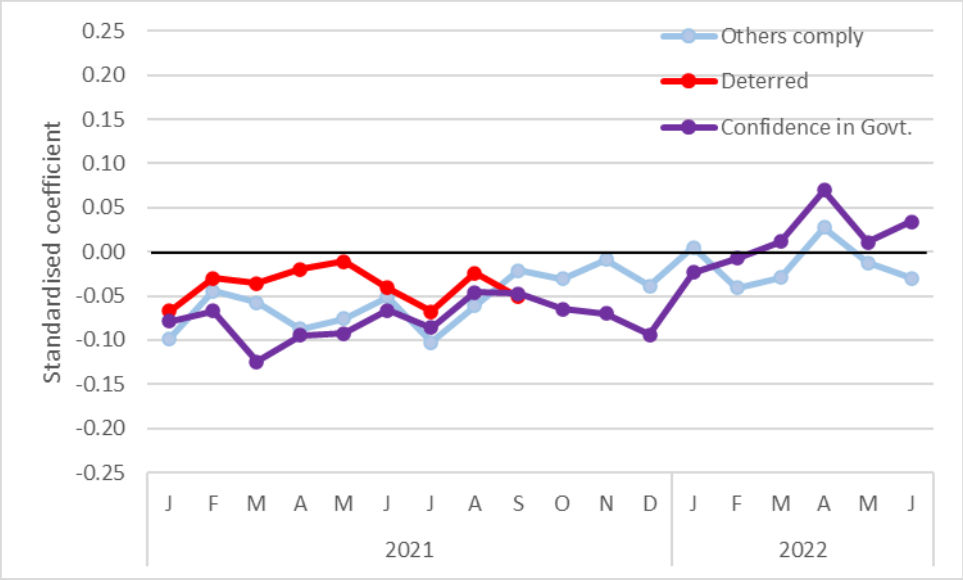


Note: Positive coefficients imply more risky behaviours.

One might anticipate that people who understood how the virus transmits would be more likely to also understand the logic of the public health guidance and, therefore, to be more willing to follow it. Figure 3.16 shows that people's self-reported understanding had a mostly negative but weak influence on risk scores. One reason for the weakness of this effect may be that people's self-reported understanding and their actual understanding are two different things. In the first five rounds of SAM, fielded between January and March 2021, we asked a set of multiple choice questions that tested comprehension of how the virus spreads. The correlation between scores on this test and self-reported understanding was just 0.06. However, in those early months, the relationship between an individual's comprehension score and their behaviour was also weak. It may be that once people had understood the basic fact that the virus was transmitted by close contact with other people, additional understanding over and above this simple fact had little bearing on behaviour.

While Figure 3.16 relates to perceptions of the restrictions themselves, perceptions of other properties of the restrictions may have mattered too, such as how many were complying, whether they were being enforced, and confidence in those drawing them up. At various points during the pandemic there were public debates about the need, or otherwise, to have stronger enforcement and punishment for noncompliance with public health restrictions. For the first nine months of 2021, restrictions were consistent enough that SAM was able to ask respondents how likely they thought it was that they would be caught and fined were they to break each of five different restrictions (see Table 2.1 for detail). One prerequisite for an effective deterrent is that people think there is a reasonable chance of getting caught. Indeed, the average score was higher than three on a seven-point scale, with substantial variation between people, indicating that most people thought there was a chance that they would be caught and fined were they to transgress, with some people thinking this was quite likely and others thinking it was unlikely. Figure 3.17 shows that those perceiving the deterrent to be a more likely outcome were indeed taking less risk, consistent with the deterrent being partially effective in changing behaviour, including in the early months when having a higher risk score would have been most strongly associated with not only taking more risk but actually breaking rules. However, this deterrent effect was small, much smaller than the associations with worry, fatigue, burden–spread trade-off and perceptions of the straightforwardness and coherence of restrictions.

Figure 3.17 Relationships over time between risk score and perception of how much other people were following public health guidance, the perceived likelihood of being caught and fined for transgressing rules and confidence in the Government's handling of the pandemic



Note: Positive coefficients imply more risky behaviours.

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The deterrence effect was also substantially smaller than the other two relationships depicted in Figure 3.17. Consistent with the notion of 'conditional

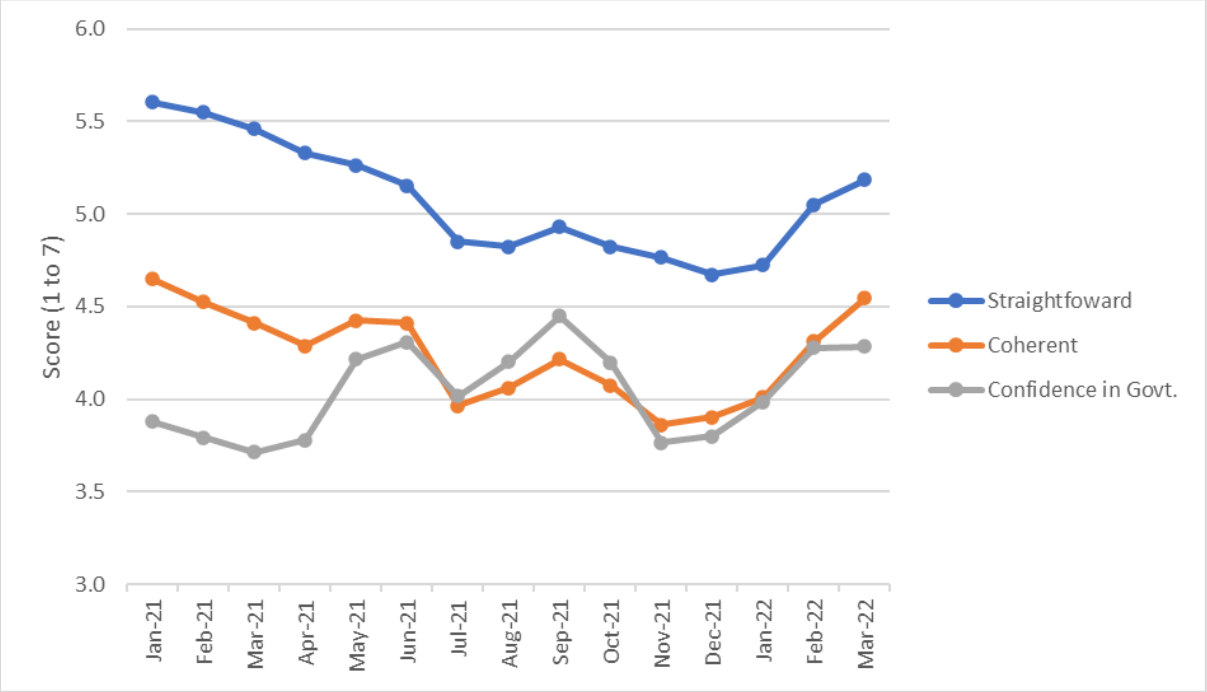
cooperation' described earlier, individuals were less socially active the more they perceived that others were following the public health guidance. One interesting aspect of this relationship was that throughout the pandemic, on average, people believed that other people tended to follow the guidance less than they did themselves. Despite this general misperception, people's perspectives on how others around them were behaving affected their own behaviour. However, Figure 3.17 also shows that this effect was not consistent across the study period, but was instead largely confined to the period in 2021 when concrete rules were in place (as opposed to mere guidance). The implication, again, is that the existence of explicit rules strengthens the behaviours driving collective action.

The final psychological variable shown, confidence in the Government's handling of the pandemic, also had an inconsistent relationship with social activity, but a significant one. This relationship appears to be relatively easy to explain. During 2021, public health guidance overwhelmingly stressed caution and was intended to encourage people to limit their activity in proportion to the severity of the epidemiological situation. Consistent with this messaging, during 2021, Figure 3.17 reveals that people who had greater confidence in the Government's handling of the pandemic tended to have lower risk scores. However, when government announcements in January 2022 stated that the Omicron variant had turned out to be less severe than feared, implying that there was no longer a public health rationale for continued restrictions, the relationship changed. In 2022, people who had confidence in the Government's handling of the pandemic had somewhat higher risk scores. Thus, Figure 3.18 provides clear evidence of the overall influence of government messaging. Once government communication was focused on the reduction in risk and no longer centred on behavioural constraints, those with most confidence in the Government changed their behaviour.

As pointed out in relation to Table 3.2, the three most significant variables in Figures 3.16 and 3.17 are themselves correlated. This means that people who were more inclined to see the public health restrictions as easy to follow and, especially, coherent, were also more likely to have confidence in the Government's handling of the pandemic. Figure 3.18 provides more insight into these relationships by plotting the time-trends of the three variables. Confidence in the Government was only below the mid-point of the scale when cases were very high and Level 5 restrictions were in place at the beginning of 2021 and again late in 2021 when there was a sharp increase in cases. Moreover, while it is not possible statistically to disentangle the direction of causality in the relationships, it is evident that confidence in the Government was closely related to perceptions of the restrictions, with all three variables influencing behaviour. These perceptions of the restrictions should not be confused with whether the policies were popular; the survey questions asked about specific properties of the restrictions, not whether people approved of them. Furthermore, how straightforward the

restrictions were to follow and how coherent they appeared overall would have depended both on the policy and how that policy was communicated. In both cases, perceptions were mostly above the midpoint of the scale. The communications of the restrictions and the reasons behind them were therefore likely to have contributed to the amount of risk that citizens were taking in their daily behaviour.

Figure 3.18 Time-trends of perceptions of the ease of following current public health restrictions, the coherence of the set of restrictions in place and confidence in the Government



Note: Data truncated at March 2022, given that almost all restrictions had been lifted.

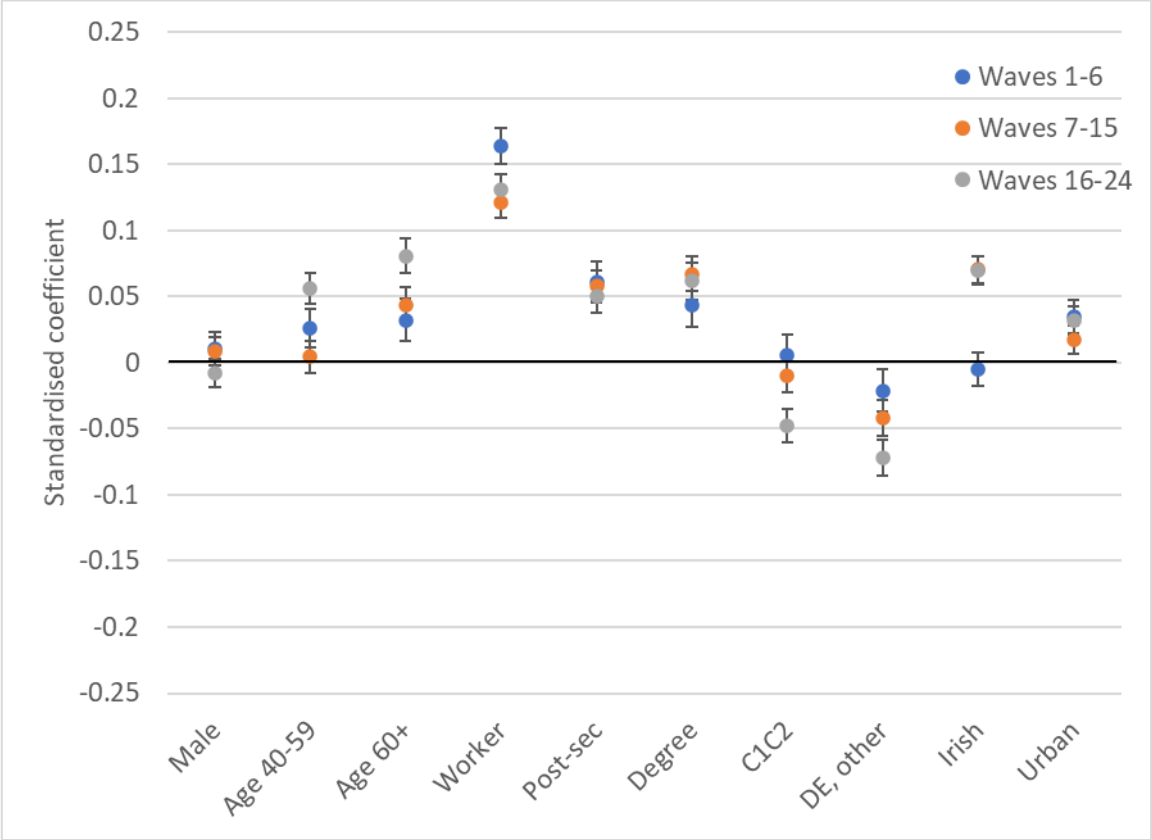
3.5 RELATIVE STRENGTH OF INFLUENCES ON RISK SCORES

The volume and complexity of the data described in Figures 3.11 to 3.18 means that it is difficult to compare the relative strengths of effects across different charts. Furthermore, as the discussion in the previous paragraph notes, the implications of social activity and, consequently, the associated public health guidance, were very different in 2021 and 2022. Figures 3.19 and 3.20 therefore present the data in a slightly different way. Instead of reporting coefficients based on separate models for each month, the charts report coefficients from models estimated for three different periods of 2021. Waves 1–6 of SAM were undertaken before Level 5 restrictions began to be lifted in April. Waves 7–15 were carried out between then and the end of August, before case numbers began to climb again. Finally, the third period includes waves 18–24 and covers the time up to Christmas, when cases were rising increasingly sharply and before the lesser severity of

Omicron was understood. Plotting the coefficients for all the socio-demographic variables and all the psychological variables on just two charts, with the vertical axis at the same scale, permits easier comparisons to be made.

Figure 3.19 confirms the importance of being a worker as a predictor of social activity. It also shows how, as time went on and more people were vaccinated, disparities between age groups and people with different socio-economic backgrounds increased.

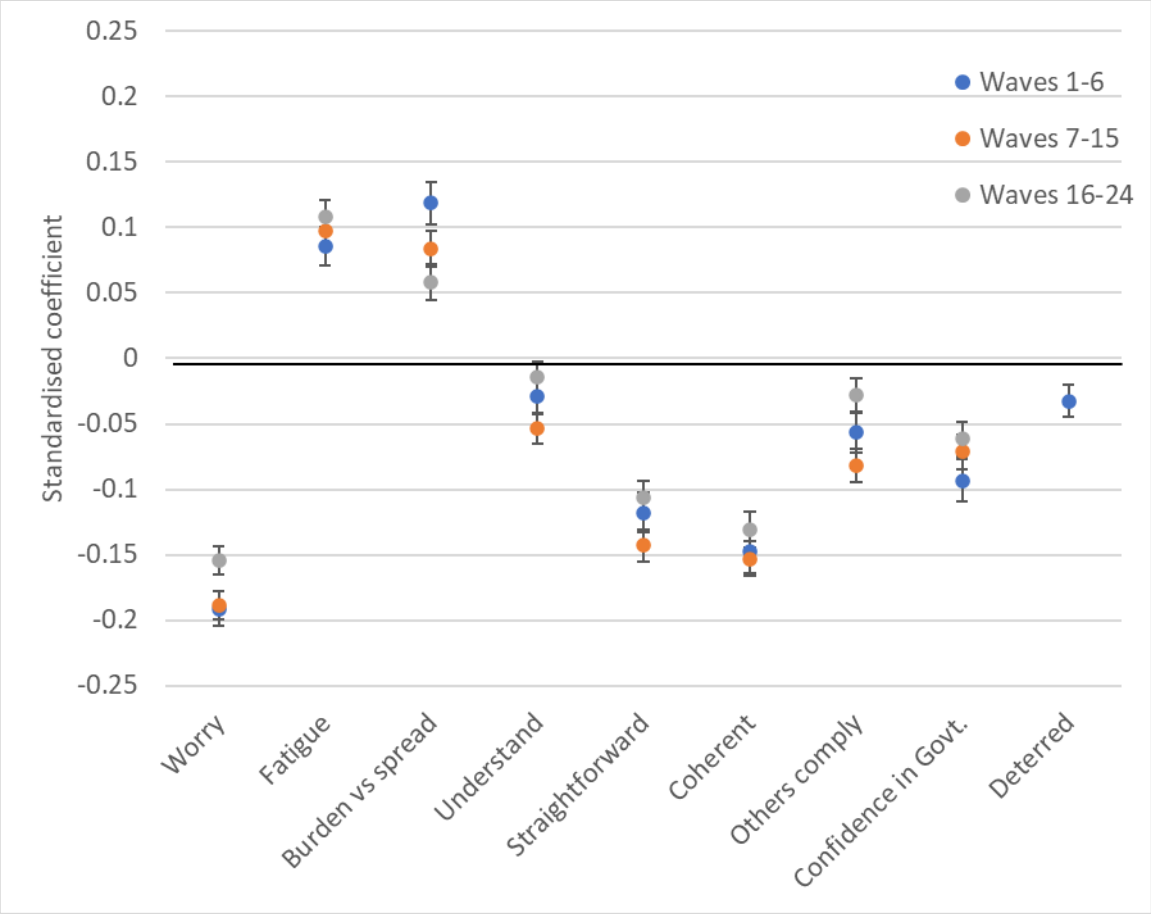
Figure 3.19 Relationships between risk score and socio-demographic background characteristics for three time periods



Note: The three time periods were: waves 1–6 (25 January–13 April, 2021); waves 7–15 (20 April–17 August, 2021); and waves 16–24 (24 August–16 December, 2021). Positive coefficients imply more risky behaviours.

Figure 3.20 confirms the fact that people's overall level of worry about COVID-19 was consistently the strongest predictor of behaviour. However, viewed in comparison to Figure 3.19, the chart also provides evidence that psychological factors were, in general, a more important influence on social activity than background characteristics; many of the psychological variables generally have larger coefficients. This observation is confirmed by model statistics that estimate the amount of variance in the outcome variable that is accounted for by the explanatory variables. These statistics suggest that the nine psychological variables, in combination, account for more variance in social activity than the socio-demographic variables by a factor of more than half again.

Figure 3.20 Relationships between risk score and psychological variables for three time periods



Note: The three time periods were: waves 1–6 (15 January–13 April, 2021); waves 7–15 (20 April–17 August, 2021); and waves 16–24 (24 August–16 December, 2021). Positive coefficients imply more risky behaviours.

Figure 3.20 also confirms that self-reported understanding and belief in the likelihood of being caught breaking restrictions (deterred) were the weakest effects. After worry, perceptions of the straightforwardness and coherence of the restrictions mattered, followed by a combination of fatigue with restrictions and whether individuals thought the burden of following them was more or less important than preventing the spread of the virus.

These psychological factors are interesting to consider in light of previous research on collective action problems undertaken at smaller scales. It is possible to map the variables approximately onto the main factors relevant to any, general, collective action problem. People's level of overall worry about COVID-19 parallels perceptions of the overall collective benefit available if everyone cooperates. Perceptions of the restrictions map onto clarity and communication about the collective behaviour required to obtain the benefit. Fatigue maps on to the personal cost of cooperation, while the burden–spread trade-off measures how selfless people are in balancing that personal cost against the motive to cooperate. As mentioned previously, perceptions of the behaviour of others would have

mattered to those who are conditional cooperators. In summary, the pattern of psychological influences on people's behaviour observed in this context of a global pandemic bear a resemblance to those that are regularly seen in small-scale collective action problems that have been studied extensively over the last 30–40 years. We return to the implications of this observation in the final section.

3.6 PERCEPTIONS OF RISKY BEHAVIOURS

The last section focused on drivers of social activity, as captured by the risk score. The array of psychological factors associated with behaviour shows how decisions to undertake such activity during the study period were informed by a complex set of psychological factors. These decisions would also have depended on individual and family circumstances and events that would have varied greatly between different people and households at different points in time. However, one constant factor, which was relevant to every person and every decision, was the level of perceived risk involved: what were the chances that engaging with a given activity would lead one to contract and/or spread COVID-19? Presuming that the individual paid attention to the level of risk, an assessment might depend on the background prevalence of the disease, individual understanding of how the virus transmits and how these processes would interact with the context in which social activity took place. Much public health and general government communication aimed to inform these kinds of assessments by educating and informing the public. This aim was sometimes explicit, such as in the 'RSVP' (risk, symptoms, venue, people) campaign run in late 2021.

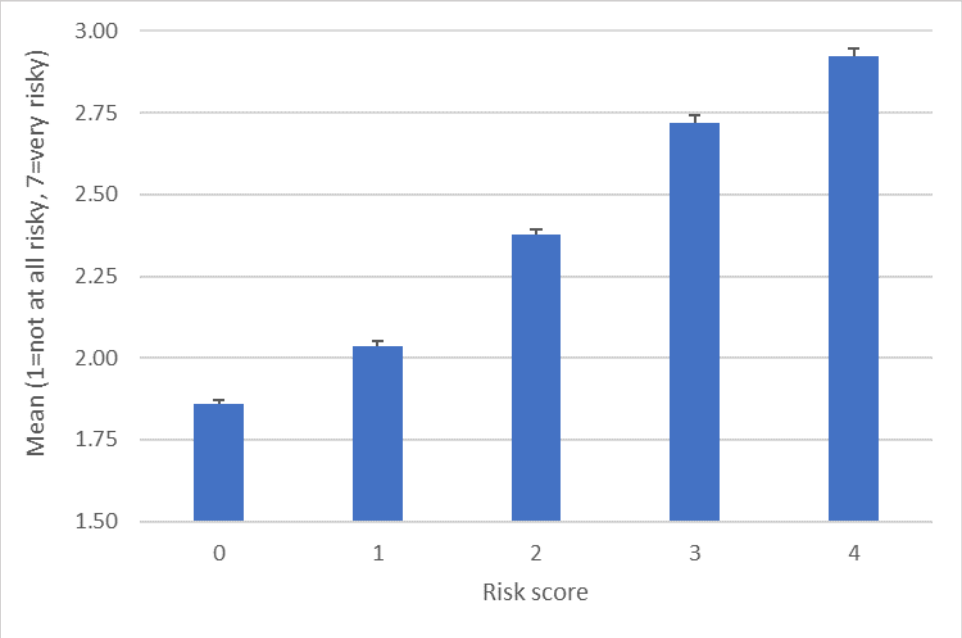
Given the above, it is of particular interest to analyse how members of the public perceived the risks they were taking. Towards the end of the SAM questionnaire, after participants had given an account of activity during the previous 48 hours, including the contacts they had, places they visited, people they met and mitigation behaviours, they were asked to assess the overall level of risk they had taken. The specific question was: 'Overall, how risky do you think your behaviour has been over the last two days (in terms of contracting or spreading COVID-19)?'. The response scale ranged from one (not at all risky) to seven (very risky).

3.6.1 Perceived risk compared to risk score

Figure 3.21 provides an immediate indication that people's perceptions were strongly related to their behaviour. The chart plots mean perceived riskiness against the risk score (as deployed in the previous sections). There is a strong and highly statistically significant relationship. People who undertook the activities that contribute to the risk score indeed perceived themselves as taking substantially higher risk. That said, responses in all categories were, on average, well below the

midpoint of the scale. Only 20 per cent of individuals whose behaviour equated to the highest risk score responded with a perceived riskiness of greater than four.

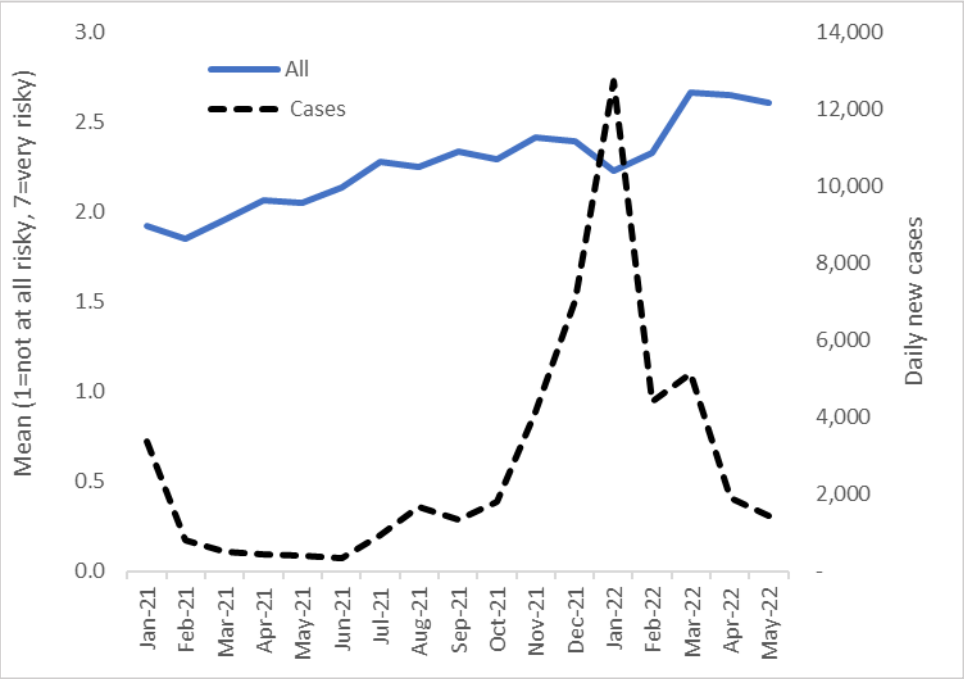
Figure 3.21 People's perceptions of the riskiness of their own individual behaviour, by the risk score calculated from their actual reported behaviour



3.6.2 Perceived risk and daily cases

A simple question to ask is whether people's assessment of the risk they were taking was related to the background incidence of the virus. Previous results in behavioural economics, going back to Kahneman and Tversky (1973b), have shown that people can be insensitive to base rates when considering the conjunction of probabilities, so it would not be a great surprise to observe perceived riskiness responding to variation in people's behaviour but not to variation in the likelihood of meeting someone carrying the virus. Figure 3.22 charts the progression of perceived risk only for those individuals with a risk score of four, superimposing the number of daily new cases. The outcome demonstrates that perceptions of the riskiness of behaviour were insensitive to the background incidence of the virus, even falling when the cases peaked at the end of 2021 and rising when cases fell thereafter. People's perceptions of riskiness appear to have been linked mainly to the behaviours that they undertook, regardless of the (at times dramatically) changing probability of encountering someone who might infect them.

Figure 3.22 Perceived riskiness of individual's behaviour and the number of reported daily new cases of COVID-19



Looking across the different sections of this report, this finding might appear to generate a contradiction. On average, people reduced their social activity when case numbers increased and were less likely to engage in activity the more worried they were about COVID-19, yet seemingly perceived a high level of social activity to be similarly risky at times when case numbers were low and when they were very high. This apparent contradiction is probably explained by how people make judgements when questions are asked in different ways. When asked to judge the riskiness of behaviour, respondents probably assessed their behaviour relative to other behaviours and did not take the external context into account. This does not mean that the external context did not affect their decisions about how much social activity to undertake in the first place. As the evidence presented above shows, these decisions were influenced by case numbers, worry and a range of other factors. Rather, when asked to judge the riskiness of the behaviour once it had been undertaken, respondents applied a narrower focus that limited the judgement to comparison of different behaviours, not different contexts. As described above, neglect of base rates when judging risk is an established and strong phenomenon.

3.6.3 Perceived risk from meeting other people

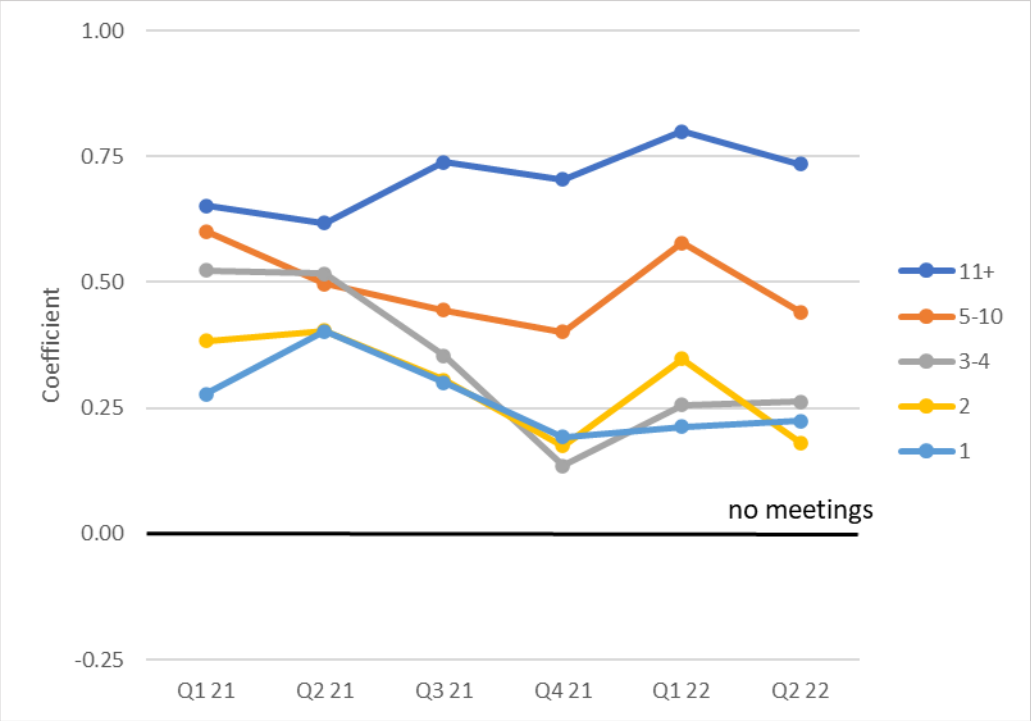
Having shown the general level of perceived risk and how it related to overall social activity, we now describe statistical models that investigate which specific behaviours were judged as risky. As in the above analysis, we use OLS regressions

to explore how relationships changed over time. A first set of statistical models relate perceptions of the riskiness of behaviour during the previous 48 hours to the number of locations an individual visited in the previous 48 hours, the number of people from outside the household that an individual met over the same period and the number of close contacts an individual had the previous day.[2] Of these variables, the number of people met accounts for the largest proportion of variation in perceived riskiness. Further details of the regression method and an example model are provided in Appendix B.

Figure 3.23 shows how the perceived riskiness of behaviour related to how many people an individual had met and how this relationship changed over time. (The data are presented on a quarterly basis to ensure sufficient samples in each category of behaviour.) People who met a lot of others perceived themselves as engaging in riskier behaviour. This gap widened over time, not because people came to view meeting a lot of people as more risky, but because they viewed meeting with four or less people from other households as less risky (relatively to meeting no one at all). An interesting aspect of this chart is how little difference people perceived in the riskiness of meeting one, two, three or four others, especially as time wore on. A possible explanation for this is that once people got used to meeting up with other people in small numbers, perhaps just one or two at a time, they ceased perceiving much risk in doing so; it simply became something people were happy to do, or not. That is, there may have been an element of 'binary thinking' about undertaking activities – either something is ok to do or it is not. By contrast, to meet five to ten or more than ten people over 48 hours would probably involve meeting people in larger groups, which would constitute a conceptually different form of socialising and hence invoke different feelings about risk.

[2] Ideally, we would also have this information for the previous 48 hours, but SAM gathered the necessary detail to establish whether a close contact had taken place in relation to the previous day.

Figure 3.23 **Relationship over time between the number of people from other households that an individual met in the previous 48 hours and the individual's perception of the riskiness of their behaviour over the previous 48 hours**

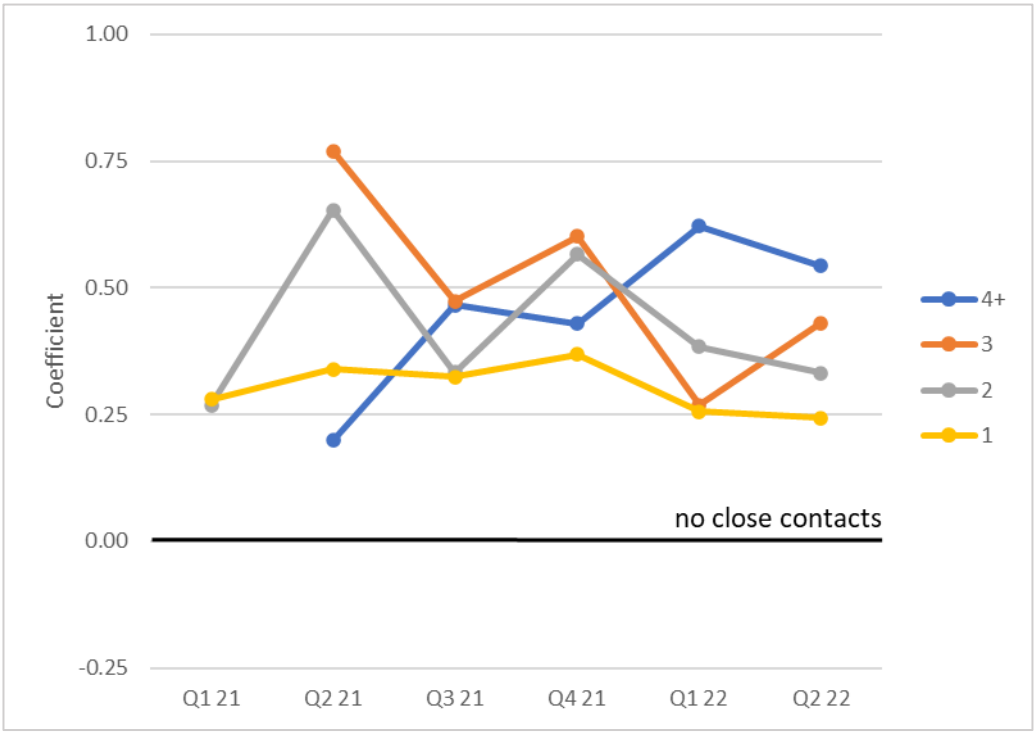


3.6.4 Perceived risk from close contacts

After the number of people met, the variable that accounted for the second largest amount of variation in perceived riskiness was the number of close contacts. Figure 3.24 shows how this relationship evolved over time. The pattern is more complicated than that shown in Figure 3.23. (Results for people having three or more close contacts in the first quarter of 2021 are excluded from the analysis, because the number of people in these categories under Level 5 restrictions was too small to produce a reliable estimate.) In Quarter 2 of 2021, people who had four or more close contacts the previous day rated their own behaviour as less risky than all other categories except those who had no close contacts at all. There are two possible explanations for this, which are not mutually exclusive. First, this group may have contained people having close contacts for professional reasons, e.g. healthcare workers, who were likely to be undertaking strong mitigation activity (and requiring the same from patients). Second, this group may have contained a small minority who were simply not bothering to follow public guidance and who dismissed COVID-19 as a threat. During the second quarter of 2021, less than 1 per cent of the sample were having four or more close contacts per day. Turning to the other three categories, while there is an evident relationship between the number of close contacts and the perceived riskiness of behaviour, once an individual had one close contact, additional close contacts did not receive the same weight in terms of perceived risk. The explanation may be similar to that suggested above for the influence of the number of meetings. Once

someone is having close contacts with people outside of their household, having more than one a day feels like less of a big deal.

Figure 3.24 Relationship over time between the number of close contacts an individual had the previous day and the individual's perception of the riskiness of their behaviour over the previous 48 hours

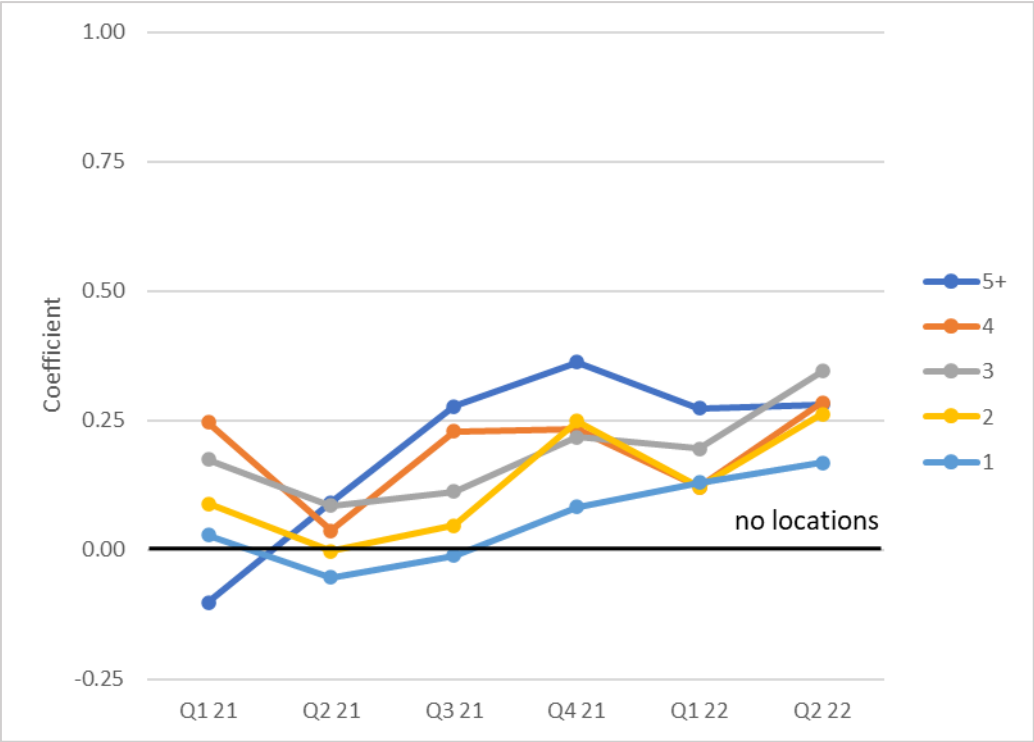


3.6.5 Perceived risk from visiting multiple locations

Figure 3.25 displays the relationships between the number of locations visited outside the home and perceptions of riskiness. The first thing to notice about this chart is that, in general, visiting multiple locations is less associated with risk than meeting multiple people or having multiple close contacts. The vertical axis is maintained at the same scale as in Figures 3.24 to 3.26 to permit comparison. The coefficients in Figure 3.25 are lower and less separated than in Figure 3.24 and, especially, Figure 3.23, indicating smaller effects. Nevertheless, the chart reveals a similar pattern with respect to the most active people. In the first quarter of 2021, under Level 5 restrictions, people visiting five or more locations viewed their own activity as less risky than people in all other categories, including those who did not leave their home. Again, this group, amounting to less than 1 per cent of the sample, may have contained some essential workers and also the very small minority that was effectively denying the realities of COVID-19. Apart from this anomaly, the results presented in Figure 3.25 imply an approximate relationship between the perception of riskiness and the number of locations visited, albeit a relatively small one. The distinctions between zero, one and two locations are clearer than between three and four, perhaps again indicating an insensitivity to

the number of locations visited once an individual got used to travelling to multiple places again.

Figure 3.25 Relationship over time between the number of different locations an individual visited during the previous 48 hours and the individual's perception of the riskiness of their behaviour over the previous 48 hours

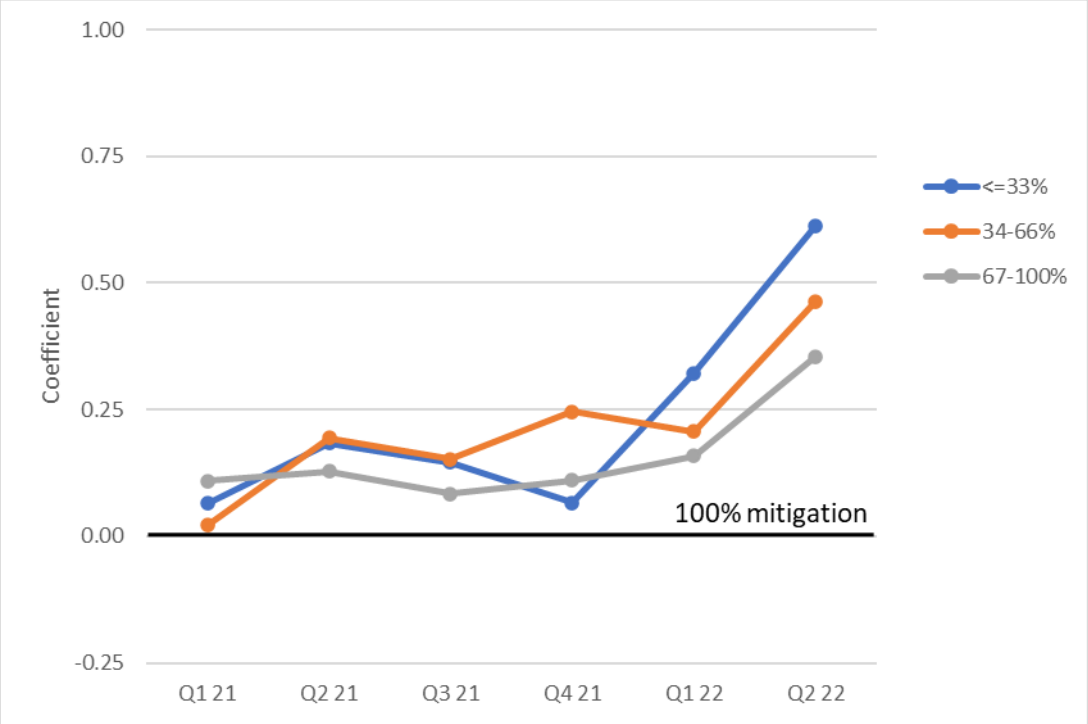


3.6.6 Perceived risk and mitigation behaviours

Figure 3.26 completes the analysis of perceptions of riskiness by showing how this was affected by mitigation behaviour. Mitigation behaviour was defined as whether people cleaned their hands, maintained a two-metre distance and wore a facemask, and was expressed as the proportion of the opportunities people had to do so across any locations visited. While the same statistical model was used to generate Figures 3.23 to 3.25, the model used to derive the results in Figure 3.26 excludes people who didn't visit any locations during the previous 48 hours, because they had no opportunity to undertake the relevant behaviours. This is important for interpreting the results, because we know from findings in the previous section that people in this group, which ranged from 22 to 14 per cent of the population across the quarters, were among the most worried and the most cautious in their behaviour. Nevertheless, during 2021 the coefficients in this chart are relatively low and not clearly separated by the extent of mitigation behaviour. The implication is that, in comparison to people who were undertaking the three relevant behaviours 100 per cent of the time, people doing so only some of the time did not perceive this as greatly increasing their risk. For 2021, there is little clear and consistent separation in perceived riskiness between the three groups.

This could be because people were choosing to undertake the three mitigation behaviours only when they felt they most needed to. A more detailed analysis of when people were most and least likely to engage in these behaviours suggests that people were least likely to do so when visiting other people's homes, perhaps suggesting that they viewed the likelihood of contracting the virus from someone they knew as lower than contracting it from a stranger.

Figure 3.26 Relationship over time between the proportion of occasions that an individual undertook mitigation activity (wearing mask, cleaning hands, maintaining distance) when engaged in social activity outside the household during the previous 48 hours and the individual's perception of the riskiness of their behaviour over the previous 48 hours



Perceptions of the riskiness of mitigation behaviours changed in 2022. The amount of mitigation behaviour fell away in 2022, meaning that people who were previously in the 100 per cent reference category moved into the three other categories and the size of the <=33 per cent category increased from less than 10 per cent to more than 30 per cent. The data are consistent with many people having decided, knowingly, to stop bothering with mitigation behaviours in many contexts and to accept the greater risk of contracting COVID-19 that this implied, knowing that the likely consequences had become less severe.

3.6.7 Summary of perceived risk

Looking across all the results in this section, when assessing the riskiness of their own behaviour, the responses collected in the SAM data reflect a combination of

reasoned responses to the actual risks people faced and some known psychological distortions of risk perception. In general, people did perceive themselves to be taking more risk the more socially active they were and, especially, the more other people they met. However, despite reducing their activity when case numbers were higher, people did not moderate their perceptions of the riskiness of specific behaviours according to the background incidence of the virus, thereby ignoring a base rate that had a substantive impact on their chances of contracting the disease. Furthermore, the charts imply an insensitivity to the frequency of behaviours once the behaviour itself was deemed to be an acceptable risk, indicating a degree of binary thinking. In general, avoidance of other people was seen as the main way to lower risk, with mitigation behaviours thought to be less effective.

CHAPTER 4

Discussion and policy implications

The Social Activity Measure (SAM) study produced an accumulation of rich data about the behaviours, perceptions and attitudes of the population during an ongoing national emergency. This report set out to examine that data for lessons that might be helpful for the future. Most obviously, understanding Ireland's experience in responding to and coping with COVID-19 is likely to be useful should we have the misfortune to face another pandemic situation, or find ourselves tackling a serious disease outbreak at the national level. However, the current findings have more widespread applicability than this.

In this final section, we first consider the implications of the results for the communication of risk to the public, and for both the design and communication of rules and/or guidance designed to underpin a collective effort to reduce risk. We then discuss what the SAM data teach us about coping with mass collective action problems, including a brief discussion of implications for policy on climate change. Lastly, we highlight the importance of measurement.

4.1 RISK COMMUNICATION

The evidence provided in this report points strongly to the conclusion that the publication of daily case numbers had a substantive and lasting impact on the everyday behaviour of people in Ireland. Multiple forms of social activity increased and decreased in response to falling and rising case numbers. The number of daily cases had a stronger association with behaviour than indicators of severe disease, following a pattern that established itself early in the pandemic. The case numbers may simply have become the 'go to' measure in many people's minds for assessing how well we were doing as a society in fighting the virus.

As noted in the body of the report, however, the relationship may not have been entirely direct. Rising case numbers were typically accompanied by stronger government communication of the need to be cautious and to follow guidance. Changes in the case numbers gave communication greater urgency and attention. The finding nevertheless demonstrates how the establishment of a single, dominant, numeric indication of risk can develop a powerful relationship with behaviour. In principle, this insight might be helpful in any emergency where it is important for the public to assess risk, assuming that a risk measure can be selected appropriately to provide an accurate and faithful indication of the risk faced. If so, the experience of COVID-19 suggests that people will respond accordingly. The decision made early in the pandemic to provide daily case numbers was in keeping with established crisis communication principles

(Reynolds, 2011) and with evidence that people, in general, want and trust numeric information about risk (Trevena et al., 2006). The SAM data affirm the size of the public response and the effectiveness of this risk communication policy. At various points during the pandemic, some stakeholders questioned the release of daily case figures on the grounds that they were making the public too cautious. Such comments often came from people with a commercial stake in the willingness of others to tolerate risk. People will always differ in risk aversion; there is no 'right' amount of risk to take. Yet it is worth asking how the public would have made decisions about their social activities in the absence of this highly influential daily number. The likelihood is that they would have done so based on a more approximate assessment of the current risk of contracting the virus and, in all probability, this assessment would have been less accurate and more easily manipulable by third parties with commercial or political interests. Members of the public will assess risk for themselves, so getting an early, accurate, numeric indicator of risk in play is an effective communication policy to support these assessments. The challenge in any future crises may be to identify at the outset an indicator that meets these criteria, given that the SAM data also indicate that once the public is familiar with a numeric risk measure, that measure is likely to remain influential in guiding behaviour.

None of this is to say that public risk perceptions in relation to COVID-19 were accurate; risk perceptions were subject to systematic biases. The observed patterns in people's perceptions of the riskiness of their own behaviour suggest that they were inclined to view behaviours in a binary fashion, as either safe or unsafe, without fully taking into account the frequency of the behaviour. The data are also consistent with people viewing interactions with strangers as more risky than interactions with family and friends. Other distortions in risk perceptions were identified during the pandemic, such as people underestimating how much socialising outdoors reduced the likelihood of transmission compared to socialising indoors (Timmons et al., 2022). Where such misperceptions are identified, they can to some extent be countered directly in public health and media communications, although this is unlikely to remove the misperception completely (or perhaps much at all). A more telling intervention may be to produce rules and guidance that are informed by evidence about the misperception and designed specifically to counter it. For instance, a public health restriction that specifies a certain number of encounters per day or per week and is simple and easy to communicate (e.g. 'limit yourself to three meetings per week') may be more effective for those inclined to binary thinking who might otherwise categorise behaviours simply as 'safe' or 'unsafe'. The more rapid lifting of restrictions on outdoor activities before many of those on indoor activities during summer 2021, coupled with stressing the rationale for doing this, was in keeping with this approach. The broader point is that identifying misperceptions of risk matters not only for the communication of policy; it can help in the design of a better, often perhaps simpler, policy that

deploys rules and guidance that dovetail with people's psychology. Of course, this is only possible where evidence about how the public perceive risk is available, either through past experience or contemporaneous research. In the event of a future emergency, a reader of this report might find useful evidence about risk perceptions during the COVID-19 pandemic that is likely to apply to the novel context as well. The new context may also engender specific circumstances that require rapid evidence accumulation – a point we return to below.

4.2 CO-ORDINATING COLLECTIVE ACTION

One of the lasting effects of the COVID-19 pandemic may be the realisation that, if the circumstances are right, humans are able to cooperate on a massive scale to achieve collective outcomes. The opening section of this report describes evidence from studies of previous collective action problems, which provided grounds for optimism at the beginning of the pandemic – that people would pull together and be willing to make sacrifices for the public good. However, those findings were mostly derived from laboratory and field studies, and were conducted on a small scale. How they would translate to such a large-scale collective action problem as the COVID-19 pandemic was unknown.

In the event, that initial evidence was confirmed. In Ireland and elsewhere, a large majority of people cooperated with protective public health measures over many months to reduce the spread of COVID-19.

Self-interest will, of course, always play a part in human action. Cautious behaviour was in part driven by people's desire to avoid illness, the potential disapproval of others if they were seen not to follow the rules and perhaps even being caught and fined for breaking those restrictions that were legally binding. Yet the SAM data show how much else was involved in people's decisions and behaviour. The strongest predictor of social activity was overall worry about COVID-19. This should not be taken to imply that people lived in a state of personal fear during the period of study. Rather, worry was linked to multiple broader societal concerns – more so than to the perceived risk of catching the virus personally. In any collective action problem, the strength of the benefit that emerges if everyone co-ordinates their actions is an important factor in securing cooperation. In this case, when facing a threat, the strength of people's worries can be considered a measure of how much benefit they perceive from cautious behaviour.

Although younger adults were at substantially less risk from the disease, age differences in social activity were small and, once work was accounted for, younger adults on average engaged in less risky behaviour than older ones. Given the disparity in individual-level incentives across different age groups, which meant that the sacrifices involved were greater for younger adults, voluntary cooperation

with a collective effort to tackle the disease is the only plausible explanation of this behaviour. These sacrifices came at a high cost in terms of the personal wellbeing of young people, with potential long-term impacts (Darmody et al., 2020).

People's cooperative behaviour was also influenced by individual perceptions of the effectiveness of the strategy to limit the spread of the virus, including how straightforward the restrictions were to follow, how coherent they were, general confidence in the Government and perceptions of whether others were following guidance. These findings are in keeping with the previous evidence on people's willingness to cooperate in collective action problems generally, where understanding of how the cooperative actions will lead to the desired outcome is a predictor of cooperation, as is belief that others will cooperate. The data presented here show how, on average, the public perceived the restrictions as straightforward to follow and as coherent. This was linked to confidence in the Government and, ultimately, all three of these perceptions were associated with more cautious behaviour during 2021. These factors contributed to Ireland's ability to keep the level of infection down. For any future emergencies that require voluntary collective action, the implication is that simple, coherent and consistently communicated guidance is more likely to be complied with. The findings also support the strategy of not focusing too much communication on incidents of non-compliance, but instead stressing the number who are complying and the positive implications if everyone were to follow suit and do the right thing.

A more general lesson to derive from this analysis is that when facing a mass collective action problem, it is not possible to disassociate a policy designed to promote cooperative behaviour from the communication of the policy. This is because the actual effectiveness of the policy depends not only on how effective it would be *if everyone were to do what is asked of them*, but also on whether it can be understood by the general public as an effective solution to the problem, which determines whether they *actually do what is asked of them*. All things equal, a policy that promotes simple, coherent actions, which everyone can see will produce a better outcome for all, is likely to work better because more people will cooperate. Sometimes, simpler policies may be more effective than more complex ones that, in theory would be better, but in practice will not be. A policy that is harder to follow or for which the collective benefit is less clear will be adhered to less in a mass collective action problem – a factor that may trump the theoretical benefits of the more complex approach.

The role of explicit rules is also worth considering in light of the SAM findings. Multiple pieces of evidence described in this report point to definite rules having had a beneficial effect on supporting cooperative behaviour. As soon as Level 5 restrictions began to be lifted, the psychology of cooperation started to change, with how tiresome people found compliance with remaining restrictions becoming

a stronger influence on behaviour than how the burden of the restrictions traded off against the desire to reduce the spread of the virus. As more restrictions were lifted and fewer rules were in place, perceptions of whether others were following public health guidance also became less of an influence on behaviour. These effects were stronger than the effect of deterrence, as measured by people's belief that breaking rules would lead them to be caught and fined. Later, when the mask mandate became mere guidance in 2022, mitigation behaviours declined quickly. All of these trends are consistent with the idea that concrete rules help to sustain cooperative behaviours, regardless of whether there are official sanctions for transgression. While we cannot be sure why this is the case, important factors are likely to be social disapproval, simplicity and conditional cooperation. Explicit rules supported by a majority can be effective because people are concerned about what others will think if they are seen to break them. The simpler the rule, the more obvious it is when someone fails to follow it. However, once behaviour starts to change and people see that some other people are not cooperating, conditional cooperators may also decide to stop bothering, leading to rapid reductions in the desired behaviour.

In sum, perhaps the most important lessons to extract from the current exercise concern how to support cooperative behaviour in a nationwide collective action problem. Policymakers need to search for simple rules, whether legally binding or otherwise, that are easy to follow and that can be straightforwardly shown to generate the collective benefit if everyone follows the rule. Where this is achieved, the COVID-19 pandemic shows us that the large majority are more likely to cooperate voluntarily and, to a substantial extent, to self-police the rule.

There is a broader point to be made here about the ability of policy to motivate behaviour. There is always a tendency to believe that people's primary motivations are driven by the incentives they face – that changing behaviour requires some combination of 'sticks and carrots'. Behaviour during the pandemic demonstrates, by contrast, that human psychology is much richer than this approach recognises and that people are influenced by many other motivations.

The point is important specifically in the context of ongoing efforts to tackle climate change. As a collective action problem, climate change is a more difficult policy challenge than responding to the pandemic. This is true for multiple reasons: the threat is not as immediate; the benefits are harder to see or experience; whether the required behaviours constitute a best strategy for all is less certain; and the behaviours required are multiple and dynamic, with different behaviours demanded of people living in different geographic locations, working in different industries and engaging in different lifestyles. Yet some of the principles of co-ordinating mass collective action described above are nevertheless likely to apply, including searching for simple collective rules and showing how they can generate

the desired benefit. The differences in the contexts just highlighted are also instructive. During the pandemic everyone could look around and observe the relevant behaviour of others. When it comes to climate change, this is less true. Sectors and communities are likely to be unaware of the actions of other sectors and communities, unless action is taken to keep them informed. Given the conditional nature of cooperation in collective action, widespread communications of the multiple different actions being undertaken in different places may be vital in ensuring continued willingness to embrace the change required to live more sustainable lifestyles.

4.3 MEASUREMENT

Finally, SAM offers some lessons in relation to the importance of measurement. In any national emergency situation, perceptions and comprehension might change rapidly. It may be hard for those at the centre of policy discussions, who are appraised of a problem and then spend hours considering it, to put themselves in the shoes of members of the public for whom the issue is new. Accurate measurement of a public response requires more than gathering attitudes and opinions to gauge the public view on what should be done. Designing rapid studies that measure what the public perceive, what they understand and, depending on the nature of the emergency, how they are behaving, can give a much richer picture to inform policy.

To provide an international illustration, there was a view adopted in a number of national governments that declining adherence to COVID-19 restrictions and public health guidance indicated some kind of 'pandemic fatigue' (e.g. World Health Organization, 2020). That is, based on limited data, authorities jumped quickly from a finding of changed behaviour to a presumed psychological explanation for it, without a diagnostic investigation of possible causes. The SAM data show that, in Ireland, there were multiple psychological reasons for a change in compliance with public health restrictions and guidance, of which fatigue was only one and far from the strongest. In the absence of properly designed studies that measure relevant psychological factors, mistakes like this can lead to policy that is missing important pieces of evidence.

In an emergency, the gathering of rapid and accurate evidence is vital. SAM underscores the importance of including measurement of what people perceive and understand, as well as what they are doing.

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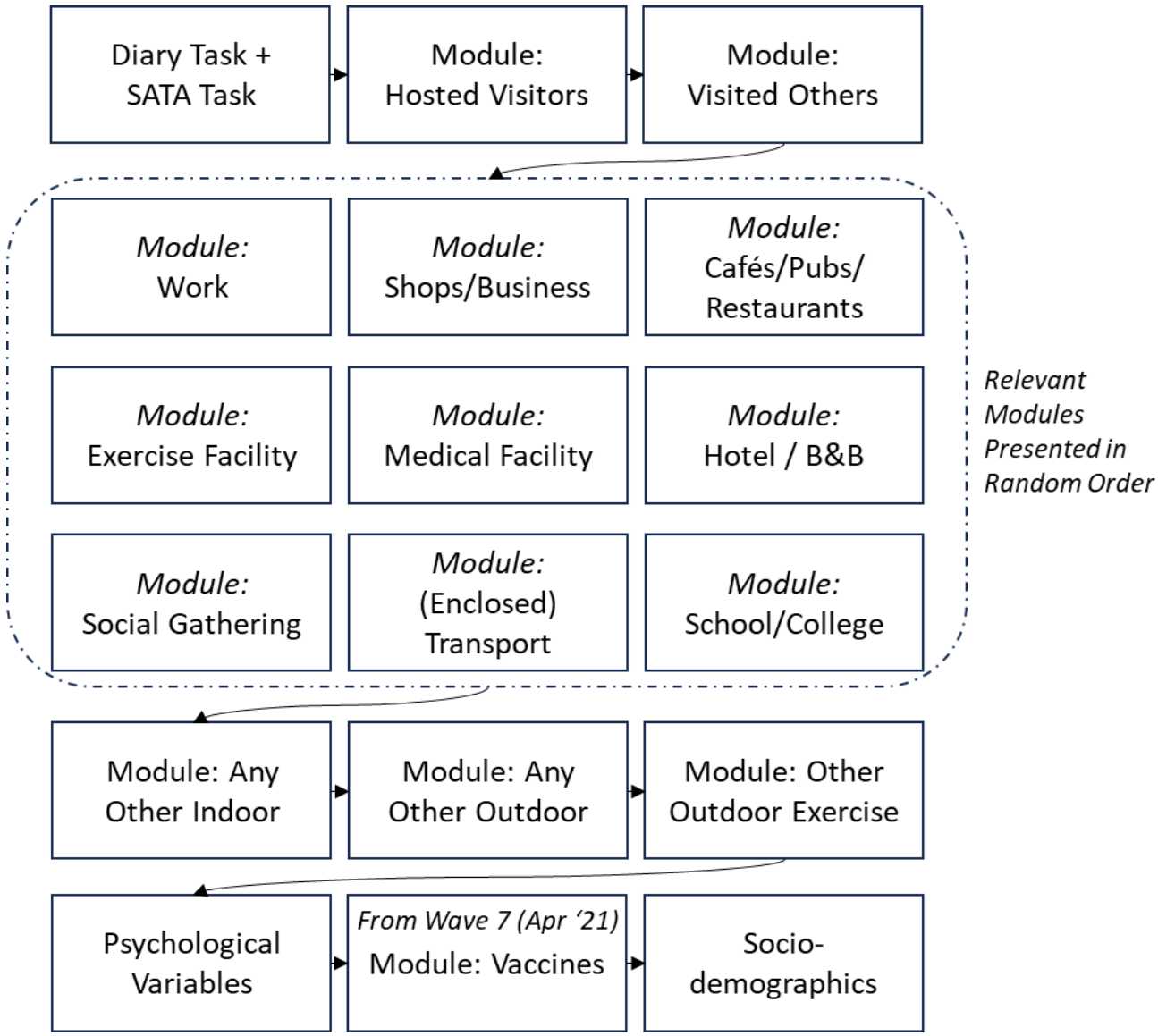
APPENDIX A

Survey structure

The following schematic maps out the structure of the survey. All participants began by completing a diary task adapted from the Day Reconstruction Method to prompt their recall of activities over the previous two days. They were then presented with a list of locations and asked to select any that they had visited. They were instructed to 'select all that apply' – a SATA question format. The responses to the SATA question were then used to branch the survey, so that participants only completed the subset of modules that were relevant for the locations they had visited. Before completing relevant modules, all participants responded to questions about any people who had visited their home or any other homes that they had visited. After completing relevant modules, participants were asked questions about any other indoor or outdoor activities undertaken outside of their home. Once all of these questions that gathered detailed information about behaviour in different locations had been completed, all participants answered a battery of psychological questions about their perceptions and experiences of the pandemic, their vaccination intentions and status (once the vaccine was available), and their socio-demographic background.


Diary Task + SATA Task
Module: Hosted Visitors
Module: Visited Others
Module: Work
Module: Shops/Business
Module: Cafés/Pubs/ Restaurants
Module: Exercise Facility
Module: Medical Facility
Module: Hotel / B&B
Module: Social Gathering
Module: (Enclosed) Transport
Module: School/College
Relevant Modules Presented in Random Order
Module: Any Other Indoor
Module: Any Other Outdoor
Module: Other Outdoor Exercise
Psychological Variables
From Wave 7 (Apr '21)
Module: Vaccines
Socio-demographics

APPENDIX B

Regression models

Table B1 provides an example regression model of the sort used to derive the variation in standardised coefficients over time depicted in Figures 3.11 to 3.14 and Figures 3.16 to 3.18. The dependent variable is the risk score (0–4). This specific model was estimated for the 2,000 observations gathered in the ninth month of the study, September 2021. The reported estimates are derived via ordinary least squares (OLS) regression, although results are closely similar if models are estimated using ordered logistic regression. When estimating the influence of the psychological variables, the socio-demographic variables listed below were always included in models. A separate model was run to derive each data-point. The variable of interest in this specific model is worry. This model is therefore how the ninth data-point in the time-series for worry (-0.147, in bold) was derived for Figure 3.16. The variable 'waves completed' controls for how many times the participant had previously completed the SAM survey. The equivalent models pooled over multiple months were then used to generate Figures 3.19 and 3.20.

Table B1 Example regression exploring influences on risk score

	Coefficient	Standard error	P-value	Standardised coefficient
Male	-.138	.063	.029	-.049
Age (ref: 18-39)				
40–59	.148	.072	.040	.052
60+	.368	.087	.000	.117
Worker	.456	.072	.000	.158
Educational attainment (ref: <= second-level)				
Post-sec	.112	.081	.170	.035
Degree	.220	.080	.006	.078
Social grade (ref: AB)				
C1C2	-.206	.078	.008	-.074
DE, other	-.258	.094	.006	-.080
Irish national	.188	.091	.038	.045
Urban location	-.053	.064	.405	-.018
Worry	-.077	.011	.000	-.147
Waves completed	-.077	.056	.561	-.118
Waves completed^2	.003	.006	.561	.050
R^2	.076			
N	2,000			

Table B2 illustrates a regression model of the sort used to derive the estimates for influences of behaviour on perceived risk in Figures 3.23 to 3.26. The dependent variable is the individual's perceived risk of catching COVID-19 associated with their own behaviour during the previous two days (on a one-to-seven scale). All models controlled for the range of socio-demographic background characteristics shown. Separate models were estimated for each of six quarters. The specific model shown is based on the observations collected in Quarter 3 of 2021. Thus, the standardised coefficients (in bold) for the numbers of people met, close contacts and locations relate to the third data-points in the time series displayed in Figures 3.23 to 3.25. In order to produce the estimates for mitigation behaviours in Figure 3.26, the equivalent model was estimated including only those participants who had visited at least one location and therefore had the opportunity to undertake mitigation behaviours at least once.

Table B2 Example regression exploring influences on perceived risk of catching COVID-19

	Coefficient	Standard error	P-value	Standardised coefficient
Male	.052	.035	.132	.018
Age (ref: 18-39)				
40–59	-.388	.040	.000	-.128
60+	-.708	.049	.000	-.209
Worker	.159	.040	.000	.052
Educational attainment (ref: <= second-level)				
Post-sec	.015	.046	.735	.005
Degree	.051	.045	.251	.017
Social grade (ref: AB)				
C1C2	-.123	.042	.003	-.041
DE, other	-.156	.052	.003	-.044
Irish national	-.124	.052	.017	-.027
Urban location	.093	.036	.009	.030
Waves completed	.014	.035	.697	.017
Waves completed^2	-.001	.004	.893	-.006
People met (ref: none)				
1	.300	.060	.000	.065
2	.306	.060	.000	.067
3–4	.354	.058	.000	.086
5–10	.443	.057	.000	.115
11+	.735	.067	.000	.156
Close contacts (ref: none)				
1	.325	.044	.000	0.94
2	.335	.070	.000	.058
3	.478	.114	.000	.049
4+	.468	.160	.004	.035
Locations visited (ref: none)				
1	-.008	.058	.893	-.002
2	.050	.061	.415	.015
3	.114	.068	.091	.030
4	.233	.083	.005	.043
5+	.281	.121	.020	.030
R^2	.121			
N	7,000			

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