A risk-risk trade-off analysis of heatwave-related mortality risk

Irene Mussio*

Susan Chilton[1]

Darren Duxbury[2]

Jytte Seested Nielsen[3]

Smriti Sharma[4]

[*] (Corresponding Author) Newcastle University Business School (Economics), 5 Barrack Road, Newcastle upon Tyne, NE1 4SE, United Kingdom. irene.mussio@newcastle.ac.uk ORCID ID 0000-0003-3724-9865

[1] Newcastle University Business School (Economics) Frederick Douglass Centre, Newcastle Helix. 2 Science Square, Newcastle upon Tyne, NE4 5TG, United Kingdom Susan.chilton@newcastle.ac.uk ORCID ID 0000-0003-2547-4467

[2] Newcastle University Business School (Accounting and Finance) Frederick Douglass Centre, Newcastle Helix. 2 Science Square, Newcastle upon Tyne, NE4 5TG, United Kingdom. Darren.duxbury@newcastle.ac.uk ORCID ID 0000-0002-7285-8474

[3] Newcastle University Business School (Economics), 5 Barrack Road, Newcastle upon Tyne, NE1 4SE, United Kingdom. Jytte.nielsen@newcastle.ac.uk ORCID ID 0000-0003-0129-0225

[4] Newcastle University Business School (Economics), 5 Barrack Road, Newcastle upon Tyne, NE1 4SE, United Kingdom. Smriti.sharma@newcastle.ac.uk ORCID ID 0000-0003-0129-0225

Abstract

As climate variability is increasing, extreme events such as temperature fluctuations will be more frequent. For the case of India, the country's exposure to heatwaves has risen in frequency, reaching temperature records in 2022. For policy-making purposes, there is an urgent need to understand measure citizens' preferences with respect to increasing climate change risks and value those risks. However, in income-constrained populations, the use of WTP for avoiding increased mortality risks might be a controversial approach. We adapt a double bounded, dichotomous choice approach to measure individual non-monetary risk-risk trade-offs. This low-cost method allows us to summarize how much people value heatwave mortality risks into a context premium, which could be later used to calculate a heatwave-specific VSL. Our results shows that on average, people care about avoiding heatwave-related mortality risks. Individuals in our sample of seven geographical states in India value avoiding increased heatwave-related mortality risks at an average of 1.85 times the rate of traffic accident mortality risks. Our second objective was to value avoiding increased heatwave mortality risks in India – that is, being able to calculate the VSL for heatwaves. Since VSLs for LMICs are sparse, we used benefit transfer to calculate the VSL under different assumptions. This gives us a range of VSLs for heatwave mortality risks for India of $0.30-2.14 million (2021 US Dollar values).

JEL codes: I12, Q51, Q54

Keywords: Climate change, heatwaves, context premium, dichotomous choice, value of statistical life

Ethical approval and consent to participate: This study was approved by the Newcastle University Ethics Board (Ref. number 23039/2022). Respondents had to sign an informed consent prior to participating in the survey.

Funding: This project was funded by the Newcastle University Business School Research and Impact Recovery Fund and the Faculty of Humanities and Social Sciences Faculty Research Fund.

1. INTRODUCTION

Climate change is significantly affecting people's lives and there is increasing evidence that the variability of heat and extreme weather has a significant impact on individuals' health, including nutrition, mental health and ultimately, premature mortality (IPCC 2014). Prior research has shown an increasing trend in temperatures in the last decades (1°C above pre-industrial levels in 2017 and 0.2°C per decade, IPCC 2021) and the impact of climate change is expected to intensify with additional warming, putting to the test the influence that temperature has on human lives (IPCC 2022). One of the countries which is currently dealing with the adverse consequences of temperature changes is India. India's maximum temperature has increased at a rate of 0.99°C per year in the period 1901-2020 (World Bank 2021). Moreover, India has become a hotspot in the last decade, with heatwaves in 2015, 2016 and 2019. The latest prolonged heatwave in 2022 (March to May) brought in new temperature records reaching almost 47°C (Indian Meteorological Department 2022). It is also expected that the frequency and intensity of warm days and nights to increase in the next decades (Sanjay et al. 2020), representing an increasing threat to human lives.

There may be tangible benefits to implementing health and safety policies to reduce the risk of individuals' premature mortality due to heatwaves in India, but these risks have not been monetarized for policy purposes. For these purposes, the Value of Statistical Life (VSL) - which represents the rate at which an individual is willing to exchange money for a small change in their own (mortality) risk - is usually applied (Robinson et al. 2019a). However, there is controversy regarding the appropriateness and ethics of using willingness to pay (WTP) in benefit-cost analysis of both health and environmental programs. Calculating the VSL due to reductions in premature mortality (or any risk reduction) in low and middle income countries (LMIC) using WTP does not always consider that individuals are usually income constrained (Hammitt & Robinson 2011) when asking WTP questions. Low income populations allocate most of their income to satisfy basic needs and have little room to allocate income to risk reductions and WTP might not reflect their actual willingness to pay. The monetary approach (WTP) has also been shown to be susceptible to scope insensitivity problems (Beattie et al., 1998; Carson and Mitchell 1995; Fetherstonhaugh et al. 1997; Jones-Lee, et al. 1995).

Therefore, to estimate preferences for mortality risk changes we need an approach that does not include money in the decisions of individuals while providing a reliable estimate of how people value avoiding increased risks. For this purpose, we adapt the risk-risk trade-off (RRTO) approach originally developed by Viscusi et al. (1991), which allows us to calculate a context premium for our relevant mortality risk (heatwaves). The RRTOs is a non-monetary, relative valuation approach that has been applied across a number of contexts to examine the trade-offs for fatal and non-fatal risks, such as chronic illnesses (McDonald et al. 2016; Magat et al. 1996; Van Houtven et al. 2008; Viscusi et al. 1991) and traffic accidents (Chilton et al. 2006; Nielsen et al. 2019). We extend the RRTO method to examine another risk in India, which has less individual control - heatwaves – and is more complex to introduce when it comes to estimating WTP under environmental uncertainty (Jones et al. 2015; Veronesi et al. 2014). Moreover, in RRTO, respondents choose hypothetically between risks (i.e. on one dimension, rather than between money and risks -two dimensions). Although one of the challenges of the approach is the use of small probabilities to measure risk (Baron 1997; Featherstonhaugh et al. 1997; Krupnick et al. 2002), these comparisons allow respondents to focus on the relative risk magnitudes without bringing money into decision-making,[1] easing the cognitive burden (Van Houtven et al. 2008; Nielsen et al. 2019) and enforcing the merits of adopting a RRTO framework to compare like with like. Thus, the first aim of this study is to establish whether a premium for heatwave-related mortality risks for India exists. A premium might be a priori expected to exist as the risks used to calculate the VSL of more common risks and climate change vary across a number of dimensions, such as degree of control and familiarity and experience with the risks.

For estimating the heatwave context premium, we extend the work of Mussio et al. (2022) and adapt a double-bounded, dichotomous choice (DBDC) approach, first proposed for WTP estimation by Hanemann (1985) and Carson et al. (1986). The DBDC approach elicits a second discrete response which is set on the basis of an individual's response to the first bound (in our case, a choice of which of two areas of a city an individual would prefer to move to, and with that which risk of death increase would be tolerated – either traffic accidents or heatwaves). This approach, with the extra information that it provides through the answers to two questions instead of one, has been empirically proven to be asymptotically more efficient than the single-bounded approach (Hanemann et al. 1991). To the best of our knowledge, we are the first study to use a DBDC elicitation method jointly within the RRTO approach and more specifically, to measure a premium for heatwave related mortality risks.

The second aim of our study is to calculate the value for avoiding increased heatwave mortality risks in India. For this, we calculate the VSL for heatwave-related mortality risks. We use a benefit transfer approach, involving sensitivity analysis and the best practices for benefit-cost analysis in LMIC (Robinson et al. 2019a, 2019b). However, there are two main issues with using the VSL for policy appraisal: context-dependence and benefit transfer.

First, the optimal approach is to use a VSL that was conducted using a study from the relevant country. However, not only there are few estimates of VSL for India, but none of them are calculated for climate change-related events (Shanmugan 1997; Simon et al. 1999 and Madheswaran 2007 for wage differentials; Bhattarcharya et al. 2007 for traffic accidents). Default VSL values, usually calculated for traffic or job accidents, are applied across contexts without change (OECD 2012). But context has been shown to affect an individual's value of a risk change (Alberini and Ščasný 2010;

[1] Money is oftentimes treated as non-fungible, with individuals adopting mental accounts (Thaler, 1999), but not always (Moon, Keasey & Duxbury, 1999; Duxbury, Keasey, Zhang & Chow, 2005) and so excluding monetary considerations can be desirable.

Chilton et al. 2002; Covey et al. 2010; McDonald et al. 2016), individual preferences to avoid mortality risks (Slovic et al. 1981) as well as the VSL for climate change (Mussio et al. 2022). Thus, VSL might be *context-dependent* and not transferable.

Second, given the lack of reliable studies for LMIC that use local data to calculate the VSL (through either revealed preference or stated preference methods, and regardless of the specific risk to be measured), calculations usually involve extrapolating VSL figures from high income countries such as the US or the UK to the relevant context, via a series of assumptions (also defined as *benefit transfer*; Robinson et al. 2019). But estimates from higher income countries cannot be applied directly as that there is heterogeneity among countries' dimensions, such as income levels, life expectancy, attitudes to risk and the norms related to risk and death, which might influence the VSL (Viscusi and Masterman 2017; Hammitt 2017; Eeckhoudt and Hammitt 2004). In addition, the VSL is sensitive to the assumptions used to transfer the value to another country, such as the exchange rate used to transfer monetary values into the same currency for the same year (translated using purchasing power parity). When it comes to adjustments for differences in income across countries, the income elasticity (the change in the VSL associated with a change in income) is used for extrapolating values across countries. However, it is reasonable to assume that consumption expenditures and investments in mortality reduction differ by country and tend to be higher in countries with higher levels of economic development (Hammitt and Robinson 2011; Robinson et al. 2019a). A range of elasticities (based on different assumptions) is usually assumed to present a range of VSL values (Viscusi and Masterman 2017; Masterman and Viscusi 2018). Lastly, benefit transfer does not account for differential preferences for avoiding risk changes between high income and LMIC. However, the RRTO method allows us to incorporate the preferences in the target country through the use of the context premium by modifying the VSL value for the relevant context (in our case, to value avoiding increased heatwave risks).

Coping with heatwaves has become increasingly common around the world, and the behaviors associated with these coping strategies depend directly on experience and individual factors. Most risks can be decreased, but at a cost, be it in terms of the foregone opportunities associated with the consumption of scarce resources or at the expense of increased risk elsewhere (Hammitt & Robinson, 2021). While psychological insights inform behavioral intervention design, Robinson and Hammitt (2011) call for increased consideration of how behavioral insights might inform the economic valuation of policy consequences, and especially of avoiding increasing heatwave risks.

One of the factors that influence behavior towards climate change is the psychological distance to climate change (McDonald et al. 2015). Public engagement with climate change is low, as individuals tend to perceive the threat of climate change as distant in time and space (Lorenzoni and Pidgeon 2006; Wang et al. 2019, 2021). But research on psychological distance shows that perceiving an event as concrete leads individuals to make more efforts to adapt to it (Guillard et al. 2021). Hence, we include validated measures of Construal Level Theory (CLT; Spence et al. 2012). For policy purposes, psychological distance to climate change gives us information about awareness regarding climate change and the behaviors which could be encouraged at the individual level. For example, there are individual differences in the extent to which distant outcomes are considered for decision-making – that is, temporal distance (Strathman et al. 1994). Individuals who consider future outcomes (such as the effects of current behavior on climate change) might be willing to sacrifice immediate benefits to achieve a more desirable future state (such as a lower impact of climate change in the future; Bruderer Enzler 2015; Murphy et al. 2020).

It is also conceivable that assessments of future risks might be influenced by how individuals weigh short- and long-term goals and thus, with individual psychological distance to these outcomes. Therefore, we also include validated psychological measures of Consideration of Future Consequences (CFC, Strathman et al. 1994). CFC questions are complementary to CLT questions, as temporal distance and the future consequences of climate change are related. CFC is context dependent (Bruderer Enzler 2015; Murphy et al. 2020) and prior research has shown that the consideration of future or distant outcomes, partially accounts for higher levels of scepticism about climate change (Veckalov et al. 2021).

Using a DBDC valuation experiment, in seven geographical states in India affected by prior heatwaves, we find evidence of a heatwave risk context premium of 1.7-1.9. In the aggregate, individuals value avoiding increased heatwave-related mortality risks at 1.8 times the rate of traffic accident mortality risks. By using benefit transfer, different VSL values and following the recommendations for benefit-cost analysis (Robinson et al. 2019a), we show that benefit transfer a range of VSL for heatwave mortality risks of $0.30-2.14 million (2021 US Dollar values). Our analysis of systematic heterogeneity shows that individuals who are psychologically close to climate change report a context premium of 3, meaning that individuals value avoiding increased heatwave-related mortality risks at 3 times the rate of traffic accident mortality risks.

In the next section, we discuss the theory behind the RRTO method and our experimental valuation design.

2. THE RISK-RISK TRADE-OFF METHOD

2.1. Theory

Assume an individual is faced with a choice between two mortality risks, e.g., traffic accident and heatwaves. The problem can be expressed in an expected utility framework. Following Viscusi et al. (1991), Magat et al. (1996) and Van Houtven et al. (2008), we assume that individuals make choices to maximize expected utility:

(1) $E(U) = r_W U(W,m) + r_T U(T,m) + (1 - r_W - r_T) U(H,m)$

Utility is determined by three mutually exclusive health outcomes (W, T, H) and wealth (m). Individuals are assumed to face the risks of these outcomes within the next period. The three outcomes are: the mortality risk from heatwaves (W) with probability r_W, the mortality risk from a traffic accident (T) with probability r_T, and all other health outcomes (H).

Individuals make a choice between two options, A or B. In option A, the probabilities of the first and second outcomes are represented by r_W^A and r_T^A. In option B, the probabilities of the first and second outcomes are represented by r_W^B and r_T^B. Expected utilities of both options are set out as follows:

(2) $E(U)^A = r_W^A U(W,m) + r_T^A U(T,m) + \left(1 - r_W^A - r_T^A\right) U(H,m)$

(3) $E(U)^B = r_W^B U(W,m) + r_T^B U(T,m) + (1 - r_W^B - r_T^B) U(H,m)$

If an expected utility maximiser indicates indifference between options A and B, this would result in:

(4) $E(U)^A = E(U)^B$

Rearranging equation (4) gives us:

(5) $U(W,m) = rr_{WT}\, U(T,m) + (1 - rr_{WT})\, U(H,m)$

Where the utility of death from a heatwave has been transformed into an equivalent lottery on life with good health and death from a traffic accident, similar to the model framework setup in Jones-Lee (1976). The lottery transformation is based on coefficient $rr_{WT} = \frac{r_T^B - r_T^A}{r_W^A - r_W^B}$, the ratio of the outcome probability differences under indifference.

For example, if the participant is indifferent between option A (with a heatwave mortality risk of 100 in 100,000 and a traffic accident mortality risk of 80 in 100,000) and option B (with a heatwave mortality risk of 80 in 100,000 and a traffic accident mortality risk of 110 in 100,000), rr_{WT} is calculated as $rr_{WT} = \frac{110-80}{100-80} = \frac{30}{20} = 1.5$, and equation (5) would be rewritten as:

(6) $U(W,m) = 1.5\, U(T,m) - 0.5\, U(H,m)$

Van Houtven et al. (2008) showed how this analysis can be recast in VSL terms, where the VSL is defined as the marginal rate of substitution between wealth and the mortality risk from a traffic accident. In the case of the heatwave mortality risk, VSL_W is the marginal rate of substitution between wealth and the mortality risk from a heatwave. With no loss of generality, setting $U(T,m)$ to zero, and differentiating equation (1) with respect to r_W, r_T, Van Houtven et al. (2008) show that the relativity between VSL_W and VSL_T (the Mortality Equivalence Ratio, MER) can be written as:

$$(7)\quad \frac{VSL_W}{VSL_T} = \frac{U(W,m)-U(H,m)}{-U(H,m)} = 1 - \frac{U(W,m)}{U(H,m)}$$

Because in practice we do not directly observe utilities from applications of the RRTO method, but we do observe the relative sizes of risk changes that make participants indifferent between options A and B, from equation (5) we have:

$$(8)\ U(W,m) = (1-rr_{WT})U(H,m) = \left[1-\left(\frac{r_T^B-r_T^A}{r_W^A-r_W^B}\right)\right]U(H,m)$$

Which, combining with equation (7) leads to an alternative MER specification linking the relativity between VSL_W and VSL_T and the ratio of outcome probabilities, rr_{WT}:

$$(9)\quad MER = \frac{VSL_W}{VSL_T} = \frac{r_T^B-r_T^A}{r_W^A-r_W^B} = rr_{WT}$$

This equation allows us to determine the relative size of the VSL from one cause compared to the other. This VSL trade-off also represents the proportional utility loss in the case of heatwave-related mortality risks, which stems from equation (7) (McDonald et al. 2016).

Equation (9) also shows that the MER is equal to the rr_{WT} coefficient that equates $E(U)$ between two options. The estimated expected value of the MER can be also interpreted as the heatwave context premium, which reflects the value individuals place on heatwaves versus traffic accident mortality risks. Following our example, from equation (6) we would have a MER of 1.5. i.e. $VSL_W = 1.5 * VSL_T$. Thus, a person would be indifferent between an increase (decrease) in their risk of traffic accident mortality which is 1.5 times as large as the increase (decrease) in the risk of heatwave mortality and would therefore value avoiding a heatwave-related fatality 1.5 times more than avoiding a traffic accident fatality.

2.2. Experimental and survey design

The survey is split into three blocks. Block 1 informs respondents of the risks to be considered in the survey – traffic accident and heatwave mortality risks. This section also serves as a warm-up before the RRTO, providing context for both risks. The block starts with a simple description of what constitutes risk, followed by explanations of what traffic accident and heatwave fatalities involve. Respondents are also informed about the baseline mortality risks, including an explanation on how these are expected to impact different sized cities in India over the next ten years.

Block 2 contains our double-bounded RRTO questions. We use the most common scenario in the literature, framing the question as a choice of moving from the respondent's current area to one of two distinct areas of a city (Cameron et al. 2010; Clarke et al. 1997; Nielsen et al. 2019; Van Houtven et al. 2008; Viscusi et al. 1991). Each area differs only with respect to mortality risk. The decision scenario clearly states that "Housing, medical services alternative employment opportunities and general living and working conditions, can be considered to be identical in both Areas of the new city".

The decision to move is a conditional decision based on the mortality risks presented to the respondents. As the need to move is established, the only decision that needs to be made is which Area to move to. This also means that we do not include the option to stay in the area that they are currently living in, which would lead to protest responses. Mortality risks are presented as risks per 100,000 people per decade, avoiding individual differences in the interpretation of verbal probabilistic statements associated with climate change (Budescu et al. 2012).

Respondents were asked to assume that the baseline mortality risks for the two events were 80 deaths per 100,000 people per decade. Baseline deaths are constructed from previous traffic accident data (96 deaths per 100,000 people every ten years, India National Crime Records Bureau 2020) and the literature on heatwaves (60 deaths per 100,000 people every ten years, Zhao et al. 2021). For ease of comparison, we averaged and rounded the two risks to provide us with the same baseline risk - 80 deaths per 100,000 people per decade – for both events[2]. Respondents were first presented with a randomly selected choice from a set of nine scenarios and asked whether they would prefer to move to Area T (where traffic accident mortality risk increases) or Area W (where heatwave mortality risk increases). This is followed by a second RRTO question based on the responses to the first choice. Central to the method is the assumption of indifference (equation (9)) and the empirical estimation of indifference points between two risk increases.[3] Therefore, we include an option that allows for indifference between the two Areas (in the two choice questions).

The RRTO question is described in general terms, followed by an example. Respondents are then asked to answer a practice RRTO question where one area is unambiguously better that the other (Figure 1). The practice choice also serves as an attention check to inform the empirical analysis, allowing us to split respondents into those who answered it correctly (move to Area T which is unambiguously better since both risks are smaller than in the current Area) or incorrectly (move to

[2] As the two baseline risks were similar, we decided that averaging these risks was a reasonable compromise given the problems noted in the literature on the impact of baseline risk on choices. Chilton et al. (2006) identify a number of alternative behaviors (to expected utility) that would result in sub-optimal choices in the context of 'dread risks'. For example, "Absolute Risk Equalisers" who would prefer to increase the risk of death with a very low baseline risk until it was equal to the risk of death with a (much) higher baseline risk. The outcome of this would be to significantly increase the total risk of death over and above that incurred by accepting a very small risk increase in the latter risk. In this study, this behavior would mean a respondent would choose the option with the lowest baseline risk, irrespective of any contextual preferences. By standardizing the baseline risk, we remove this potential confound in the estimates of the MER.

[3] Whilst this has been done at the individual level in Chilton et al. (2006), McDonald et al. (2016) and Nielsen et al. (2019), given the nature of the data, we follow Van Houtven et al. (2008) and estimate indifference points at the aggregate sample level.

Area W or indicate indifference, where Area W is unambiguously worse since one risk is higher than in the current Area)[4].

After the practice choice, each respondent is presented with two RRTO questions which were designed using the DBDC approach, and which determined their individual lower and upper bounds for tolerance of mortality risk increases.

Figure 1: Risk-risk trade-off practice choice

The place where you currently live has the following risks of death per 10 years:

	Your current Area risk of death per 10 years
Traffic accidents Heatwaves	80 in 100,000 80 in 100,000

Please choose between Area T or Area W of the new city, or if you are equally happy with moving to any of the two Areas.

	Area T risk of death per 10 years	Area W risk of death per 10 years
Traffic accidents Heatwaves	**70** in 100,000 **70** in 100,000	**90** in 100,000 80 in 100,000

Please indicate the option which you most prefer:

☐ Area T	☐ Area W	☐ I am equally happy to move to either Area

We initially designed nine alternative, DBDC RRTO choice scenarios for the first bound, based on the approach proposed by Hanemann (1985) and Carson (1985) and first implemented by Carson et al. (1986) to estimate WTP. Given the additional information which is provided by two questions instead of only one, DBDC choice scenarios have been shown to be asymptotically more efficient than the single-bounded approach (Hanemann et al. 1991). To design these scenarios, we follow the approach of Van Houtven et al. (2008). By varying the sizes of the mortality risks randomly across respondents, we can present scenario choices with different "Risk Difference Ratios" (RDRs) between Area T and Area W. Each choice scenario RDR for the first bound is calculated as:

$$(10)\quad RDR = \frac{p_T^{AW} - p_T^{AT}}{p_W^{AT} - p_W^{AW}}$$

[4] For clarity purposes, we refer to the areas throughout the text as Area T and Area W. However, following piloting, we adopted the labels Areas 1 and 2 in the survey to provide a neutral framing.

In Area T, the probabilities of the first and second outcomes are represented by p_W^{AT} and p_T^{AT}. In Area W, the probabilities of the first and second outcomes are represented by p_W^{AW} and p_T^{AW}. Based on how choices change with respect to the RDRs, the responses can be used to estimate the expected value of MER and calculate the VSL_W.

The range of RDRs[5] in the first bound followed principles similar to those for optimal bid design for dichotomous choice WTP elicitation (Alberini 2005). The range of RDRs was determined to encompass a reasonably large (but plausible) proportion of mortality risk increases. Based on the results of our pilot study, we determined five different increases in traffic accident ($p_T^{AW} - p_T^{AT}$) mortality risk and five increases in heatwave-related mortality risk ($p_W^{AT} - p_W^{AW}$) for our first bound. Our baseline is 80 deaths in 100,000 per decade for both traffic and heatwave-related mortality risks, and the vector of increases for the first bound is (85, 90, 95, 100, 105)[6]. Our RDRs for the first question presented to our participants, which are calculated using equation (10) and our five increases in mortality risks, range from 5 (highest traffic accident risk increase) to 0.2 (highest heatwave risk increase) and are centred at 1, where both risk increases are low (85 per 100,000 per decade see Table 1). Figure 2 presents an example of a scenario choice the respondent faces between Areas (RDR = 5.0). Note, there is no area in any of the choices that is unambiguously better than the other.

Table 1: List of risk-risk trade-off scenarios, first bound

First bound scenario	Traffic accident mortality risk (in 100,000, per 10 years)	Heatwave mortality risk (in 100,000, per 10 years)	Risk Difference Ratio (RDR)
0. Baseline	**80**	**80**	
1	105	85	5
2	100	85	4
3	95	85	3
4	90	85	2
5	85	85	1
6	85	90	0.5
7	85	95	0.33
8	85	100	0.25
9	85	105	0.2

[5] Under Expected Utility theory, marginal increases and decreases in risk are assumed to be equally weighted given the assumption that linearity holds at the margin. The proposed analysis is unaffected by the choice of risk increases or risk reductions but, in practical terms, given the relatively low baseline mortality risk in either case, we adopt risk increases, as in Chilton et al. (2006), McDonald et al. (2016) and Nielsen et al. (2019). This allows for a broader range of risk changes to be included in the analysis (since risk decreases are bounded from below by 0 in 100,000 whilst risk increases are effectively unbounded).

[6] We vary the risk for each event independently, holding the other event risk constant at its low value (85/100,000), hence there are nine, not ten, scenarios in total.

Figure 2: Example of a risk-risk trade-off choice scenario, first bound, RDR=5

The place where you currently live has the following risks of death per 10 years:

	Your current Area risk of death per 10 years
Traffic accidents Heatwaves	80 in 100,000 80 in 100,000

Please choose between Area T or Area W of the new city, or if you are equally happy with moving to any of the two Areas.

	Area T risk of death per 10 years	Area W risk of death per 10 years
Traffic accidents Heatwaves	**105** in 100,000 80 in 100,000	80 in 100,000 **85** in 100,000

Please indicate the option which you most prefer:

☐ Area T

☐ Area W

☐ I am equally happy to move to either Area

For determining the second bound, we use the choice of Area the participant makes in the first bound. A summary of the decision-making process can be found in Figure 3. If the area chosen by the participant in the first bound is Area T, in the second bound we increase the traffic accident mortality risk by 5 deaths in 100,000 per 10 years (in Figure 2, the mortality risk from a traffic accident in Area T would go from 105 to 110 in 100,000 per 10 years), while the other mortality risks remain unchanged. This means that there is an additional, maximum RDR in this second stage equal to 6 from increasing traffic accident mortality risk from 105 to 110 in 100,000 per 10 years. If the area chosen by the participant in the first bound is Area W, in the second bound we increase the heatwave mortality risk by 5 deaths (in Figure 2, the mortality risk from a heatwave in Area W would go from 85 to 90 in 100,000 per 10 years), while the other mortality risks remain unchanged. This means that there is an additional, minimum RDR in this second stage equal to 0.17 from increasing heatwave mortality risk from 85 to 90 in 100,000 per 10 years. If the participant is indifferent to either area in the first bound, no second bound is presented as we found their indifference point. Thus, in this case, they move directly to the socio-economic questionnaire (Block 3).

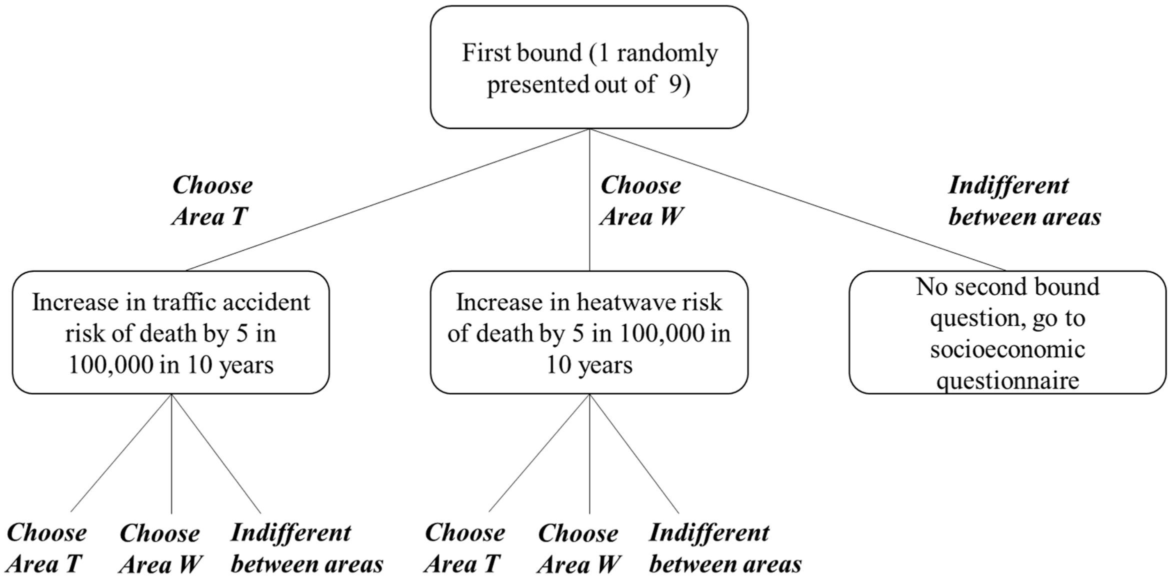
Block 3 includes socio-economic questions plus two sets of measures on (i) individual goal attainment regarding future/distant outcomes (CFC) and (ii) how psychological distance dimensions are related to the concept of climate change (CLT). To account for the perception of heatwave and traffic accident mortality risks we introduce a series of questions about respondents’ daily lives to conceptualize their experiences at a personal level, while emphasizing the current occurrence of heatwaves in India (Zanocco et al. 2018). Our a priori expectation is that behavioral factors partially explain the context premium that might exist for heatwave mortality risks. For this reason, we include two psychological scales in our questionnaire to account for psychological distance to climate change (CLT) and the analysis of distant outcomes and goals (CFC). We explore whether these scales provide key insights regarding heatwave mortality risks.

CLT (Liberman and Trope 2008; Trope and Liberman 2010) describes psychological distance as composed of four dimensions: temporal (events in the past or future being more distant), spatial (geographically distant places being more psychologically distant), social (different people to oneself being more distant) and hypothetical (events with a lower probability of occurrence are more psychologically distant). Climate change is perceived to be psychologically distant in all four dimensions of CLT (Wang et al. 2019, 2021). A higher degree of psychological distance increases mental abstraction: individuals who are psychologically distant to climate change believe that it only affects other populations or future generations, viewing climate change as something more abstract than contextual (Liberman and Trope 2008; Milfont 2010). Our CLT index is based on the questionnaire developed by Spence et al. (2012), which proposes a series of questions pertaining to peoples' perception and behavioral intention to climate change across the different aspects of psychological distance.

CFC refers to "the extent to which individuals consider the potential distant outcomes of their behaviors and the extent to which they are influenced by these potential outcomes" (Strathman et al. 1994, p. 743). More specifically, CFC captures how a person is driven by short-term rewards or is oriented toward long-term goals (Bruderer Enzler 2015). In the case of climate change, there is a temporal dimension in CFC that links this scale with the temporal component of the CLT, as many environmental behaviors involve a conflict between short-term and long-term benefits (Dawes 1980; for a meta-analysis of the relationship between CFC and environmental-related behaviors see Milfont et al. 2012). For constructing our CFC index, we use the original 12-item scale proposed by Strathman et al. (1994). Low scorers prioritize maximizing immediate benefits with little regard for the future costs of their current behaviors, while high scorers prioritize the future implications of their current actions, while sacrificing immediate gratification (Murphy et al. 2020; Strathman et al. 1994). The CFC scale has been widely validated by the literature, and it has been found to be a robust predictor of climate and environmental attitudes (Beiser-McGrath and Huber 2018; Corral-Verdugo et al. 2009; Joireman et al. 2009; Veckalov et al. 2021). The survey is included in the Online Appendix.

We tested the survey for comprehension with 10 participants and then piloted the survey with 200 participants to determine the final choice scenarios for the RRTO questions.

Figure 3: RRTO double-bound elicitation process



2.3. Geographical state selection and survey administration

The survey was administered online between July and August 2022 and coded using Qualtrics. We partnered with Dynata for data collection and targeted a sample of Indian adult residents from the following seven geographical states: Delhi, Haryana, Punjab, Rajasthan, Uttar Pradesh (North), Andhra Pradesh and Tamil Nadu (South). This subgroup of states was selected from two sources. First, we chose the geographical states which experienced the highest temperatures during the 2019 heatwave in the North and those states which were affected by the heatwave in the South (Andhra Pradesh and Tamil Nadu). Second, we used the World Bank (2022) climate data projections for India (2020-2039)[7] to choose the most affected states. From the overlap of the two sources, we chose a group of geographical states which satisfied both conditions (worst affected by the 2019 heatwave and worst predictions of the number of very hot days from the World Bank).

[7] For a map of the heatwave temperatures during the 2019 heatwave in India please refer to the following Earth Observatory NASA (2019) map: https://earthobservatory.nasa.gov/images/145167/heatwave-in-india (last accessed July 21, 2022). The information used from the World Bank is the projected climatology of number of very hot days (Tmax>35°C) for 2020-2039 (SSP 1-2.6, reference period 1995-2014, last accessed May 05, 2022).

3. RESULTS

We collected responses from 2,334 participants. The majority of participants took an average of 16 minutes to complete the survey. We did not find significant differences in sociodemographics across the nine first bound choice scenarios (see Online Appendix).

Over one-tenth (12.8%) of our sample have experienced major traffic accident-related injuries and 13.3% responded having suffered major heatwave-related health consequences. Almost two thirds of our participants reported that their geographical state has a SMS heatwave alert system and a majority of them are subscribed to the system and find it useful. From those who do not have this system, 85% believe that a SMS heatwave alert system would be useful. Forty percent of our sample experience power cuts a few times a day. Descriptions and summary statistics for the variables used in the analysis are provided in Table 2.

Of the total sample (2,334), 451 participants stated indifference between the two areas in the first choice scenario and were not asked a second question. This subsample of participants is used to perform robustness tests against the DBDC estimation of the MER. Of the total sample, 1,883 participants chose to move to either Area T or Area W in the first choice scenario were presented with a second choice scenario (see Table 3). These participants are those used for the DBDC estimation of the MER. Around 26% of the respondents of the two bounds switch between Area T to Area W and viceversa, and this percentage increases to 35% if we account for the switches from Area T or Area W to indifferent. These switching figures are consistent with the percentage of switches in the prior literature on WTP for environmental issues in Southeast Asia (Islam et al. 2019; Paparrizos et al. 2021; Akter 2020).

Table 2: Variable description

Variable	Description	Mean	Standard deviation	Min	Max
Male	=1 if participant self-describes as male	0.419	0.494	0	1
Less than 35 years old	=1 if participant is less than 35 years old	0.440	0.497	0	1
Income below 30,000 rupees	=1 if participant has an income of less than 30,000 rupees a month	0.242	0.428	0	1
Degree level education (and above)	=1 if participant has at least tertiary education	0.889	0.315	0	1
Private sector employee	=1 if participant is a private sector employee	0.590	0.492	0	1
Hindu	=1 if participant practices Hinduism	0.604	0.489	0	1
General caste	= 1 if participant is of general caste	0.545	0.498	0	1
Risk averse	=1 if participant is risk averse (based on self-reported willingness to take risks question)	0.840	0.367	0	1
Patient	=1 if participant is patient (based on self-reported patience question)	0.847	0.360	0	1
Has air cooler	=1 if participant owns an air cooler	0.768	0.422	0	1
Has air conditioner	=1 if participant owns an air conditioner	0.771	0.420	0	1
Number of power alternatives owned	Number of power alternatives owned from (recheargeable battery, diesel generator, solar panels or home system or another power alternative)	2.174	1.360	0	4
Construal level theory scale	Construal level theory scale (as constructed by Spence et al. 2012)	0.001	0.610	-2.862	0.919
Consideration of future conseq scale	Consideration of future consequences scale (as constructed by Strathman et al. 1994)	3.819	1.032	1	5
Dummy Construal level theory scale	=1 if participant is psychologically close to climate change	0.500	0.500	0	1
Dummy Consideration of future conseq scale	=1 if participant prioritizes the future implications of their current actions	0.467	0.499	0	1
Traffic accident injury	=1 if participant has suffered injuries from a traffic accident	0.695	0.460	0	1
Heatwave health consequences	=1 if participant prioritizes the future implications of their current actions	0.683	0.465	0	1
N	Number of observations		2,234		

Table 3: First and second bound response sequence, by area

	Percentage of second bound responses (%)	*N*
AT-AT	33.56	632
AT-AW	12.53	236
AW-AT	13.33	251
AW-AW	31.28	589
AT-Indifferent	2.87	54
AW-Indifferent	6.43	121
Total second bound		***1883***
Indifferent in first bound		***451***
Total participants		**2334**

Note: AT = Area T, AW = Area W

3.1. Maximum likelihood estimation of the DBDC RRTO

To estimate the double-bounded dichotomous choice model for our RRTO responses, we follow the approach of Lopez-Feldman (2013). In our model, we assume that our MER follows a linear function and that the error term is normally distributed:

(10) $MER_i(z_i, u_i) = z_i'\beta + u_i \;, \qquad u_i \sim N(0, \sigma^2)$

Where i corresponds to each participant, z_i is a vector of explanatory variables (including socioeconomics and our psychological scales in Table 2) and u_i is the error term. One of the objectives of our analysis is to understand the impact of heatwaves on decision-making. Therefore, we examine the decision to move to Area W. Under this model, we have four main cases. Assume that, for the bounds, the RDR from the first choice scenario is RDR_1 and the RDR from the second choice scenario is RDR_2:

(11) $P(A_W, A_W) = P(MER < RDR_2)$

(12) $P(A_W, A_T \; or \; Indifferent) = P(RDR_2 \leq MER < RDR_1)$

(13) $P(A_T, A_W \; or \; Indifferent) = P(RDR_1 \leq MER < RDR_2)$

(14) $P(A_T, A_T) = P(MER > RDR_2)$

In order to estimate the parameters in this model ($\hat{\beta}$ and $\hat{\sigma}$), we construct a four-part likelihood function that needs to maximized:

$$(15)\ \sum_{i=1}^{N}\left[d_i^{WW}\,ln\left(\Phi\left(z_i'\frac{\beta}{\sigma}-\frac{RDR_2}{\sigma}\right)\right)+\ d_i^{WTI}\,ln\left(\Phi\left(z_i'\frac{\beta}{\sigma}-\frac{RDR_2}{\sigma}\right)-\Phi\left(z_i'\frac{\beta}{\sigma}-\frac{RDR_1}{\sigma}\right)\right)\right.$$

$$+\ d_i^{TWI}\,ln\left(\Phi\left(z_i'\frac{\beta}{\sigma}-\frac{RDR_1}{\sigma}\right)-\Phi\left(z_i'\frac{\beta}{\sigma}-\frac{RDR_2}{\sigma}\right)\right)$$

$$\left.+\,d_i^{TT}\,ln\left(1-\Phi\left(z_i'\frac{\beta}{\sigma}-\frac{RDR_2}{\sigma}\right)\right)\right]$$

Where $d_i^{WW}, d_i^{WTI}, d_i^{TWI}, d_i^{TT}$ are indicator variables that take the value of one or zero depending on the choices made by each participant. For example, if $d_i^{WW} = 1$ and $d_i^{WTI}, d_i^{TWI}, d_i^{TT}$ are 0 the participant chose Area W in the first bound and Area W in the second bound.

By using this approach and maximizing the likelihood function, we can estimate $\hat{\beta}$ and $\hat{\sigma}$ and thus, directly estimate the MER. For this estimation, we use the 1,883 participants who chose an area (either Area T or Area W) for the first choice scenario. More specifically, we use as inputs of the model the participant responses to each of the two choice scenarios as well as the associated RDR for the two choices presented. As an example, consider the following specification with just one explanatory variable, z_1:

$$(16)\quad MER_i(z_i, u_i) = \beta_0 + \beta_1 z_{1_i} + u_i$$

Using this example specification, the aggregate "univariate MER" can be directly derived as:

$$(17)\ MER_{UNI} = \beta_0$$

We can also include the systematic heterogeneity in our MER to calculate a "multivariate MER". In our example, a multivariate MER that varies based on z_1 can be calculated as:

$$(18)\ MER_{MULTI} = \beta_0 + \beta_1$$

We next present the results of our maximum likelihood estimation as well as univariate and multivariate versions of the MER (our context premium for heatwave mortality risk vs. traffic accident mortality risk).

3.2. Results of the DBDC RRTO estimation

Based on the model of section 3.1., our main input variables for the estimation of the univariate MER are the decision to move to Area W in the first and second choice scenarios and the RDR of the first and second choice scenarios (our "bounds"). Results of this estimation, with and without systematic heterogeneity are presented in Table 4.

The simplest model, without any systematic heterogeneity, is presented in specification (1) of Table 4. Our maximum likelihood estimation translates into a univariate MER of 1.85 (based on equations (10)-(17)). This means that in aggregate, individuals in our sample value avoiding increased heatwave-related mortality risks at 1.85 times the rate of traffic accident mortality risks (our "context premium"). Thus, the first objective of our analysis is achieved.

As a first robustness check, we can compare our estimated MER with the average RDR for all those participants who stated being indifferent to the areas proposed to them in the first-choice scenario (remember that those indifferent in the first choice are not presented with a second choice). These 451 participants have directly told us what their risk-risk trade-off indifference point is; thus, we do not have to estimate their MER, as it is the RDR of the question posed to them. Comparing our estimated univariate MER from the sample of 1,883 participants who were presented with two bounds with the average RDR from those who were presented a single bound and were indifferent, the values are almost the same: the estimated univariate MER is 1.852 (s.d. 0.245) and the average RDR for the first bound indifferent is 1.828 (s.d. 1.727).

As a second robustness check, we compare the results the single bound probit specification used in Mussio et al. (2022) for the case of the UK. For the estimation in this Indian sample, we use a probit specification that incorporates only the first bound choices made by our sample of participants. We then compare the standard errors of the univariate MER between this and our DBDC estimation (see online appendix for first bound probit regression results). Consistent with the empirical findings of Hanemann et al. (1991), our DBDC univariate MERs have a much lower standard deviation than the univariate MERs calculated from using only our first bound results. For example, for the specification that has only the decisions to move to Area W and the RDRs, the first bound only univariate MER has a mean of 4.051 and a standard deviation of 1.021, while for the DBDC, the univariate MER has a mean of 1.853 and a standard deviation of 0.245. Thus, in the case of this sample of participants, the DBDC approach is empirically more efficient than the single-bounded approach.

Table 4: Analysis of risk-risk trade-offs: maximum likelihood results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Constant only	Socioeconomics	Socioeconomics + preferences	Socioeconomics + preferences + appliances	Socioeconomics + preferences + appliances + psych scales	Socioeconomics + preferences + appliances + psych scale dummies	Socioeconomics + preferences + appliances + psych scale dummies + injuries
Beta							
Male		-0.277	-0.287	-0.275	-0.111	-0.045	-0.047
		(0.197)	(0.213)	(0.241)	(0.232)	(0.221)	(0.221)
Less than 35 years old		-0.093	-0.101	-0.138	-0.010	0.018	0.009
		(0.185)	(0.183)	(0.184)	(0.236)	(0.232)	(0.233)
Income below 30,000 rupees		-0.006	-0.001	-0.126	0.007	-0.006	-0.018
		(0.119)	(0.113)	(0.188)	(0.118)	(0.129)	(0.129)
Degree level education (and above)		0.552	0.532	0.571	0.429	0.511	0.495
		(0.442)	(0.448)	(0.443)	(0.371)	(0.407)	(0.392)
Private sector employee		-0.360**	-0.356**	-0.330**	-0.381**	-0.417**	-0.379**
		(0.177)	(0.156)	(0.142)	(0.174)	(0.177)	(0.153)
Hindu		-0.390*	-0.399*	-0.383*	-0.227*	-0.256**	-0.260**
		(0.205)	(0.216)	(0.213)	(0.119)	(0.116)	(0.111)
General caste		0.106	0.095	0.084	0.121	0.124**	0.134**
		(0.065)	(0.068)	(0.060)	(0.082)	(0.075)	(0.062)
Risk averse			-0.372	-0.422*	-0.635*	-0.588*	-0.579*
			(0.230)	(0.250)	(0.350)	(0.350)	(0.340)
Patience			0.583***	0.566***	0.478**	0.470**	0.489***
			(0.175)	(0.177)	(0.187)	(0.189)	(0.182)
Has air cooler				0.283	0.059	0.001	0.019
				(0.248)	(0.280)	(0.296)	(0.293)
Has air conditioner				-0.532**	-0.562***	-0.514***	-0.517**
				(0.241)	(0.196)	(0.191)	(0.203)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Construal level theory scale					1.003***		
					(0.421)		
Consideration of future conseq scale					-0.187		
					(0.131)		
Dummy Construal level theory scale						1.327***	1.332***
						(0.452)	(0.452)
Dummy Consideration of future conseq scale						-0.307	-0.295
						(0.218)	(0.227)
Traffic accident injury							-0.338*
							(0.175)
Heatwave health consequences							0.127*
							(0.066)
Univariate MER (Constant)	**1.853*** **	**1.904*** **	**1.758*** **	**1.994*** **	**3.039*** **	**1.712** **	**1.813** **
	(0.245)	**(0.443)**	**(0.547)**	**(0.744)**	**(0.912)**	**(0.733)**	**(0.771)**
Sigma	-2.916***	-2.897***	-2.892***	-2.883***	-2.855***	-2.842***	-2.839***
	-0.217	(0.204)	(0.205)	(0.200)	(0.190)	(0.182)	(0.181)
Observations	*1883*	*1883*	*1883*	*1883*	*1883*	*1883*	*1883*

*Notes: * p=0.10 ** p=0.05 *** p=0.01. Construal level theory scale is calculated based on Spence et al. (2012). Consideration of future consequences scale is calculated based on Strathman et al. (1994). Analysis is performed on sample who was presented with the first and second choice scenarios. Univariate MERs are calculated based on equations (10)-(17). Errors clustered by state.*

Models that control for systematic heterogeneity are reported in specifications (2) through (7) of Table 4. Controls include socioeconomic variables, individual self-reported preferences for risk and time, ownership of heatwave-related assets (air cooler, air conditioner), scales and dummies for psychological distance to climate change (CLT) and consideration of future consequences (CFC) and prior individual experience with traffic accidents and heatwaves. As a second robustness check for the univariate MER, the results from these estimations show that the introduction of individual heterogeneity results in an increased univariate MER variance and a reduced univariate MER mean value, ranging between 1.7-1.9 for most specifications (specification (5) shows a univariate MER of 3, which is explained by the use of psychological scales directly as they were constructed).

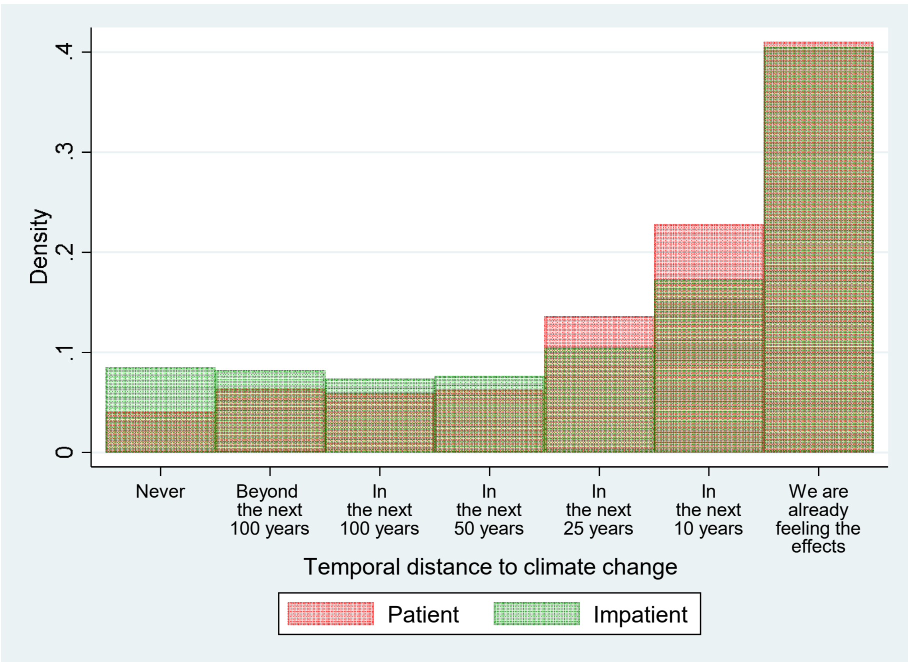
The second aim of this project is to understand how different behavioral factors could shape the context premium (Table 5). Specifically, we want to understand whether behavioral-based variables cause the aggregate MER to change (see Table 4, specifications 2-7). Using econometric specification (6) to calculate multivariate MERs, individuals who are psychologically close to climate change value heatwave mortality risks at 3 times the rate of traffic accident mortality risks versus 1.8 for those psychologically distant (our psychological distance variable is coded: 1 if psychologically close to climate change, 0 if psychologically distant). Although we do not elicit information to calculate individual discount factors, we find that self-reported individual patience (Cai et al. 2020) is positively related with the context premium. Self-reported levels of patience also have a positive relationship with the time distance component of the Spence et al (2012) CLT scale, which given the way the question is constructed it could be used as a proxy for discounting climate change. Patient individuals in our sample state that the effects of climate change in India will be felt closer in time compared to those who are impatient – which could be approximated as having a higher discount rate for climate change compared to the impatient sub-sample (p-value for mean response to time distance question, patient vs. impatient = 0.004, Kolmogorov-Smirnov distribution test p-value = 0.013; see Figure 4). We did not find significant effects from the CFC scale.

Table 5: Context premium with systematic heterogeneity

	Specification (6)		Specification (7)	
	Mean	St.Dev.	Mean	St.Dev.
Univariate MER (only constant term)	1.712	0.733	1.813	0.772
Psychologically close to climate change	3.040***	0.950	3.146***	1.018
Has air conditioner	1.198***	0.655	1.296***	0.676
Patient	2.182***	0.589	2.302***	0.659
Has been injured in traffic accident			1.475***	0.714
Has experienced health consequences of heatwaves			1.941***	0.733

*Notes: * p=0.10 ** p=0.05 *** p=0.01 for tests comparing the univariate MER against MERs with systematic heterogeneity (multivariate MERs). Specifications (6) and (7) from Table 4. Univariate MERs are calculated based on equation (17), multivariate MERs are calculated based on equation (18).*

Figure 4: Distribution of time distance to climate change question, by level of patience



Lastly, in terms of experience, from specification (7) in Table 4, having experienced negative health consequences due to a heatwave significantly increases the context premium from 1.8 to 1.9, valuing mortality risk from heatwaves significantly more. Having direct experience with traffic accidents lowers the heatwave context premium from 1.8 to 1.5, but still valuing heatwave mortality risk more than traffic accident mortality risk.

3.3. Value of Statistical Life

To calculate the VSL for heatwave mortality risks (VSL_W), we follow a two-step approach. First, given that there are no direct, official VSL estimates for India, we follow the guidelines for benefit cost analysis (BCA; Robinson et al. 2019a) and calculate a VSL that is not based on heatwave mortality risks. The typical approach when no official VSL figures exist is to extrapolate values from wealthier countries, adjusting for income differences and conduct a sensitivity analysis to assess the extent to which conclusions might depend based on these estimates (Robinson et al. 2019b). To calculate VSL estimates for India we use the three approaches suggested by the BCA guidelines to extrapolate values from the US, as well as an extrapolation of the Value for Prevented Fatality for the UK, specifically calculated for traffic accident mortality risks, and the unofficial VSL value for traffic accident mortality risks in India calculated by Bhattacharya et al. (2007; $150,000 in 2005 values). Main inputs for these calculations come from the following sources:

- VSL for the US ($11.8 million): US Department of Transport guidance on valuation of a statistical life in economic analysis (2022)
- Gross National Income per capita in PPP $ (India: $7,220; United States: $70,480; United Kingdom: $49,420): World Bank DataBank (2022)
- VPF (VSL) for the United Kingdom (£2.14 million): Department for Transport Analysis Guidance (TAG) DataBook (2022)

Table 6 presents the VSL values extrapolated for India, which ranges from 0.16-1.16 million US Dollars (2021 values) depending on the methodology and country used.

To apply our findings at an aggregate (policy) level, we use an indirect approach (see Chilton et al. 2002; McDonald et al. 2016) and 'peg' the estimated context premium for heatwave mortality risks to the extrapolated VSLs from the first step. This provides us with a range of estimates for the VSL for heatwaves (VSL_W) for India. For these calculations, we use the univariate MER (context premium) estimated with the DBDC data in section 3.2 (Table 4, specification (1)) and apply equation (9) to reach a VSL_W (in 2021 US Dollars). Table 6 presents the range of values for VSL_W. Following the BCA guidelines, VSL_W ranges from \$0.72 to \$2.14 million US Dollars (at 2021 values). Using the UK VSL, which is calculated using traffic accident mortality, the VSL_W is \$0.30 millions, while using the VSL from Bhattacharya et al (2007), the value is \$0.38 millions.

Table 6: VSL and VSL_W calculations (millions of US Dollars, 2021)

	VSL	VSL_W
FROM BCA GUIDELINES		
1. VSL extrapolated from a U.S. VSL of and U.S. GNI per capita (a VSL-to-GNI per capita ratio of 160), using an income elasticity of 1.5. If this approach yields a target country value of less than 20 times GNI per capita, then 20 times GNI per capita should be used instead.	0.39	0.72
2. i.b) VSL extrapolated from an OECD VSL-to-GNI per capita ratio of 100 to the target country using an income elasticity of 1.0; i.e., VSL = 100 * GNI per capita in the target country.	0.72	1.34
3. VSL extrapolated from a U.S. VSL-to-GNI per capita ratio of 160 to the target country using an income elasticity of 1.0; i.e., VSL = 160 * GNI per capita in the target country.	1.16	2.14
OTHER SOURCES		
VSL extrapolated from VPF (VSL) UK Department of Transport Analysis Guidance (TAG) DataBook (2021) for traffic accident mortality risk, using BCA guideline 1.	0.16	0.30
VSL from Bhattacharya, Alberini and Cropper (2007) for traffic accident mortality risk in India	0.21	0.38

Notes: Calculations are performed with the Univariate MER from specification (1), Table 4. s

4. DISCUSSION

As climate variability is increasing, extreme events such as temperature fluctuations will be more frequent (heatwaves and cold snaps; IPCC 2022, 2021, 2014). There is an urgent need to understand how individuals cope with climate change, and for policy-making purposes (health and safety), it is important to measure citizens' preferences with respect to increasing climate change risks, and whether these preferences matter for climate change adaptation and should be monetarized. However, in income-constrained populations (LMIC), the use of WTP for avoiding increased mortality risks might be a controversial approach, as we are asking populations who use most of their income to satisfy their basic needs to (hypothetically) pay for changes in their own mortality risks. For this reason, we adapt a DBDC approach to measure individual non-monetary risk-risk trade-offs (RRTOs). For the case of India, the country's exposure to heatwaves has increased in frequency, with temperature records in 2022. Thus, valuing avoiding heatwave-related mortality risk increases would be beneficial for policy-making not only at the country-level but also by geographical state. The RRTO method allows us to summarize, by using a non-monetary method, how much people value heatwave mortality risks into a context premium, which could be later used to calculate a heatwave-specific VSL.

The aim of our study was two-fold. Our first objective was to calculate the context premium for heatwave-related mortality risks in India. That is, we wanted to understand whether people value heatwave-related mortality risks and whether they valued it more or less compared to traffic mortality risks - the risk with which VSL is usually calculated with. For estimating the context premium, we adapted a DBDC methodology. The DBDC method is an incentive-compatible methodology generally used to calculate WTP but in our study, we modified it to elicit individual preferences for non-monetary risk trade-offs. Methodologically, the DBDC method adapted to incorporate non-monetary preferences for risk increases in LMIC is statistically more efficient than a single bound, in line with the findings of Hanemann et al. (1991) for WTP DBDC. Our results shows that on average, people care about climate change-related mortality risks, and specifically, heatwaves. Individuals in our sample of seven geographical states in India value avoiding increased heatwave-related mortality risks at an average of 1.85 times the rate of traffic accident mortality risks. The range of the univariate context premium is 1.7-1.9. An optimal approach would be to compare the results from the RRTO DBDC and WTP DBDC as a robustness test. However, the RRTO approach provides us with a low-cost alternative to asking for WTP, and particular in income constrained populations, which gives consistent and robust results, as our tests show.

We also find that there are several behavioral and experience-related factors that influence the value of the context premium, such as experience with heatwave health consequences and traffic-related injuries. In line with the prior literature (Guillard et al. 2021; Milfont 2010; Van der Linden et al. 2015), individuals in our sample who are psychologically close to climate change value avoiding increased heatwave-related mortality risks 3 times the rate of traffic accident mortality risks. Reducing psychological distance has been shown to increase public engagement with climate change (Jones et al. 2017; Spence et al. 2012), modifying perceptions regarding climate risks and the temporal distance of climate change. More work that disentangles the effect of individual discount rates and psychological distance in benefit-cost analysis is needed but for policy purposes, a change in communication that decreases psychological distance to climate change could be a fruitful avenue to change behaviors.

Our second objective was to value avoiding increased heatwave mortality risks in India – that is, being able to calculate the VSL for heatwaves. Our RRTO methodology, through the calculation of the context premium provides a straightforward manner to calculate a context-dependent VSL and in this specific analysis a VSL for climate change-related mortality risks. In addition, since VSLs for LMICs are sparse, we used benefit transfer to calculate the VSL under different assumptions suggested by the BCA literature (Robinson et al. 2019a). This gives us a range of VSLs for heatwave mortality risks for India of $0.30-2.14 million (2021 US Dollar values).

Although we do not suggest that our VSLs should be used directly for policy-making purposes, we do provide a range of VSL values that policy-makers could use for other purposes, (including the context premium itself), such as budget allocation. An optimal route would be to calculate the VSL for climate change-related mortality risks through the use of WTP. However, the context premium is large enough to suggest that a VSL for traffic accident or job accidents mortality risks should not be applied for other types of policies in a discretionary manner.

References

Akter, S. (2020). Social cohesion and willingness to pay for cyclone risk reduction: the case for the coastal embankment improvement project in Bangladesh. *International Journal of Disaster Risk Reduction*, *48*, 101579.

Alberini, A. (2005). What is a life worth? Robustness of VSL values from contingent valuation surveys. *Risk Analysis: An International Journal*, *25*(4), 783-800.

Alberini, A., & Scasny, M. (2010). Does the cause of death matter? The effect of dread, controllability, exposure and latency on the VSL. Available from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1710563

Baron, J., (1997). Confusion of relative and absolute risk in valuation. *Journal of Risk and Uncertainty*, *14*(3), pp.301-309.

Beattie, J., Covey, J., Dolan, P., Hopkins, L., Jones-Lee, M., Loomes, G., Pidgeon, N., Robinson, A. & Spencer, A. (1998). On the contingent valuation of safety and the safety of contingent valuation: Part 1-caveat investigator. *Journal of Risk and Uncertainty*, *17*(1), pp.5-26.

Beiser-McGrath, L. F., & Huber, R. A. (2018). Assessing the relative importance of psychological and demographic factors for predicting climate and environmental attitudes. *Climatic change*, *149*(3), 335-347.

Bhattacharya, S., Alberini, A., & Cropper, M. L. (2007). The value of mortality risk reductions in Delhi, India. *Journal of Risk and Uncertainty*, *34*(1), 21-47.

Bruderer Enzler, H. (2015). Consideration of future consequences as a predictor of environmentally responsible behavior: Evidence from a general population study. *Environment and Behavior*, *47*(6), 618-643.

Budescu, D.V., Por, H.-H., & Broomell, S.B. (2012). Effective communication of uncertainty in the IPCC reports. *Climatic Change*, *113*(2), pp. 181-200.

Cai, M., Murtazashvili, I., Murtazashvili, J. B., & Salahodjaev, R. (2020). Patience and climate change mitigation: Global evidence. *Environmental Research*, *186*, 109552.

Cameron, M., Gibson, J., Helmers, K., Lim, S., Tressler, J. & Vaddanak, K. (2010). The value of statistical life and cost–benefit evaluations of landmine clearance in Cambodia. *Environment and Development Economics*, *15*(4), pp.395-416.

Carson, R. T. (1985). Three Essays on Contingent Valuation. PhD thesis, University of California, Berkeley.

Carson, R. T. (1985). Three Essays on Contingent Valuation. PhD thesis, University of California, Berkeley.

Carson, R.T. & Mitchell, R.C. (1995). Sequencing and nesting in contingent valuation surveys. *Journal of Environmental Economics and Management*, *28*(2), pp.155-173.

Chilton, S., Covey, J., Hopkins, L., Jones-Lee, M., Loomes, G., Pidgeon, N. & Spencer, A. (2002). Public perceptions of risk and preference-based values of safety. *Journal of Risk and Uncertainty*, *25*(3), pp.211-232.

Chilton, S., Jones-Lee, M., Kiraly, F., Metcalf, H. & Pang, W. (2006). Dread risks. *Journal of Risk and Uncertainty*, *33*(3), pp.165-182.

Clarke, A.E., Goldstein, M.K., Michelson, D., Garber, A.M. & Lener, L.A. (1997). The effect of assessment method and respondent population on utilities elicited for Gaucher disease. *Quality of Life Research*, *6*(2), pp.0-0.

Corral-Verdugo, V., Bonnes, M., Tapia-Fonllem, C., Fraijo-Sing, B., Frías-Armenta, M., & Carrus, G. (2009). Correlates of pro-sustainability orientation: The affinity towards diversity. *Journal of environmental psychology*, *29*(1), 34-43.

Covey, J., Robinson, A., Jones-Lee, M. & Loomes, G. (2010). Responsibility, scale and the valuation of rail safety. *Journal of Risk and Uncertainty*, *40*(1), pp.85-108.

Dawes, R. M. (1980). Social dilemmas. *Annual review of psychology*, *31*(1), 169-193.

Department for Transport UK. (2022). Transport Analysis Guidance DataBook. https://www.gov.uk/government/publications/tag-data-book (last accessed September 29, 2022).

Duxbury, D., Keasey, K., Zhang, H. & Chow, S.L. (2005). Mental accounting and decision making: Evidence under reverse conditions where money is spent for time saved. *Journal of Economic Psychology*, *26*(4), pp.567-580.

Eeckhoudt, L. R., & Hammitt, J. K. (2004). Does risk aversion increase the value of mortality risk?. *Journal of Environmental Economics and Management*, *47*(1), 13-29.

Fetherstonhaugh, D., Slovic, P., Johnson, S. & Friedrich, J. (1997. Insensitivity to the value of human life: A study of psychophysical numbing. *Journal of Risk and Uncertainty*, *14*(3), pp.283-300.

Guillard, M., Fleury-Bahi, G., & Navarro, O. (2021). Encouraging individuals to adapt to climate change: Relations between coping strategies and psychological distance. *Sustainability*, *13*(2), 992.

Hammitt, J. K. (2017). Extrapolating the value per statistical life between populations: Theoretical implications. *Journal of Benefit-Cost Analysis*, *8*(2), 215-225.

Hammitt, J. K., & Robinson, L. A. (2021). Introduction to Special Issue on Risk Assessment, Economic Evaluation, and Decisions. *Risk Analysis: An International Journal*, *41*(4), 559-564.

Hanemann, M., Loomis, J., & Kanninen, B. (1991). Statistical efficiency of double-bounded dichotomous choice contingent valuation. *American journal of agricultural economics*, *73*(4), 1255-1263.

Hanemann, W. M. (1985). Some issues in continuous-and discrete-response contingent valuation studies. *Northeastern Journal of Agricultural and Resource Economics*, *14*(1), 5-13.

India National Crime Records Bureau. (2020). Accidental Deaths & Suicides in India 2020. Mode of Transport – wise Number of Persons Died in Road Accidents during 2020 (All India). (Last Accessed September 29, 2022).

Indian Meteorological Department. (2022). Heatwave Warning Press Release, 30 April 2022. https://internal.imd.gov.in/pages/press_release_mausam.php (Last accessed May 15, 2022)

IPCC. (2014). Climate Change 2014: Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

IPCC. (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.

IPCC. (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.Jones, N., Clark, J.R. & Malesios, C. (2015). Social capital and willingness-to-pay for coastal defences in South-East England. *Ecological Economics*, *119*, pp.74-82.

Islam, M., Afrin, S., Ahsan, M., Haider, M. Z., Mamun, T. M., & Das, D. K. (2019). Households' willingness to pay for disaster resilient safe drinking water sources in southwestern coastal Bangladesh. *International Journal of Disaster Risk Science*, *10*(4), 544-556.

Joireman, J., Posey, D. C., Truelove, H. B., & Parks, C. D. (2009). The environmentalist who cried drought: Reactions to repeated warnings about depleting resources under conditions of uncertainty. *Journal of Environmental Psychology*, *29*(2), 181-192.

Jones, C., Hine, D.W. & Marks, A.D. (2017). The future is now: Reducing psychological distance to increase public engagement with climate change. *Risk Analysis: An International Journal*, *37*(2), pp.331-341.

Jones-Lee, M.W. (1976). The Value of life. An economic analysis. The University of Chicago Press, Chicago

Jones-Lee, M.W. Loomes, G. & Philips, P.R. (1995). Valuing the prevention of non-fatal road injuries: Contingent valuation vs. standard gambles. *Oxford Economic Papers*, pp.676-695.

Krupnick, A., Alberini, A., Cropper, M., Simon, N., O'Brien, B., Goeree, R. & Heintzelman, M. (2002). Age, health and the willingness to pay for mortality risk reductions: a contingent valuation survey of Ontario residents. *Journal of Risk and Uncertainty*, *24*(2), pp.161-186.

Liberman, N. & Trope, Y. (2008). The psychology of transcending the here and now. *Science*, *322*(5905), pp.1201-1205.

Lopez-Feldman, A. (2013). DOUBLEB: Stata module to compute contingent valuation using double-bounded dichotomous choice. https://econpapers.repec.org/software/bocbocode/s457168.htm

Lorenzoni, I., & Pidgeon, N. F. (2006). Public views on climate change: European and USA perspectives. *Climatic change*, *77*(1), 73-95.

Madheswaran, S. (2007). Measuring the value of statistical life: estimating compensating wage differentials among workers in India. *Social indicators research*, *84*(1), 83-96.

Magat, W.A., Viscusi, W.K. & Huber, J. (1996). A reference lottery metric for valuing health. *Management Science*, *42*(8), pp.1118-1130.

Masterman, C. J., & Viscusi, W. K. (2018). The income elasticity of global values of a statistical life: stated preference evidence. *Journal of Benefit-Cost Analysis*, *9*(3), 407-434.

McDonald, R.I., Chai, H.Y. & Newell, B.R. (2015). Personal experience and the 'psychological distance' of climate change: An integrative review. *Journal of Environmental Psychology*, *44*, pp.109-118.

McDonald, R.L., Chilton, S.M., Jones-Lee, M.W. & Metcalf, H.R. (2016). Dread and latency impacts on a VSL for cancer risk reductions. *Journal of Risk and Uncertainty*, *52*(2), pp.137-161.

Milfont, T. L., Wilson, J., & Diniz, P. (2012). Time perspective and environmental engagement: A meta-analysis. *International journal of psychology*, *47*(5), 325-334.

Milfont, T.L. (2010). Global warming, climate change and human psychology. *Psychological Approaches to Sustainability: Current trends in theory, research and practice*, *19*. Nova Science, New York, NY.

Moon, P., Keasey, K. & Duxbury, D. (1999). Mental accounting and decision making: The relationship between relative and absolute savings. *Journal of Economic Behavior & Organization*, *38*(2), pp.145-153.

Murphy, L., Cadogan, E., & Dockray, S. (2020). The consideration of future consequences: Evidence for domain specificity across five life domains. *Personality and Social Psychology Bulletin*, *46*(5), 663-678.

Mussio, I., Chilton, S. Duxbury, D. & Nielsen, J. S. (2022). A risk-risk trade-off assessment of climate-induced mortality risk changes. Unpublished manuscript submitted for publication. Newcastle University Business School (Economics), Newcastle University.

NASA Earth Observatory. (2019). Heatwave in India. https://earthobservatory.nasa.gov/images/145167/heatwave-in-india (Last accessed September 29, 2022).

Nielsen, J.S., Chilton, S. & Metcalf, H. (2019). Improving the risk–risk trade-off method for use in safety project appraisal responses. *Environmental Economics and Policy Studies*, *21*(1), pp.61-86.

OECD. Publishing and Organisation for Economic Co-operation and Development. (2012). *Mortality risk valuation in environment, health and transport policies*. OECD Publishing.

Paparrizos, S., Kumar, U., Amjath-Babu, T. S., & Ludwig, F. (2021). Are farmers willing to pay for participatory climate information services? Insights from a case study in peri-urban Khulna, Bangladesh. *Climate Services*, *23*, 100241.

Robinson, L. A., Hammitt, J. K., Cecchini, M., Chalkidou, K., Claxton, K., Cropper, M., ... & Wong, B. (2019a). Reference case guidelines for benefit-cost analysis in global health and development. https://sites.sph.harvard.edu/bcaguidelines/guidelines/ (Last accessed 29 September, 2022).

Robinson, L. A., Hammitt, J. K., Jamison, D. T., & Walker, D. G. (2019b). Conducting benefit-cost analysis in low-and middle-income countries: introduction to the special issue. *Journal of Benefit-Cost Analysis*, *10*(S1), 1-14.

Robinson, L.A. & Hammitt, J.K. (2011). Behavioral economics and regulatory analysis. *Risk Analysis: An International Journal*, *31*(9), pp.1408-1422.

Sanjay, J., Revadekar, J. V., Ramarao, M. V. S., Borgaonkar, H., Sengupta, S., Kothawale, D. R., ... & Ratnam, J. V. (2020). Temperature changes in India. In *Assessment of climate change over the Indian region* (pp. 21-45). Springer, Singapore.

Shanmugam, K. R. (1997). The value of life: estimates from indian labour market. *Indian Economic Journal*, *44*(4), 105.

Simon, N. B., Cropper, M. L., Alberini, A., & Arora, S. (1999). *Valuing mortality reductions in India: a study of compensating wage differentials*. World Bank, Development Research Group, Infrastructure and Environment.

Slovic, P., Fischhoff, B. & Lichtenstein, S. (1981). Perceived risk: psychological factors and social implications. *Proceedings of the Royal Society of London. A. Mathematical and Physical Sciences*, *376*(1764), pp.17-34.

Spence, A., Poortinga, W. & Pidgeon, N. (2012). The psychological distance of climate change. *Risk Analysis: An International Journal*, *32*(6), pp.957-972.

Strathman, A., Gleicher, F., Boninger, D. S., & Edwards, C. S. (1994). The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of personality and social psychology*, *66*(4), 742.

Thaler, R.H. (1999). Mental accounting matters. *Journal of Behavioral Decision Making*, *12*(3), pp.183-206.

Trope, Y. & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological Review*, *117*(2), p.440.

United States Department of Transportation. (2022). Departmental guidance on valuation of a statistical life in economic analysis. https://www.transportation.gov/office-policy/transportation-policy/revised-departmental-guidance-on-valuation-of-a-statistical-life-in-economic-analysis (last accessed September 29, 2022).

Van der Linden, S., Maibach, E. & Leiserowitz, A. (2015). Improving public engagement with climate change: Five "best practice" insights from psychological science. *Perspectives on Psychological Science*, *10*(6), pp.758-763.

Van Houtven, G., Sullivan, M.B. & Dockins, C. (2008). Cancer premiums and latency effects: A risk trade-off approach for valuing reductions in fatal cancer risks. *Journal of Risk and Uncertainty*, *36*(2), pp.179-199.

Većkalov, B., Zarzeczna, N., Niehoff, E., McPhetres, J., & Rutjens, B. T. (2021). A matter of time… consideration of future consequences and temporal distance contribute to the ideology gap in climate change scepticism. *Journal of Environmental Psychology*, *78*, 101703.

Veronesi, M., Chawla, F., Maurer, M. & Lienert, J. (2014). Climate change and the willingness to pay to reduce ecological and health risks from wastewater flooding in urban centers and the environment. *Ecological Economics*, *98*, pp.1-10.

Viscusi, W. K., & Masterman, C. J. (2017). Income elasticities and global values of a statistical life. *Journal of Benefit-Cost Analysis*, *8*(2), 226-250.

Viscusi, W.K., Magat, W.A. & Huber, J. (1991). Pricing environmental health risks: survey assessments of risk-risk and risk-dollar trade-offs for chronic bronchitis. *Journal of Environmental Economics and Management*, *21*(1), pp.32-51.

Wang, S., Hurlstone, M.J., Leviston, Z., Walker, I. & Lawrence, C. (2019). Climate change from a distance: An analysis of construal level and psychological distance from climate change. *Frontiers in Psychology*, *10*, p.230.

Wang, S., Hurlstone, M.J., Leviston, Z., Walker, I. & Lawrence, C. (2021). Construal-level theory and psychological distancing: Implications for grand environmental challenges. *One Earth*, *4*(4), pp.482-486.

World Bank (2022). Projected climatology of number of very hot days for 2020-2039. https://climateknowledgeportal.worldbank.org/country/india (Last accessed May 5, 2022).

World Bank DataBank. (2022). GNI per capita, PPP (current international $). https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD (last accessed September 29, 2022).

World Bank. (2021). Climate Risk Country Profile: India.

Zanocco, C., Boudet, H., Nilson, R., Satein, H., Whitley, H. & Flora, J. (2018). Place, proximity, and perceived harm: extreme weather events and views about climate change. *Climatic Change*, *149*(3), pp.349-365

Zhao, Q., Guo, Y., Ye, T., Gasparrini, A., Tong, S., Overcenco, A., ... & Li, S. (2021). Global, regional, and national burden of mortality associated with non-optimal ambient temperatures from 2000 to 2019: a three-stage modelling study. *The Lancet Planetary Health*, *5*(7), e415-e425.

Online Appendix

A. RRTO QUESTIONNAIRE

Consent
Newcastle University Business School

Survey of risky decision-making
Who is conducting the survey?
Newcastle University Business School, Newcastle University

What is the aim of this survey?
We want to find out more about individual decisions in risky situations.

What will I be asked to do?
We will ask questions about your preferences in a specific risky scenario, along with questions about you generally. These latter questions will help us interpret better your responses to our questions on the risky scenario. In this survey, there will be a few questions that might be perceived as sensitive, such as gender or religion. Providing responses in this questions is voluntary and you can answer 'prefer not to say'.

How long will the survey take?
The estimated time to complete the whole questionnaire is around 30 minutes. You can stop the survey at any time.

Will my taking part in this survey be kept confidential?
Data collection is completely anonymous, and data will be analysed by the research team exclusively for the purposes of academic research. Newcastle University will store your information in the UK and will not share your information with any third party.

Who can be part of the study?
People from India who live in the States of Andhra Pradesh, Delhi, Haryana, Punjab, Rajasthan, Tamil Nadu or Uttar Pradesh and who are at least 18 years old and agree to provide their data are invited to support the research project by filling in the questionnaire.

Why should you join?
Helping and supporting the research study by giving a few minutes of your time will help to support academic research on risk and risky behaviours.

Please contact the researcher below if you still have any questions or if you want more information about how your data is protected:
Dr. Irene Mussio
Postdoctoral Research Associate
Newcastle University Business School
5 Barrack Road, Newcastle upon Tyne, NE1 4SE
Email: Irene.Mussio@newcastle.ac.uk

Consent form for ***Survey of risky decision-making***

1. I confirm that I have read the online information sheet provided on the preceding page for the above study, I have had the opportunity to consider if I wish to proceed.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. I understand that if I decide to withdraw, any data that I have provided up to that point will be omitted from the research.
3. I consent to the processing of my personal information, as provided by me in response to the survey questions, for the purposes of this research study, as described in the online information sheet provided on the preceding page.
4. I consent to my anonymised research data being stored and used by others for future research.
5. I understand that my research data may be used, in anonymised and aggregate form, in published reports/articles.
6. I agree to take part in this research project.

Thank you for your interest in taking part in this research. Please complete this consent form to indicate you are happy to take part in this research.

- I agree with 1)-6) above and am happy to take part in this research, giving my consent for my data to be used as outlined. Please take me to the survey. (1)
- I am not happy to take part in this research and do not wish to proceed to the survey questions. (2)

Please tick the box before you continue to the survey

Today we are going to ask you questions that relate to risks. A risk is the chance of something bad happening. Every day you make decisions where you are, in some way, choosing between risks. For example, if you have ever jumped a red light, not worn a seatbelt while driving or have driven while drunk, you have made a decision to take the risk of being fatally hurt. Other risks include drowning in a flood, experiencing a heatstroke during a heatwave, having a job-related accident and taking medication (which has possible side-effects).

Traffic accidents in India happen on public roads, involve at least one motor vehicle in the crash, and someone being seriously injured or killed. Traffic accidents could involve a vehicle crashing with another vehicle (for example, another car, bus, motorbike, rickshaw, or animal-drawn vehicle), a cyclist or a pedestrian. Injuries from a traffic accident could lead to hospitalization, vary in severity and could include cuts and bruises, concussions, burns and broken bones, internal injuries and in extreme situations, death.

In India, it is predicted that for every 1,00,000 people, 80 people will die in the next 10 years from traffic accidents.

To put this into context, you can think about the number of people who die in a city in India every 10 years due to a traffic accident. For example, for a city like Chandigarh, which has a population of around 10 lakh, every 10 years, 800 people are predicted to die due to a traffic accident. In a city like Chennai, with a population of 50 lakh, every 10 years, 4,000 people are predicted to die due to a traffic accident. You can also think about the population in a city like New Delhi, with 1.9 crore people. Every 10 years 15,200 people in New Delhi are predicted to die as a result of a traffic accident.

Have you ever been injured in a traffic accident?

- Yes, minor injuries
- Yes, major injuries
- No
- Don’t know

Has anyone you know ever been injured in a traffic accident?

- Yes, a family member
- Yes, relatives
- Yes, friends
- Yes, a co-worker
- No
- Don’t know

Do you consider yourself at the same, higher or lower risk than everyone of being in a traffic accident?

- Lower than others
- Same as others
- Higher than others
- Don’t know

How do you usually travel for work? Choose all that apply

- Car (own car or as part of self-arranged carpool)
- Motorcycle/scooter
- Work-arranged transportation (paid by employer)
- Taxi (including Uber/Ola or other similar transportation)
- Public transportation (including bus, train, metro, auto rickshaw)
- Bicycle
- Walk
- I am not currently working

How do you usually get around for other activities such as shopping, going out with friends, etc? Choose all that apply

- Car (own car or as part of self-arranged carpool)
- Motorcycle/scooter
- Taxi (including Uber/Ola or other similar transportation)
- Public transportation (including bus, train, metro, auto rickshaw)
- Bicycle
- Walk

Now we want you to consider another risk: heatwaves. India has experienced a series of intense heatwaves during the current year as well as severe heatwaves in 2019, 2016 and 2015, where average temperatures passed 47°C. It is expected that heatwaves such as the one experienced by India in the summer will become more likely over time. Heatwaves can affect people's health. During a heatwave, people might suffer heat cramps, edema or swelling, heat exhaustion, fatigue, headaches, dizziness, nausea or vomiting, heat stroke and in extreme situations, death.

In India, it is predicted that for every 1,00,000 people, 80 people will die in the next 10 years from heatwaves.

To put this into context, you can think about the amount of people who die in a city in India every 10 years due to a heatwave. For example, for a city like Chandigarh, which has a population of around 10 lakhs, every 10 years, 800 people are predicted to die due to a heatwave. In a city like Chennai, with a population of 50 lakh, every 10 years, 4,000 people are predicted to die due to a heatwave. In a bigger city like New Delhi, with 1.9 crore people. It is therefore the same as saying that every 10 years 15,200 people in New Delhi are predicted to die as a result of a heatwave.

Have you ever experienced any health consequences of heatwaves?

- Yes, minor health consequences
- Yes, major health consequences
- No
- Don't know

Has anyone you know ever experienced any health consequences of heatwaves? Choose all that apply.

- Yes, a family member
- Yes, relatives
- Yes, friends
- Yes, a co-worker
- No
- Don't know

Do you consider yourself at the same, higher or lower risk than everyone else in terms of the health consequences of heatwaves?

- Lower than others
- Same as others
- Higher than others
- Don't know

If you are using a mobile device please rotate your screen to landscape to view the next screens. Thank you.

For the next question, we only want you to focus on two specific risks: the risk of dying in traffic accident and the risk of dying in a heatwave.

Imagine that for work or personal reasons you have to move to a new city. The place where you currently live has the following risks of death per 10 years:

	Your current Area risk of death per 10 years
Traffic accidents Heatwaves	80 in 1,00,000 80 in 1,00,000

You can choose between two distinct Areas of the new city. Please think about what the right choice for you is, which may be different to the right choice for someone else. Housing, medical services alternative employment opportunities and general living and working conditions, can be considered to be identical in both Areas of the new city.

However, the risk of death from a traffic accident and the risk of death due to a heatwave are different between the two Areas of the new city.

In the following choices, you will be asked to indicate whether you would prefer to move to Area 1 or Area 2 of the new city. Each Area of the new city has a different combination of traffic accident and heatwave fatality risks. Your choices are as follows:

	Area 1 risk of death per 10 years	Area 2 risk of death per 10 years
Traffic accidents Heatwaves	80 in 1,00,000 **85** in 1,00,000	**85** in 1,00,000 80 in 1,00,000

This means that in the next 10 years:

- If you choose to move from your current Area to Area 1 of this city:
    - Your chance of dying from a traffic accident stays **unchanged** at 80 in 1,00,000
    - Your chance of dying from a heatwave **increases** to 85 in 1,00,000.
- If you choose to move from your current Area to Area 2 of this city:
    - Your chance of dying from a traffic accident **increases** to 85 in 1,00,000
    - Your chance of dying from a heatwave stays **unchanged** at 80 in 1,00,000.

Think about what Area in this new city you would prefer to move to. To familiarize yourself with the process, we will ask you to make a practice choice between two Areas.

Click next to continue to the next screen and make your practice choice.

PRACTICE CHOICE:

In the place where you currently live, you face the following risks of death per 10 years:

	Your current Area risk of death per 10 years
Traffic accidents Heatwaves	80 in 1,00,000 80 in 1,00,000

Please choose between Area 1 or Area 2 of the new city, or if you are equally happy with moving to any of the two Areas. **To help you, any risks of death that change are highlighted in bold.**

	Area 1 risk of death per 10 years	Area 2 risk of death per 10 years
Traffic accidents Heatwaves	**70** in 1,00,000 **70** in 1,00,000	**90** in 1,00,000 80 in 1,00,000

Please indicate the option which you most prefer:

☐ Area 1	☐ Area 2	☐ I am equally happy to move to either Area

(if Practice_A1) Thank you. You have chosen to move to Area 1 where both risks of death (traffic accidents and heatwaves) decrease from 80 to 70 in 1,00,000 per 10 years.

(if Practice_A2) Thank you. You have chosen to move to Area 2 where the risk of traffic accident death increases from 80 to 90 in 1,00,000 per 10 years and the risk of heatwave-related death stays the same (80 in 1,00,000 per 10 years).

(if Practice_Indiff) Thank you. You have stated to be equally happy to move to either area.

This is the end of the practice question.

This is the example for Traffic 105 in 100,000 increase and Heatwaves 85 in 100,000 increase (first bound)

Now that you are familiar with the type of questions, we will now ask you to make the actual choice between the two Areas of the new city. **Please compare the Areas and indicate your preference.**

In the place where you currently live, you face the following risks of death per 10 years:

	Your current Area risk of death per 10 years
Traffic accidents Heatwaves	80 in 1,00,000 80 in 1,00,000

Please choose between Area 1 or Area 2 of the city you will move to, or if you are equally happy with moving to any of the two Areas.

	Area 1 risk of death per 10 years	Area 2 risk of death per 10 years
Traffic accidents Heatwaves	**105** in 1,00,000 80 in 1,00,000	80 in 1,00,000 **85** in 1,00,000

Please indicate the option which you most prefer:

☐ Area 1

☐ Area 2

☐ I am equally happy to move to either Area

Imagine that now, the Ministries of Transportation and Environment have updated the risks for each area, and there will be an increase in the risk of one of the accident types in your chosen area. Given that increase they want to know if you would still move to your chosen area or if you would prefer to go to the other area. Please compare the Areas and indicate your preference.

This is the example for choosing Area 1 in the first bound (second bound)

YOUR CHOICE:

In the place where you currently live, you face the following risks of death per 10 years:

	Your current Area risk of death per 10 years
Traffic accidents Heatwaves	80 in 1,00,000 80 in 1,00,000

Please choose between Area 1 or Area 2 of the city you will move to, or if you are equally happy with moving to any of the two Areas.

	Area 1 risk of death per 10 years	Area 2 risk of death per 10 years
Traffic accidents Heatwaves	**110** in 1,00,000 80 in 1,00,000	80 in 1,00,000 **85** in 1,00,000

Please indicate the option which you most prefer:

☐ Area 1 ☐ Area 2 ☐ I am equally happy to move to either Area

This is the example for choosing Area 2 in the first bound (second bound)

YOUR CHOICE:

In the place where you currently live, you face the following risks of death per 10 years:

	Your current Area risk of death per 10 years
Traffic accidents Heatwaves	80 in 1,00,000 80 in 1,00,000

Please choose between Area 1 or Area 2 of the city you will move to, or if you are equally happy with moving to any of the two Areas.

	Area 1 risk of death per 10 years	Area 2 risk of death per 10 years
Traffic accidents Heatwaves	**105** in 1,00,000 80 in 1,00,000	80 in 1,00,000 90 in 1,00,000

Please indicate the option which you most prefer:

☐ Area 1

☐ Area 2

☐ I am equally happy to move to either Area

If you are using a mobile phone, you can rotate your phone back to portrait mode if you would like to do so.

We would now like to ask you a set of questions about your general perceptions of climate change risks.

Please read the following question and indicate to what extent you agree or disagree:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
"My local area is likely to be affected by climate change."	○	○	○	○	○

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
"Climate change will mostly affect areas that are far away from here"	○	○	○	○	○

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
"Climate change will mostly affect developing (low to middle income) countries."	○	○	○	○	○

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
“Climate change is likely to have a big impact on people like me.”	○	○	○	○	○

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
“I am uncertain that climate change is really happening”	○	○	○	○	○

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
“The seriousness of climate change is exaggerated.”	○	○	○	○	○

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
“Most scientists agree that humans are causing climate change.”	○	○	○	○	○

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
“It is uncertain what the effects of climate change will be.”	○	○	○	○	○

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
“I am prepared to greatly reduce my energy use to help tackle climate change"	○	○	○	○	○

Please read the following question and indicate your degree of concern:

	Not at all concerned	Slightly concerned	Somewhat concerned	Very concerned
How concerned, if at all, are you about climate change, sometimes referred to as ‘global warming’?	○	○	○	○

	Not at all concerned	Slightly concerned	Somewhat concerned	Very concerned
Considering any potential effects of climate change which there might be on you personally, how concerned, if at all, are you about climate change?	○	○	○	○

	Not at all concerned	Slightly concerned	Somewhat concerned	Very concerned
Considering any potential effects of climate change there might be on society in general, how concerned are you about climate change?	○	○	○	○

Please answer the following question:

	We are already feeling the effects	In the next 10 years	In the next 25 years	In the next 50 years	In the next 100 years	Beyond the next 100 years	Never
When, if at all, do you think India will start feeling the effects of climate change?	○	○	○	○	○	○	○

Please answer the following question:

	Entirely natural processes		A mixture of natural processes and human activity		Entirely human activity	I think there is no such thing
Thinking about the causes of climate change, which, if any, of the following best describes your opinion?	○	○	○	○	○	○

Now we will ask you a few questions on heatwave alerts in the state you currently live.

Does your State have an SMS heatwave alert system?

- Yes
- No
- Don't know

How useful would an SMS heatwave alert system implemented by your State be?

- Very useful
- Useful
- Neither useful nor unuseful
- Unuseful
- Very unuseful

Have you subscribed to such an alert service?

- Yes
- No

Do you find the SMS heatwave alert useful?

- Yes
- No

Now we will ask you a set of questions on the different ways you might behave in your daily life.

For the following statement, please indicate whether or not the statement is typical of you:

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
I consider how things might be in the future, and try to influence those things with my day-to-day behavior	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
Often I engage in a particular behavior in order to achieve outcomes that might not result for many year)	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
I only act to satisfy immediate concerns, figuring the future will take care of itself	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
My convenience is a big factor in the decisions I make or the actions I take	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
I think that it is more important to perform a behavior with important distant consequences than a behavior with less-important immediate consequences	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date	○	○	○	○	○

	Extremely atypical of me	Somewhat atypical of me	Uncertain	Somewhat typical of me	Extremely typical of me
Since my day-to-day work has specific outcomes, it is more important to me than behavior that has distant outcomes	○	○	○	○	○

Lastly, we will ask you a set of questions about yourself.

Are you generally an impatient person, or someone who always shows great patience?
Please tick a box on the scale, where the value 0 means: "very impatient" and the value 10 means: "very patient".

Very impatient										Very patient
0	1	2	3	4	5	6	7	8	9	10

Please answer the following question:

How do you see yourself: are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please choose a value on the scale, where the value 0 means ‘not at all willing to take risks’ and the value 10 means ‘very willing to take risks'.

Not at all willing to take risks										Very willing to take risks
0	1	2	3	4	5	6	7	8	9	10

In comparison to others, are you a person who is generally willing to give up something today in order to benefit from that in the future or are you not willing to do so? Please use a scale from 0 to 10, where a 0 means you are completely unwilling to give up something today and a 10 means you are very willing to give up something today. You can also use the values in-between to indicate where you fall on the scale.

Completely unwilling to give up something today										Very willing to give up something today
0	1	2	3	4	5	6	7	8	9	10

How do you define your gender?

- Male
- Female
- Non-binary
- Prefer to self-define
- Prefer not to say

How old are you? (in years)

What is your marital status?

- Single (never married)
- Married
- Divorced/Separated
- Widowed
- Prefer not to say

What is your religion?

- Hindu
- Muslim
- Christian
- Sikh
- Buddhist
- Jain
- Parsi
- Other (please specify):
- No religion
- Prefer not to say

What caste group do you belong to?

- Scheduled Caste
- Scheduled Tribe
- Other Backward Class (OBC)
- General
- Prefer not to say

Excluding yourself, how many people live in your household?

How many children under the age of 18 live in your household?

How many adults over the age of 60 live in your household?

What is the highest level of education you have completed?

- Below class 12
- Class 12
- Above class 12 but not completed undergraduate degree
- Undergraduate degree (BA, BSC, BCom, LLB, MBBS, BTech etc.)
- Post-graduate or higher degree (MA, MSC, MBA, MCA, MCom, PhD)
- Vocational
- Other (please specify)

Which best describes your employment status?

- Working for wage/salary in the private sector
- Working for wage/salary in the public sector
- Self-employed/own a business
- Retired
- Student
- Looking after the family or home
- Unemployed and looking for work
- Other (please specify)

Are you the main earner in your household?

- Yes
- No

What is your monthly household income after putting together the income of all members? (in Indian Rupees)

- Below 10,000
- 10,000 - 30,000
- 30,001 - 50,000
- 50,001 - 1,00,000
- 1,00,001 - 2,00,000
- 2,00,001 - 5,00,000
- 5,00,001 - 10,00,000
- Above 10,00,000

Do you own or rent your home?

- Own (with or without a home loan)
- Rent
- Other (please specify)

Which State do you live in?

- Andhra Pradesh
- Delhi
- Haryana
- Punjab
- Rajasthan
- Tamil Nadu
- Uttar Pradesh

How long have you lived in the state you currently live in? (in years, enter 0 if less than 1 year)

How would you describe the area in which you live?

- Village
- Town (50,000-1 lakh)
- Small City (1-5 lakh)
- Big City (5-10 lakh)
- Metropolitan City (Above 10 lakh)

How often has your household faced power cuts in the last month?

- Few times a day
- Once a day
- Few times a week
- Few times a month
- No power cuts
- Don't know

Do you own any of the following? (Yes/No)

- Inverter-battery system (rechargeable battery)
- Diesel generator
- Solar panels or solar home system
- Other alternative electricity sources (please specify)

Do you own any of the following? (Yes/No)

- Air Cooler
- Air conditioner

How regularly do you do the following?

	Daily	Sometimes	Rarely	Never
Watch news on television	○	○	○	○
Read the newspaper(s)	○	○	○	○
Listen to news on radio	○	○	○	○
Read news on the internet	○	○	○	○

B. SUPPORTING ANALYSIS

B.1. Statistical checks of equality of socio demographics among the nine choice scenarios (full sample)

Choice scenario, first bound (mortality risk, deaths every 100,000 in 10 years)	**Male**	**Age**	**Less than 35 years old**	**Income below 30,000 rupees**	**North region**	**Degree level education (and above)**	**Private sector employee**	**Hindu**	**General caste**	**N**
Traffic 105 Heatwaves 85	0.426	35.876	0.423	0.246	0.742	0.865	0.621	0.642	0.507	267
	(0.495)	(10.739)	(0.494)	(0.431)	(0.438)	(0.342)	(0.485)	(0.480)	(0.500)	
Traffic 100 Heatwaves 85	0.446	36.043	0.442	0.240	0.745	0.913	0.575	0.614	0.530	278
	(0.497)	(9.857)	(0.497)	(0.428)	(0.436)	(0.281)	(0.495)	(0.487)	(0.499)	
Traffic 90 Heatwaves 85	0.398	36.298	0.436	0.237	0.745	0.900	0.593	0.536	0.594	261
	(0.490)	(9.806)	(0.496)	(0.426)	(0.436)	(0.300)	(0.492)	(0.499)	(0.492)	
Traffic 95 Heatwaves 85	0.410	34.974	0.485	0.289	0.75	0.866	0.569	0.585	0.539	239
	(0.492)	(9.634)	(0.500)	(0.454)	(0.433)	(0.341)	(0.496)	(0.493)	(0.499)	
Traffic 85 Heatwaves 85	0.455	35.776	0.455	0.256	0.750	0.890	0.601	0.593	0.605	246
	(0.499)	(9.773)	(0.499)	(0.437)	(0.433)	(0.313)	(0.490)	(0.492)	(0.489)	
Traffic 85 Heatwaves 90	0.394	35.867	0.460	0.238	0.753	0.878	0.589	0.619	0.535	256
	(0.489)	(10.005)	(0.499)	(0.427)	(0.432)	(0.326)	(0.492)	(0.486)	(0.499)	
Traffic 85 Heatwaves 95	0.413	36.663	0.418	0.214	0.754	0.893	0.549	0.636	0.517	244
	(0.493)	(10.137)	(0.494)	(0.411)	(0.431)	(0.309)	(0.498)	(0.482)	(0.500)	
Traffic 85 Heatwaves 100	0.395	36.106	0.413	0.205	0.758	0.858	0.590	0.597	0.492	283
	(0.489)	(10.170)	(0.493)	(0.404)	(0.428)	(0.348)	(0.492)	(0.491)	(0.500)	
Traffic 85 Heatwaves 105	0.434	36.888	0.434	0.254	0.764	0.930	0.619	0.606	0.588	260
	(0.496)	(9.792)	(0.496)	(0.436)	(0.425)	(0.254)	(0.486)	(0.489)	(0.493)	
p-value (for test of equality of means)	**0.832**	**0.617**	**0.831**	**0.567**	**0.999**	**0.088**	**0.809**	**0.429**	**0.088**	

B.2. Statistical checks of equality of socio demographics among the nine choice scenarios (practice choice correct)

Choice scenario, first bound (mortality risk, deaths every 100,000 in 10 years)	**Male**	**Age**	**Less than 35 years old**	**Income below 30,000 rupees**	**North region**	**Degree level education (and above)**	**Private sector employee**	**Hindu**	**General caste**	**N**
Traffic 105 Heatwaves 85	0.426	35.279	0.463	0.242	0.742	0.947	0.622	0.629	0.476	136
	(0.496)	(11.101)	(0.500)	(0.430)	(0.438)	(0.224)	(0.486)	(0.484)	(0.501)	
Traffic 100 Heatwaves 85	0.416	35.267	0.465	0.223	0.732	0.864	0.560	0.574	0.601	161
	(0.494)	(9.874)	(0.500)	(0.417)	(0.443)	(0.343)	(0.497)	(0.496)	(0.491)	
Traffic 90 Heatwaves 85	0.405	35.725	0.450	0.248	0.732	0.902	0.518	0.586	0.556	153
	(0.492)	(9.713)	(0.499)	(0.433)	(0.444)	(0.298)	(0.501)	(0.494)	(0.498)	
Traffic 95 Heatwaves 85	0.500	33.021	0.578	0.235	0.735	0.879	0.575	0.594	0.544	140
	(0.501)	(9.975)	(0.495)	(0.425)	(0.442)	(0.326)	(0.495)	(0.492)	(0.499)	
Traffic 85 Heatwaves 85	0.492	34.090	0.507	0.280	0.742	0.901	0.568	0.643	0.621	132
	(0.501)	(9.429)	(0.501)	(0.450)	(0.438)	(0.299)	(0.497)	(0.480)	(0.486)	
Traffic 85 Heatwaves 90	0.424	34.791	0.537	0.316	0.689	0.885	0.514	0.678	0.542	158
	(0.495)	(10.517)	(0.500)	(0.466)	(0.464)	(0.319)	(0.501)	(0.468)	(0.499)	
Traffic 85 Heatwaves 95	0.451	35.609	0.458	0.225	0.729	0.915	0.562	0.647	0.529	133
	(0.499)	(10.215)	(0.500)	(0.419)	(0.445)	(0.279)	(0.497)	(0.479)	(0.500)	
Traffic 85 Heatwaves 100	0.425	34.756	0.466	0.263	0.736	0.919	0.503	0.577	0.484	148
	(0.496)	(10.009)	(0.500)	(0.442)	(0.442)	(0.273)	(0.501)	(0.495)	(0.501)	
Traffic 85 Heatwaves 105	0.463	36.251	0.443	0.231	0.708	0.845	0.676	0.588	0.610	151
	(0.500)	(9.804)	(0.498)	(0.423)	(0.455)	(0.362)	(0.469)	(0.493)	(0.489)	
p-value (for test of equality of means)	**0.728**	**0.217**	**0.285**	**0.707**	**0.988**	**0.116**	**0.068**	**0.557**	**0.126**	

B.3. First bound regression outcomes

d.v.: Choice of Area W	RDR only	Socioeconomics	Socioeconomics + preferences	Socioeconomics + preferences + appliances	Socioeconomics + preferences + appliances + psych scales	Socioeconomics + preferences + appliances + psych scale dummies	Socioeconomics + preferences + appliances + psych scale dummies + injuries
RDR	0.102***	0.101***	0.100***	0.101***	0.102***	0.103***	0.103***
	(0.027)	(0.027)	(0.028)	(0.028)	(0.027)	(0.027)	(0.027)
Male		0.055	0.063	0.060	0.020	-0.000	0.005
		(0.078)	(0.081)	(0.090)	(0.098)	(0.096)	(0.096)
Less than 35 years old		0.059	0.061	0.069	0.044	0.032	0.035
		(0.058)	(0.057)	(0.057)	(0.071)	(0.070)	(0.070)
Income below 30,000 rupees		-0.049	-0.040	-0.015	-0.036	-0.034	-0.021
		(0.039)	(0.039)	(0.037)	(0.029)	(0.026)	(0.031)
Degree level education (and above)		-0.212*	-0.216*	-0.228*	-0.199*	-0.220*	-0.213*
		(0.124)	(0.129)	(0.128)	(0.106)	(0.120)	(0.115)
Private sector employee		0.208***	0.200***	0.196***	0.213***	0.223***	0.206***
		(0.068)	(0.062)	(0.062)	(0.069)	(0.067)	(0.062)
Hindu		0.035	0.041	0.035	0.001	-0.003	-0.001
		(0.078)	(0.080)	(0.079)	(0.059)	(0.055)	(0.054)
General caste		-0.023	-0.019	-0.018	-0.027	-0.028	-0.032
		(0.046)	(0.050)	(0.050)	(0.051)	(0.052)	(0.048)
Risk averse			0.195**	0.208***	0.264**	0.260**	0.250**
			(0.081)	(0.079)	(0.124)	(0.116)	(0.113)
Patience			-0.182***	-0.176***	-0.153***	-0.146***	-0.150***
			(0.052)	(0.053)	(0.041)	(0.045)	(0.044)
Has air cooler				-0.096**	-0.039	-0.018	-0.034

				(0.048)	(0.067)	(0.070)	(0.069)
Has air conditioner				0.135**	0.142***	0.134***	0.137***
				(0.053)	(0.050)	(0.046)	(0.050)
Construal level theory scale					-0.221		
					(0.136)		
Consideration of future conseq scale					0.032		
					(0.044)		
Dummy Construal level theory scale						-0.367***	-0.381***
						(0.124)	(0.123)
Dummy Consideration of future conseq scale						0.086	0.079
						(0.070)	(0.075)
Traffic accident injury							0.072
							(0.080)
Heatwave health consequences							0.074***
							(0.020)
Constant	-0.413***	-0.393***	-0.408***	-0.448***	-0.666***	-0.307***	-0.458
	(0.021)	(0.121)	(0.127)	(0.145)	(0.193)	(0.218)	(0.162)
Univariate MER (Constant)	**4.051*** **	**3.881*** **	**4.045*** **	**4.409** **	**6.485*** **	**3.723** **	**4.421** **
	(1.021)	**(1.625)**	**(2.031)**	**(2.293)**	**(2.779)**	**(1.914)**	**(2.286)**
Observations	*2334*	*2334*	*2334*	*2334*	*2334*	*2334*	*2334*

Note: Following Mussio et al. (2022), the univariate MER using a probit specification is calculated as (– constant / RDR). This means that a negative coefficient increases the MER.