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PII: S0928-7655(18)30301-4
DOI: https://doi.org/10.1016/j.reseneeco.2019.04.005
Reference: RESEN 1100

To appear in: *Resource and Energy Economics*

Received date: 23 August 2018
Revised date: 12 February 2019
Accepted date: 22 April 2019

Please cite this article as: Balmford B, Bateman IJ, Bolt K, Day B, Ferrini S, The Value of Statistical Life for Adults and Children: Comparisons of the contingent valuation and chained approaches, *Resource and Energy Economics* (2019), https://doi.org/10.1016/j.reseneeco.2019.04.005

The Value of Statistical Life for Adults and Children: Comparisons of the contingent valuation and chained approaches [1]

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1. Funding for this study was provided by the Valuation of Environment-Related Health Impacts: Accounting for Differences Across Age, Latency and Risk Categories with a Particular Focus on Children (VERHI Children) project, funded under CEC - Sixth Framework Programme grant FP6-2003-SSP-3. The funding body had no involvement in the study itself, or in the decision to submit the article. We are grateful to steering group representatives from both the US EPA and the EEA (including Richard Carson, Maureen Cropper, James Hammitt and Alan Krupnick) whose advice we gratefully acknowledge. We also owe a great debt to Graham Loomes for his input throughout this research and to Andreas Isoni for discussion of findings. Finally, we are grateful to the editor and two anonymous referees for their insightful comments and suggestions. All opinions expressed in this paper and any remaining errors therein are the responsibility of the authors.
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Abstract

Estimates of the Value of Statistical Life (VSL) provide a vital input to a variety of policy decisions ranging from health provision to transportation planning. However, the bulk of VSL research has focussed on estimating average values rather than taking account of the potential variation in VSL across groups. Policymakers are particularly concerned that using estimates based on data concerning adults might provide poor proxies of the values associated with preventing child fatalities. We investigate this empirical problem while also addressing methodological critiques of standard contingent valuation (CV) approaches to VSL estimation which ask survey respondents to value an outcome described in terms of both the probability of occurrence and the health impact of an event.

A prior lab experiment confirms fundamental problems in subjects' abilities to provide internally consistent valuations of such compound goods. Given this we compare CV approaches with the 'chaining method' of Carthy et al. (1999) which splits the valuation task in two, assessing the probability of an event and the disutility of that event separately and then 'chaining' responses together to obtain a VSL estimate. We provide a first application of this method to the estimation of the VSL for children and contrast this with values for adults. Results confirm prior expectations that VSL values for preventing child fatalities significantly exceed those for adults. Finally, we carry out the first replication of the chaining approach in a large and nationally representative sample of parents. We identify many advantages of chaining over CV approaches, however, through a novel variant of a validation test suggested by Carthy et al., we reveal anomalies in the estimates produced by the chaining method suggesting that a robust method for VSL calculation is yet to be refined.

Key words:

Value of statistical life; Contingent valuation; Chaining method; Non-market valuation; Health.

Declarations of interest: none

Introduction

The standard procedure for assessing the economic case for or against public sector interventions is to undertake a cost-benefit analysis, weighing the different costs and benefits in monetary terms. When such interventions involve changes in the risks of death, illness or injury, it is then necessary to find some way of placing a monetary value on these changes. Two rather different approaches have been used. In policy relating to safety, where the focus has been upon accidents which may cause injury and/or premature death, a number of governments and their agencies have used the Value of Statistical Life (VSL) to represent the aggregate of many individuals' willingness to pay (WTP) to avoid small mortality risks that are then used to value the prevention of one expected (in the statistical

sense) fatality[1]. In policy relating to health care interventions, where the focus is upon preventing or treating illness that may lead to reductions in health status and/or premature death, an alternative approach has involved measuring the benefits in terms of the Quality Adjusted Life Years (QALYs) gained as a result of an intervention, and then deciding whether the 'cost-per-QALY' is above or below some threshold which is regarded as good value for money[2]. Unlike the VSL approach, using QALYs does not assess welfare benefits, but rather how an intervention compares to some cost threshold.

In contrast to QALYs, in policy decision making the VSL is typically used as if it is unresponsive to age, and may therefore not be a true reflection of preferences (Shepard and Zeckhauser, 1984; Jones-Lee, 1989; Evans and Kerry Smith 2006; Aldy and Viscusi, 2008). Indeed, preventing the premature death of a child rather than an elderly person will register as a much larger benefit under a QALY-based system, yet this is not reflected in most official VSL measures where the same average value is applied to everyone. This is in part because we may be unable to predict the subset of people whose lives would be saved by accident preventing measures, while the treatment of a particular disease has a clear target population.

Nonetheless, the question of whether the benefit of reducing risk to the young is greater than that for other and in particular elderly groups has become more prominent in recent policy debates (see

[1] An alternative term for essentially the same concept is the Value of Preventing a Fatality (VPF). With either term, the important point to note is that this is *not* the value of preventing the otherwise certain death of an identifiable individual, but the summation of many people's WTP to reduce their own risks by rather small amounts until the total reduction in probabilities adds up to 1. The UK Department for Transport (DfT) values the prevention of a fatality on Britain's roads at £1.83 million (DfT, 2016) although a figure of approximately £1.55m per fatality prevented is listed in its most current guidance for undertaking cost-benefit analyses of road safety schemes https://www.gov.uk/government/publications/webtag-tag-data-book-may-2018. The UK Health and Safety Executive have recently commissioned research into the feasibility and use of the CV based Value of a Life Year (VOLY; Desaigues et al., 2011) concept within UK decision making.

[2] In the UK, for example, the National Institute for Health and Clinical Excellence (NICE) has used per QALY thresholds of less than £20,000 as likely acceptable, and more than £30,000 as in need of good justification in first approximations when judging whether a new health care intervention represents sufficiently good value for money to be adopted by the UK National Health Service. https://www.nice.org.uk/process/pmg6/chapter/assessing-cost-effectiveness and further discussion in Donaldson et al. (2011).

reviews by O'Brien, 2013; and Morgan, 2017). Some countries have contemplated using different VSLs for different age groups, notably: Canada (Hara Associates, 2000), the European Commission (EC, 2001), and, somewhat controversially[3], the U.S. Environmental Protection Agency (Viscusi, 2009). Therefore, it is of both academic and policy interest to know whether people subscribe to a distinction between the VSLs of children and adults. Although the theoretical and empirical VSL literature is quite extensive (e.g. Alberini, 2005; Hammitt and Zhou 2006), and despite some evidence that age does appear to impact upon the value of preventing a fatality (Aldy and Viscusi, 2008), only a relatively small number of studies specifically address the issue of valuing mortality risks for children (Agee and Crocker 1996; Alberini and Ščasný, 2011; Blomquist et al., 2011; Cropper et al., 2011; Dickie and Gerking 2003; Guerriero et al., 2017; Hammitt and Haninger, 2010; Jenkins et al. 2001; Mount et al 2003; Nastis and Crocker 2003).

There is no simple observable monetary value for the VSL (McDaid et al., 2015). Using wages as an estimate of a VSL wrongly equates prices and values (Rice, 2015). Revealed preference techniques using either wage premiums or expenditure on safety equipment (Bellavance et al., 2009) require strong assumptions regarding the information available on the risk associated with particular jobs or behaviours (Dolan et al., 2008), and values are very sensitive to the exact nature of risk estimation (Scotton, 2013).

These problems have meant that economists frequently apply stated preference (SP) methods such as discrete choice experiments (Andersson et al., 2016) or, most commonly, contingent valuation (CV), to estimate VSLs (e.g. Alolayan et al., 2017; Dickie and Gerking, 2003; Vassanadumrongdee and Matsuoka, 2005; Roldós et al., 2017). While CV methods have been used extensively worldwide to

[3] See, for example, the controversy surrounding the US EPA's use of an age-weighted VSL played out in newspaper headlines such as "EPA Drops Age-Based Cost Studies" (New York Times, May 8, 2003), "EPA to Stop 'Death Discount' to Value New Regulations" (Wall Street Journal, May 8, 2003), and "Under Fire, EPA Drops the 'Senior Death Discount'" (Washington Post, May 13, 2003).

estimate willingness to pay (WTP) and other measures for a wide variety of goods (Carson, 2011; Rakotonarivo et al., 2016), the large majority of these applications have been for non-risky options, i.e. goods which, in a contingent market, are certain to be supplied if sufficient funds are paid. As budget constraints, plausibility and ethical principles all mitigate against asking an individual to state their WTP to prevent the certainty of their death from a given cause, this approach is inappropriate for calculating a VSL. Therefore CV studies of health typically value risky options; goods which are provided as probabilities such as a change in a non-unity risk of death or the probability of being afflicted by a disease. These 'compound' goods present CV survey respondents with a difficult challenge: having to evaluate (in monetary terms) their value for avoiding some (often unfamiliar) adverse health outcome; and simultaneously comprehend the (typically small) probability of that outcome occurring. Both are demanding and unfamiliar tasks and their joint estimation is, arguably, cognitively overwhelming. All CV studies assume that, when stating the value of reducing her[4] mortality risk by a specified amount, an informed individual has well-formed and theoretically consistent preferences (Carson and Groves, 2007). In cases where this assumption does not hold CV responses may be malleable and subject to bias. In particular commentators have long argued that in cases of cognitive overload, respondents may seek to infer information regarding appropriate responses from objectively irrelevant elements of the framing of a valuation question (Tversky and Kahneman, 1973, 1974; Slovic, 1995; Nielsen et al., 2012; Kjaer et al., 2018).

Indeed, the SP literature reports a number of persistent anomalies; results which suggest that respondents are unable to relate certain valuation questions to a set of standard economic preferences (Chilton et al., 2004; Desvousges et al., 1992; Dolan et al., 2008; Hausman, 2012; Jones-Lee et al., 1995; Jones-Lee and Loomes 2004; McFadden and Train, 2017). In the context of health outcomes, value estimates have often been found to be insensitive to scope (e.g. inadequately related to changes in the risk of a health state arising; Beattie et al., 1998; Vassanadumrongdee and Matsuoka,

[4] Following convention we adopt the female gender throughout to refer to a participant in our study.

2005; Andersson et al., 2016), even when it cannot be plausibly argued that income is acting as a constraint on WTP (Søgaard et al., 2012; Gyrd-Hansen et al., 2014). Both Jones-Lee et al., (1995) and Dubourg et al., (1997) note inadequate responsiveness in individual's WTP when risks were reduced, resulting in the inflation of corresponding VSL estimates. Clearly insufficient scope sensitivity renders such VSL estimates invalid for decision making purposes as reducing the risk probabilities presented to CV respondents will erroneously drive up the implied VSL. It has been argued that this phenomena is driven in part by the cognitive demands of valuing a compound good (Carthy et al., 1999; Gyrd-Hansen et al., 2012). Given this, we open the applied element of our analysis with a laboratory experiment designed to test how respondents cope with each element of the compound good: 1) valuing outcomes (using both familiar and unfamiliar goods to examine the effects of experience) and 2) assessing small risks of those outcomes occurring (with those risks being varied to examine scope sensitivity).

It was with the particular challenge of compound goods in mind that Carthy et al., (1999) proposed the 'chaining method' to estimate VSLs. This approach splits presentation of the compound good up into a two-step procedure. The first step asks subjects to trade-off a risk of a specified ill-health state against a risk of death (e.g. which is worse, an X% chance of a specified ill-health state or a Y% chance of death; respondents adjust Y until the two outcomes are equivalent). The second step asks the respondent to place a value on avoiding what would otherwise be a certain occurrence of that ill-health state. Combining these responses allows the analyst to 'chain' WTP for the ill-health state up to an inferred WTP to reduce the risk of death and hence the VSL. The VSL derived from the Carthy et al. (1999) study have since informed values used in cost-benefit analyses by a number of UK government departments (for example: Department for Transport, Department for Local Communities and Government, Department of Health, The Scottish Government's Health Department and Transport Department, Health and Safety Executive, Environment Agency, Health Protection

Agency, Food Standards Agency; as reviewed in Kelly 2008; Jones-Lee and Spackman, 2013) as well as internationally (European Maritime Safety Agency, 2014).

The chaining method has been the focus of some criticism given that it seems to be susceptible to certain anomalies (Thomas and Vaughan, 2015a&b), but it has been strongly defended by the original authors (Chilton et al., 2015; Jones-Lee and Loomes, 2015). Therefore, the present paper seeks to contribute to this debate and the wider literature through comparison of the chaining approach to the estimation of VSL with the more widely applied CV method. Furthermore, we use both methods to address the policy relevant question of whether VSLs for children and adults are different. While typically one would only ask someone about risks to their own life, we avoid the cognitive and moral challenges of asking children such demanding questions by investigating the values held by parents for both their own lives and those of their children. If a 'child premium' exists, it should be detectable within the subset of the population who are parents[5]. Any excess of the estimated child VSL over the parent VSL values should provide strong evidence of an age premium associated with young lives. Thus, while our formative lab experiment considers broader issues, our subsequent initial field study represents the first use of the chaining method applied to the value of a child's life; the first time the CV and chaining methods have been trialled in the same sample to estimate the VSL; and the first replication of the chaining method in a much larger sample than before (300 vs 167).

We then extend our analysis to address a methodological challenge. In separating the compound good into its two constituent parts, Carthy et al., argue that the cognitive demand placed on a subject can be much reduced and certainly the results they obtain appear promising. We examine this claim by developing a novel variant of a test for internal consistency suggested by Carthy et al. This is achieved by splitting the first stage of the chaining approach into two tasks where respondents initially compare

[5] Note, we are not suggesting that any age premium we observe in this group should be used as a social value, but rather that if an age premium does exist in the wider population, then it will be most easily detectable in a sample of parents.

minor with major ill-health state, then compare the latter major ill-health state with death. We term this a 'double' chained method and compare this with the conventional 'single' chain approach pioneered by Carthy et al. (wherein WTP is applied to a single comparison between ill-health and death). Consistency should be evidenced by no significant difference arising in the VSL measures delivered by the single and double chaining variants. Conversely, if parents apply any 'child premium' at each stage of the chaining exercise, this will cause inconsistency in the VSL estimates obtained from the single and double chained approach with the latter inflating VSL in a potentially dramatic manner given the multiplicative nature of the chaining approach. In our second field study, we implement the first replication of the chaining method in a nationally representative sample, some six times larger than that used by Carthy et al., providing the first set of new data to bear on the robustness of the chaining approach since that initial study.

The rest of this paper is organized as follows. First, we discuss and present results from the laboratory experiment testing scope sensitivity of responses across different levels of both risk and familiarity of goods. Next we present a first field survey of parents comparing the standard Carthy et al. (single chain) approach to the chaining method with a conventional CV analysis of VSL. Finally, we present our consistency test of the chaining method, contrasting the single and double chain variants across a very large (996 participants), nationwide, and nationally representative sample of parents.

Scope sensitivity, familiarity with the good and risk framing: an experiment

As discussed above, an initial objective was to test some of the key assumptions inherent in CV studies of VSL. Through the highly controlled of a lab experiment we sought to examine the sensitivity of stated WTP responses to: a) the familiarity of the goods being valued; b) the size of the risk reduction offered; and c) the framing of risk probability information. Concerns regarding responsiveness to scope in CV studies are not novel; indeed, instances of scope insensitivity are widespread within the

literature (Ojea and Loureiro, 2011). However, investigations into the causes of such problems remain an active area of research (Borzykowski et al., 2018). Despite this, and the crucial importance of scope sensitivity to CV based estimates of VSL, implausibly small sensitivity to scope often appears to be considered acceptable in the field literature (Amrian and Hagen, 2010; Whitehead, 2016), while very few studies conduct the controlled examinations afforded by experimental investigations (Hammitt and Graham, 1999; Andersson et al., 2016).

Such a controlled experiment was conducted with 99 students at the University of East Anglia. This used a self-administered, computerised questionnaire (coded in z-tree; Fischbacher, 2007), which randomised the presentation order of treatments and questions. As is best practice, each respondent was asked warm-up questions to help familiarise her with risk and probability and all questions involving risk used visual diagrams to illustrate probabilities, again as per best practice (e.g. Zhang et al., 2013; see Appendix 1 for the exact implementation of the study). The questionnaire took an average of 50 minutes to complete and participants were paid £5.50 to take part, with the chance of winning an additional £10 at the end of the survey if they chose to take an unrelated gamble.

The experimental subjects were presented with three goods of differing levels of familiarity: avoiding losses of money (£75); avoiding a temporary stomach complaint; and avoiding a condition causing temporary blindness. Each of these goods were offered at different levels of risk, with probabilities presented using different formats (either chances in 10, such as 1/10, or changes in 1,000, such as 100/1,000), the latter being a variant of the test for risk framing effects previously found to be significant (Pinto-Prades et al., 2006; Zhai and Suzuki, 2008). Respondents were asked to value each compound of good, risk and probability presentation in a manner similar to CV studies of the VSL.

Question ordering was varied and analyses conducted so as to minimise the potential for initial responses to anchor subsequent responses (Jacowitz and Kahneman, 1995)[6].

Table 1 reports the mean, median and standard deviation values of stated WTP for the various compounds of outcome and risk reduction valued in this experiment. The pattern of values across compound goods appears plausible and panel (a) presents nonparametric tests of the scope sensitivity of WTP within each good. Here the penultimate column presents a series of 'weak' scope sensitivity examining, for each outcome, whether WTP for a given risk reduction is significantly smaller than that for a substantially (five times) larger risk reduction. In all cases this weak sensitivity test is satisfied. However, as discussed previously, it should not be regarded as sufficient for the larger risk reduction to have just a larger WTP. Rather, it has long been understood that, where any income effects should be negligible (i.e. when the budget of the respondent cannot be reasonably argued to be binding), the implied value for the certainty of receiving a good should not be dependent on the risk level used to elicit that value (Jones-Lee, 1974; Weinstein et al., 1980; Hammitt and Graham, 1999). In line with previous studies (e.g. Beattie et al., 1998; Hammitt and Graham 1999; Vassanadumrongdee and Matsuoka, 2005; Andersson et al., 2016) the value of the 'whole' good (i.e. in this case the value of avoiding the certainty of either the money loss, temporary stomach complaint, or temporary blindness) can be calculated as WTP divided by the risk reduction. The final column of this table tests

[6] It is possible that a subject might use their response to an initial question to calculate their response to a subsequent question rather than referring to their preferences afresh. For example, if a respondent is first asked about her WTP to avoid a 1/10 chance of a stomach bug, she may then simply multiply her response by five to determine her WTP to avoid a 5/10 chance of a stomach bug. The likelihood of such 'anchoring' may potentially be reduced where risks are expressed using different denominators (where the necessary calculation is far less obvious, e.g. where the second question concerns a 500/1000 risk), or between different outcomes. Therefore, to avoid these potential problems of anchoring, we focus our analyses on the first responses that an individual provides for a risk expressed using a particular denominator for each negative outcome. In the example above, if a respondent's answer to a 1/10 risk was included in a scope sensitivity analyses, then their subsequent response regarding a 5/10 risk would be excluded on the grounds that simple anchoring heuristics may responsiveness here. Conversely, the same respondent's subsequent response to a risk expressed as 500/1000 would be included in our scope sensitivity analysis on the grounds that the anchoring heuristic may be weaker here. Question ordering was varied so that multiple risk representations (including all of the above) might be presented first in the list seen be an individual respondent, thereby avoiding any anchoring on that initial response.

whether the implied value of the whole good differs when calculated from responses to the smaller as opposed to larger risk reduction. This test effectively examines whether observed scope sensitivity is insignificantly affected by the level of risk used to elicit WTP; as one would require to avoid framing anomalies. In every case this 'strong' sensitivity test fails: WTP for the whole good is inversely proportional to the size of the risk reduction used to estimate it. This confirms prior results that CV respondents over-estimate WTP for small probability risk reductions, a result which may be explained by cumulative prospect theory (Shogren, 1990; Tversky and Kahneman, 1992; Jones-Lee et al., 1995; Dubourg et al., 1997; Beattie et al., 1998; Chilton et al., 1999; Hammar and Johansson-Stenman, 2004).

Panel (b) of Table 1 extends this analysis by testing whether the framing of a 0.1 risk as either 1/10 or 100/1,000 alters WTP. Test results clearly reject equality in all cases with WTP to reduce a 100/1,000 risk consistently and significantly greater than that to reduce a 1/10 risk. This clear evidence of framing effects within such a deliberately straightforward experiment suggest that, when faced with compound, risky options, WTP responses to standard CV questions are likely to fail basic anomaly tests.

These simple tests question the assumptions underpinning the CV approach to valuing compound risky options, as applied to the VSL (e.g. as used by Gerking et al., 1988; Krupnick et al., 2002; Alberini and Ščasný, 2011). As described subsequently, the chaining method avoids this challenge by splitting the risk assessment and valuation tasks. In the following section we provide a field study comparison of the standard CV approach to VSL estimation to the Carthy et al., chaining method.

(a) Tests for scope sensitivity	Mean WTP (£) *Median* (St. Dev.)		Weak test for scope sensitivity:* WTP smaller risk v WTP larger risk [Standard theory **does** predict a difference] p value (z statistic)	Strong test for scope sensitivity:* Scaled WTP smaller risk v WTP larger risk [Standard theory **does not** predict a difference] p value (z statistic)
	Smaller risk reduction	Larger risk reduction		
Risk in 10	*1/10 to 0/10*	*5/10 to 0/10*		
Money stolen	6.21 *5.00* (5.69)	19.55 *15.00* (14.36)	<0.001 (-5.56)	0.044 (-1.71)
Stomach bug	8.57 *5.20* (9.05)	23.96 *15.00* (31.9)	<0.001 (-4.39)	0.004 (-2.66)
Temporary blindness	29.23 *10.00* (75.89)	57.27 *30.00* (104.22)	<0.001 (-3.41)	0.026 (-1.95)
Risk in 1,000	*20/1,000 to 0/1,000*	*100/1,000 to 0/1,000*		
Money stolen	5.17 *4.50* (5.19)	14.49 *7.95* (20.28)	<0.001 (-4.04)	0.011 (-2.30)
Stomach bug	7.61 *5.00* (8.02)	14.81 *8.10* (17.03)	0.009 (-2.35)	<0.001 (-3.58)
Temporary blindness	16.98 *6.15* (29.17)	40.58 *19.40* (67.00)	<0.001 (-3.11)	0.033 (-1.84)

(b) Tests for framing effects	Mean WTP (£) *Median* (St. Dev.)		Significance of difference between 0.1 risk framed either as 1/10 or 100/1,000[7]* [Standard theory **does not** predict a difference] p value (z statistic)
Risk framing	*1/10 to 0/10*	*100/1,000 to 0/1,000*	
Money stolen	6.21 *5.00* (5.69)	14.49 *7.95* (20.28)	<0.001 (-3.29)
Stomach bug	8.57 *5.20* (9.05)	14.81 *8.10* (17.03)	0.033 (-1.85)
Temporary blindness	29.23 *10.00* (75.89)	40.58 *19.40* (67.00)	0.041 (-1.74)

Table 1: WTP responses to avoid negative outcomes at different risk levels: Tests for (a) scope sensitivity and (b) framing effects

Note: Heavier weight grid cells denote data rather than test results

* Non-parametric one-tailed Mann-Whitney Wilcoxon test

[7] One tail test examines whether the 1/10 risk is perceived as smaller than the 100/1,000 risk.

Comparing the contingent valuation and chaining methods for estimating VSL: A first field study

Our experimental results raise considerable concerns regarding the ability of individuals to provide consistent valuations of compound risky health options. The chaining approach was specifically designed to address such challenges. However, how does it perform relative to the more commonly applied CV method when applied in a relevant field context, and how would both approaches address the policy relevant question of whether VSL varies between adults and children? Our first field study set out to answer these questions.

The chaining method

As summarised previously, the chaining method was first developed by Carthy et al (1999) with the intention of overcoming some of the difficulties faced by the CV method in assessing VSL based upon valuations of small changes in health risk. An illustrative example of a CV-style question, with the text in parentheses showing the changes employed when a respondent is asked about their child rather than themselves. The format, including payment time horizon, and risk level, are taken from Krupnick et al. (2002). Note that the respondent is being asked to simultaneously consider both the value of avoiding a negative outcome and the risk of that outcome.

> *"Consider a product that you could buy which reduces your (child's) risk of dying over ten years by 5/1000. The product has no other benefits or side effects except reducing the risk of death. Suppose that this product was not provided through public health services, nor would it be covered by private health insurance. Therefore the only way to obtain this product would be for you to pay for it.*
>
> *What is the maximum amount you would be willing to pay for this product?"*

The chaining method avoids asking respondents to directly value a change in mortality risk, breaking the valuation and risk parts into two steps. The first step essentially uses the CV approach to ask respondents to value the avoidance or cure of what would otherwise be the certainty of a non-fatal ill-health incident. An illustrative example of this first stage in the chaining approach is given below (with the text in parentheses again referring to a respondent being asked about their child rather than themselves).

> "*Imagine that a test shows that you (your child) is going to suffer severe stomach pains, diarrhoea and vomiting for 2-3 days every 2 weeks for 12 months.*
> *I want you to suppose that a treatment is available which would avoid all of the effects of this to you (your child). Suppose that this treatment was not provided through public health services, nor would it be covered by private health insurance. Therefore the only way to obtain this alternative treatment would be for you to pay for it.*
>
> *What is the maximum amount you would be willing to pay for this treatment which would bring you (your child) back to full health within a few days, after which you (your child) would be cured?*"

Adjustments to the payment elicitation format as well as the wording of other parts of the question can be made, but crucially this question involves certain, as opposed to risky, outcomes; the respondent does not have to simultaneously consider the probability of an outcome while also assessing their willingness to pay.

The assessment of risk preferences is considered in the second stage of the chaining method, where respondents undertake a risk trade-off. Carthy et al. initially discuss a 'Standard Gamble' approach, a respondent is asked to trade-off between either (i) the certainty of a specified ill-health state or (ii) a

treatment which has some chance $(1 - \pi_j)$ of delivering full health and some risk (π_j) of death. Respondents vary π_j until they are indifferent between (i) and (ii). This risk level can then be applied to the respondent's WTP to avoid the certainty of the specified ill-health state to obtain their imputed VSL.

While in principle the Standard Gamble approach should provide an unbiased estimate of π_j, Carthy et al., (1999) argue that it may be subject to a "certainty effect" if respondents are unwilling to trade ill health states for anything but negligible mortality risks. At the extreme a complete unwillingness to accept any risk of death, π_j, would lead to an infinite VSL. To alleviate this concern and replicate the Carthy et al approach we employ a Modified Standard Gamble (MSG; Baker and Robinson 2004; Jones-Lee et al 1995). The MSG asks the respondent to imagine she has become unwell and is taken to hospital where doctors tell her that if she is not treated then she is certain to die. However, she is also told that there are two possible treatments available to her, both free of charge, for example as follows:

> *Treatment A: If successful, the treatment will result in the respondent experiencing the consequences of a specified, non-fatal, ill-health state for a defined period* [e.g. the severe stomach pain, diarrhoea and vomiting for 12 months case mentioned previously, or ill-health states X and Y referred to subsequently]. *However, if the treatment is unsuccessful then the patient would fall unconscious and die shortly afterwards with probability of 1/1,000* [this risk is set by the analyst and can be varied].
>
> *Treatment B: If successful, this treatment will result in a return to normal health after a couple of days but if unsuccessful there is a risk that the treatment will result in immediate unconsciousness followed shortly by death* [this risk, π_j, is varied until the

respondent states that they are indifferent between Treatment A and B].

If successful then Treatment B has a better outcome than Treatment A, and therefore it is expected that the respondent will accept some additional mortality risk for the chance of this better successful outcome. Notice that in the MSG format, both treatments involve some risk of death, the intention being that this will counteract any certainty effect and still avoid the direct valuation of a risky compound good as in the CV approach.

The two steps of the chaining procedure thus provide: a) a link between money and the certainty of a health state; and b) a link between that health state and a risk of death. These are then linked ('chained') together, connecting mortality risk to a money sum, from which a VSL can be derived.

Survey design and sampling

The survey comprised eight main sections: the first four asked the questions necessary to undertake the chaining method and the last four relate to the CV method. The chaining method preceded the direct CV method, as the text describing the chaining method introduced concepts within the survey and included some "warm-up" questions. Randomising the order of the two approaches was neither possible (as it would have required altering or adding to the survey text, hindering comparability of the results between treatments) nor considered desirable; including CV questions after the chaining method was deemed likely to improve the consistency of responses to the CV questions and therefore, if anything, was likely to favour the standard CV method. Eight different treatments of the survey were used to control for question ordering effects within each of the two methods (see Appendix 2). Respondents were all parents recruited from the Cambridgeshire area, approached either through

schools or at local attractions for young children[8]. The survey was conducted in person, with face-to-face interviews (as is best practice; Jones-Lee and Spackman, 2013), and took an average of a little more than 35 minutes to complete. The sample was not selected to be representative of parents nationally; rather, by randomly allocating each parent to each treatment, we sought to test how robust the CV and chaining methods were to anomalies. In total, 300 respondents took part in this survey, and the complete survey is given in Appendix 3 and the resources that were used in Appendix 4.

Treatments used to describe the non-fatal ill-health scenario were introduced in the warm-up section and parents were asked to consider the following ill-health states[9], X and Y as follows:

- X: 3 weeks hospitalisation; 4 months severe pain; permanent pain in hip
- Y: 2 months hospitalisation; 4 months moderate pain; permanent pain in knee

After reading through the ill-health states the respondent ranked them in terms of perceived disutility, first if she was affected, and then if the ill-health states were suffered by her child.

In the chaining method section, each parent was asked to sort a series of randomly presented cards, each specifying a different payment amount, dependent on whether she would or would not be willing to pay that amount for the certainty of avoiding each of these ill-health states. Accounting for the highest amount that she was definitely willing to pay, and the lowest amount she was definitely not willing to pay, she was then asked to estimate the maximum she would pay, with the interviewer explaining that this need not be an amount on any of the cards. This is very similar to the Carthy et al

[8] Participation rewards to respondents depended on where they were recruited: either £5 plus a £5 donation to the school; a £10 payment; or two passes for a local play centre (worth £7).

[9] Pre-testing also examined a third ill health state, Z, described as: "2 weeks hospitalisation; 2 months severe pain and bedridden; no permanent ill-health." However, piloting revealed that respondents were not willing to trade the risk of ill-health and mortality risk for their children in the MSG with the ill-health state Z, and it was therefore decided to focus these questions on various combinations involving just X and Y.

procedure, with the one difference that the respondent's estimate, while again being bounded above and below by the card sort, need not be a value displayed, and is therefore a continuous variable. The respondent then completes the MSG questions relating each of the ill-health states to risks of death. This was implemented with a similar card sorting exercise as to the WTP, but with risk levels rather than monetary amounts being shown on each card. Note, therefore, that we elicit two preference measures; one assessed in monetary terms, the other as additional risk of death to avoid a certain ill-health state. Each respondent was asked to answer on her own behalf and on behalf of one randomly selected child in her household[10]. Thus in the first step of the chaining method we obtained WTP values for both the adult and child to avoid the certainty of the ill-health states described above; and from the MSG we identified the risk of death in Treatment B at which the respondent was indifferent between Treatment A and Treatment B for herself and, separately, also for her child.

For the chaining method, and following the framework of Carthy et al. (1999), the VSL is calculated by multiplying the stated WTP to avoid a particular ill-health state by the risk trade-off between that ill-health state and death as per Equation (1):

$$VSL = WTP \times \psi \quad (1)$$

where, to allow for potential framing effects, ψ is defined as $\psi_j = \frac{1-\delta}{\pi_j - \delta}$ where δ is the mortality risk associated with Treatment A (e.g. δ=1/1,000 in prior discussions), and π_j is the mortality risk level at which the respondent states she is indifferent between Treatment A and Treatment B. Assumptions regarding the utility function, and the consequent derivation of this equation are given in the Appendix to Carthy et al. to which we refer the interested reader. We make one modification from their specification; we use only the monetary WTP value of avoiding the 'for-certain' ill-health state, rather than a weighted[11] average of WTP and willingness to accept (WTA) values. This allows us to avoid the

[10] If the respondent had more than one child, she was asked to consider the child whose birthday was next.
[11] The exact weighting function depends on the specification of the utility function which is used in the calculations

well-recognised complications and cognitive load associated with eliciting WTA values[12] (Shogren et al., 2010).

The design of the CV element of the questionnaire was based on the approach employed in the highly cited Krupnick et al. (2002) study. After some questions intended to help the respondent think about her overall baseline mortality risk, she was asked to consider how much she would value a product that would reduce her risk of dying over the next ten years. Each respondent was asked about products which would reduce the risk of dying over 10 years by 5/1,000 and separately for a risk reduction of 1/1,000. Again, the value was elicited through a card sort exercise, and both questions were also asked with respect to her child. The ordering of the questions were varied depending upon the survey version implemented (see Appendix 2). Each respondent was asked about both levels of risk reduction in order that we could test for possible ordering effects within-subject.

To estimate the VSL from CV responses, we follow the methods of previous studies (e.g. Gerking et al., 1988; Krupnick et al. 2002[13]; Alberini and Ščasný, 2011). This estimates VSL as the WTP for a particular change in the probability of death, divided by this probability change (Δp) as shown in Equation (2):

$$VSL = \frac{WTP_{\Delta p}}{\Delta p} \quad (2)$$

[12] Using a WTP format makes the survey cognitively more familiar than a WTA frame. The adoption of this approach should not be taken as implying that respondents are strictly risk neutral (or approximated to be, owing to a small income effect), but rather that a linear approximation of the utility function is acceptable for three reasons. First, for goods which have few (or no) substitutes, such as good health, the linear approximation should be theoretically consistent (Amiran and Hagen, 2010). Second, in practice, cost-benefit analyses do not typically account for diminishing marginal values, to the extent they exist. In the cost-benefit analyses conducted by the many organisations listed in the main text, the underlying assumption is that the VSL multiplied by the number of prevented fatalities, gives the total value of those prevented fatalities. Finally, if anything, reliance upon WTP rather than a weighted average of WTP and WTA is likely to yield a more conservative estimates of the VSL.

[13] A further approach is to use modelled rather than raw responses. However, this requires additional assumptions concerning the appropriate approach to modelling, assumptions which are somewhat contentious where the data is dominated by anomalous zero WTP responses, e.g. Krupnick et al. (2002) employ a spike model (Kriström, 1997). We prefer to avoid such assumptions and work with actual rather than modelled responses so as to adhere to the approach of Carthy et al. which is the main focus of our study.

Again, we refer the interested reader to Krupnick et al. (2002) for further details. In addition to the arguments given above regarding the individual's utility function, we also note that at the margin and with small baseline risks, the income effect is negligible and hence the linear approximation of the utility function is accepted as standard (Jones-Lee, 1974; Weinstein et al., 1980; Hammitt and Graham, 1999).

Results

WTP to avoid negative health outcome (£)	Mean (£) *Median* (St. Dev.)		Is the adult value lower than the corresponding child value?* p value (z statistic)
	Adult	Child	
Ill-health state X	29,083 *5,000* (102,317)	97,849 *15,000* (224,334)	<0.001 (-5.94)
Ill-health state Y	16,738 *5,000* (81,824)	112,293 *20,000* (242,255)	<0.001 (-7.11)

Table 2: First step (valuation) of the chaining method: Mean and median WTP values for avoiding the certainty of specified ill-health states

Note: ill-health state X = 3 weeks hospitalisation; 4 months severe pain; permanent pain in hip
ill-health state Y = 2 months hospitalisation; 4 months moderate pain; permanent pain in knee
* Non-parametric one-tailed Mann-Whitney Wilcoxon test

Acceptable *π /1,000*	Mean *Median* (St. Dev.)		*Is the adult value higher than the corresponding child value?** p value (z statistic)
	Adult	Child	
Ill-health state X	62.47 *25.00* (95.66)	45.12 *10.00* (82.67)	0.006 (-2.50)
Ill-health state Y	75.79 *25.00* (119.99)	42.70 *10.00* (81.30)	<0.001 (-3.17)

Table 3: Second step (MSG) of the chaining method: Levels of mortality risk (π_j) stated by respondent at which they are indifferent between Treatment B and a particular ill-health state (X or Y) which itself has a mortality risk of 1/ 1,000

Note: Heavier weight grid cells denote data rather than test results
* Non-parametric one-tailed Mann-Whitney Wilcoxon test

Table 2 presents summary statistics of the results for the first step in the chaining method; valuing the certainty of avoiding a negative health outcome. Substantially different mean and median values for a given health outcome and large standard deviations highlight the positive skew of responses. Tests reveal that values for reducing risks to children are very substantially higher than those for adults; a finding which accords with general expectations and informs policy concerns.

Table 3 presents summary statistics for the second step in the chained approach, responses to the MSG question, and tests whether these values are significantly lower for children than for adults. Indeed, it is clear that respondents are prepared to accept substantially higher risk levels for themselves than for their children. *Ceteris paribus*, this implies a higher VSL for children than adults; a finding which accords with the policy concerns motivating this study.

Taken individually, the higher WTPs for children in Table 2 and the lower acceptable additional mortality risk for children in Table 3 both seem reasonable findings. However, the chaining approach combines these responses together in calculating VSLs and the child premium present in both value and risk assessments seems to suggest the potential for double counting if chained together. We investigate the potential for such bias in the final study of this paper. However, for the moment we press on to the CV results from the present study.

Table 4 presents the results from the CV questions regarding WTP to avoid either a 1/1,000 or 5/1,000 risk of death to either the respondent or their child. To avoid the potential problems of anchoring, panel (a) of Table 4 only uses individuals' responses to the first of these four questions, the ordering of which was rotated across respondents as per Appendix 2. Results show clear differences in first response WTP for adult as opposed to child lives. Results from a weak scope sensitivity test (comparing WTP for a 1/1,000 risk to a 5/1,000 risk) show statistically significant scope in child values but not in

adult values which are dominated by zero WTP responses (medians for both risks being zero)[14].

Panel (b) of Table 4 calculates the same values again but now using individuals' response to the second life they value. So, in an ordering which first asked a respondent to value a 1/1,000 risk reduction to their own life, panel (b) reports values based on that respondent's subsequent valuation of a risk reduction of 1/1,000 to their child's life (i.e. ordering Version 6 in Appendix 2). The potential for anchoring is obvious and is reflected in findings. Now the adult valuations clearly pass a scope sensitivity test. Comparison with the insignificant scope revealed in Table 3 suggests that the responses underpinning Table 4 have been upwardly anchored by their previous (relatively high) valuation of their child's life. Similarly valuations of child risk reductions are now anchored down by prior (relatively lower) values for adults. For example, considering the 5/1,000 risk reduction values for children, in panel (a) first responses provide a mean of £4,187 while in panel (b) anchoring on prior (relatively lower) adult values gives a second response value of just £2,478 which is no longer significantly different from the adult value in that table. Consistency tests across first and second responses are reported in panel (c) which shows clear evidence of anchoring effects in CV values at the 5/1,000 risk level.

How do the chaining and CV methods compare? While almost none of the chaining respondents stated that they would not be willing to pay anything to avoid a given ill-health state[15], in the CV task the rate of zero WTP response ranged from 13% for the 5/1000 risk reduction for the child to 61% for the 1/1000 reduction for the parent. High proportions of zero responses are a common and longstanding feature of the CV literature observed both in VSL studies (Krupnick et al., 2002)[16] and across a wide range of contexts and countries (see for example, Rowe and Chestnut, 1982; Desvousges et al., 1987;

[14] Within-respondent tests reveal no significant impact of education upon these results; see details in Appendix 10

[15] In the chaining exercise just over 1% of respondents gave a zero WTP to avoid a certain ill health state for themselves and no zero bids were recorded in respect of ill health states for children.

[16] Krupnick et al 2002 report a 36% rate of zero responses, a rate which lies in the middle of our observed range.

Bostedt and Boman, 1996; Jorgensen et al., 1999; Strazzera et al., 2003; Cho et al., 2008; Chen and Hua, 2015; Ferreira and Marques, 2015; Lee, 2015; Lee and Heo, 2016; Vossler and Holladay, 2018; and the recent review of the issue of zero responses in CV studies by Chen and Qi, 2018). Recalling that, within our first field study, these are the same people who were happy to engage with the chaining exercise, the high rates of zero WTP and implied illogical zero VSL values, raise considerable concerns about the use of the CV method in this context, particularly where such problems are hidden by aggregate measures such as the mean.

(a) First response WTPs		Mean (£) *Median* (St. Dev.)		*Weak scope sensitivity test** *p value* *(z statistic)*
		1/1000	*5/1000*	
Adult		441 *0* (1210)	448 *0* (1371)	0.267 (-0.62)
Child		1,047 *50* (3484)	4,187 *500* (18387)	<0.001 (-4.64)
*Adult vs child values**	p value (z statistic)	0.021 (-2.03)	<0.001 (-6.08)	

(b) Second response WTPs		Mean (£) *Median* (St. Dev.)		*Weak scope sensitivity test** *p value* *(z statistic)*
		1/1000	*5/1000*	
Adult		458 *0* (1,728)	2941 *100* (18,451)	0.001 (-2.98)
Child		880 *25* (2,210)	2478 *100* (7,359)	0.063 (-1.53)
*Adult vs child values**	p value (z statistic)	0.003 (-2.78)	0.1014 (-1.27)	

(c) Comparing first & second response WTPs	*Are first and second responses different?** *p value* *(z statistic)*	
	1/1000	*5/1000*
Adult	0.670 (0.44)	0.019 (-2.06)
Child	0.583 (0.21)	0.006 (-2.50)

Table 4: Summary statistics for WTP values from the CV responses (a) for first responses, (b) for second responses, and (c) comparing these

Note: Heavier weight grid cells denote data rather than test results

* Non-parametric one-tailed Mann-Whitney Wilcoxon test

		Mean (£) [Mean excluding zero] <5% Trimmed mean> *Median* *{Median excluding zero}* (St. Dev.)				Framing tests: Significance of anomalies	
Method		*CV*		*Chained*		*CV*[1,*] *p value* *(z statistic)*	*Chained*[2,**] *p value* *(z statistic)*
Risk level (CV) or Treatment (Chaining)		*1/1000*	*5/1000*	*X*	*Y*		
Adult		441,000 [1,143,333] <164,697> *0* *{500,000}* (1209864)	89,623 [199,484] <28,985> *0* *{30,000}* (274214)	11,377,436 [11,628,409] <1,289,649> *268,188* *{299879}* (87221816)	9,144,810 [9,211,561] <1,016,644> *138,119* *{151364}* (85107745)	0.424[#] (-0.19)	0.218 (-0.78)
Child		1,046,959 [1,936,875] <321,071> *50,000* *{500,000}* (3484135)	837,321 [965,048] <291,351> *100,000* *{200,000}* (3677320)	38,420,686 [38420686] <12,003,187> *1,125,857* *{1125857}* (139644139)	98,399,253 [98399253] <8,802,169> *2,002,004* *{2002004}* (853117844)	0.973[#] (1.93)	0.324 (-0.05)
*Adult vs child values**	*p value (z statistic)*	0.021 (-2.03)	<0.001 (-6.01)	<0.001 (-4.75)	<0.001 (-7.17)		

Table 5: VSL estimates using the chaining and CV approach

Note: 1. Significance of difference between CV VSL values based on WTP for 1/1,000 or 1/5,000 risk reductions

2. Significance of difference between Chained VSL values based on chaining from ill-health state X or Y

Heavier weight grid cells denote data rather than test results

* Non-parametric one-tailed Mann-Whitney Wilcoxon test; while standard theory expects no difference, the anomaly literature suggests that a VSL calculated from a 1/1000 risk may exceed that calculated from a 5/1000 risk.

** Non-parametric two-tailed Mann-Whitney Wilcoxon test; standard theory expects no difference and there is no indication of a directional effect from the anomaly literature.

These results differ substantially when 0 responses for the WTP are removed. The estimate got from the 5/1000 WTP is significantly smaller: for parents (p = 0.001, z statistic = -3.04) and for children (p = 0.005, z statistic = -2.55)

The VSLs from both the CV and chaining approaches are summarised in Table 5, which for the CV section uses only the first responses as previously described in panel (a) of Table 4 so as to mitigate against the anchoring which is a clear feature of this data. One result is very clear – given the means, medians, standard deviations and the fact responses are bound by zero, we observe highly positively skewed data.

Focussing upon the CV findings, here the skew is extreme with medians being zero for the adult values and relatively low for the child values. This results in mean values that are well below those given in the literature. In major part[17] this is likely to reflect the fact that we employ levels of risk similar to those observed in ordinary life (e.g. annual risks of car accidents, fatal cancers, etc. as per Viscusi, 1993) whereas the CV literature often uses much lower risk levels. The clear evidence of insensitivity to scope observed both in this paper, the wider literature and meta-analyses thereof (Lindhjem et al., 2011) strongly suggests that had we used conventionally small risk probabilities our CV derived VSL estimates would be significantly higher.

Untrimmed VSLs for the chaining method are particularly high for estimates of child values, suggesting that child premiums in both the valuation and MSG elements of the method may be causing a double counting bias; again we address this in our final study. Given that there are justifications for trimming extreme values (Chilton et al, 2015)[18], the chained trimmed mean values fall more in line with the extant literature although again the child VSL values remain somewhat, but not implausibly, high.

A further, clear message from Table 5 is that, within any method or starting point, VSL values for children are consistently higher than those for adults.

[17] See also our earlier footnote regarding our rejection of the Krupnick et al. decision to use modelled outputs from a spike model as opposed to raw WTP responses in calculating VSL. This is also likely to have avoided inflation of our CV VSL estimate.

[18] Chilton et al., note that a single high value would have resulted in "an untrimmed mean more than seven times higher than the median" (p. 297) in the Carthy et al., (1999) study had it not been removed from analysis.

Testing the internal consistency of the chaining method for estimating VSL: A second field study

Results from both our lab experiment and first field study point to significant issues for use of the CV method to estimate VSLs, most particularly in terms of anchoring and the insensitivity of WTP to changes in risk, especially where the absolute magnitude of the risks concerned are small resulting in farming effects upon VSL estimates. In contrast, the robustness of the chaining method to such framing anomalies and very much lower rates of zero WTP responses (both problems being present in our CV results), give some reason for cautious optimism regarding the usefulness of the approach. However, as outlined above, results from the first field study gave some cause for concern regarding the ability of the method to appropriately reflect any child premium expressed by parents. If parents use this premium to calculate both their WTP for (certainty) health improvements for their child, and also apply the same premium to their risk trade-offs on behalf of their child, then analysts' combination of these responses to generate VSL estimates may result in a double counting of this child premium. Moreover, the only previous application of the chaining method to the estimation of the VSL (Carthy et al., 1999), reported internal inconsistencies, which has since sparked heated debate regarding the method (Thomas and Vaughan 2015a&b; Chilton et al., 2015; Jones-Lee and Loomes, 2015).

The focus upon child versus parent VSL values allows us to propose a novel variant of the chaining consistency test devised by Carthy et al. Their chaining approach to estimating VSL links together a single WTP valuation of avoiding a specified ill health state with a corresponding single risk trade-off question, linking that ill-health state to a risk of a fatal outcome. In our final field study we contrast such a 'single chain' approach with a 'double chain' variant of the chaining method. Here the risk trade-off is spilt into two parts; the first linking a minor (temporary) to a major (permanent) ill-health state, and the second linking that major ill-health state to mortality. If respondents are only incorporating their 'child premium' into the valuation element of the chaining process then a switch

from the single to double chain variant should have no impact on resultant VSL. However, if that child premium is expressed at each stage of the chaining method then the double chain approach will produce higher values than the single chain variant. Comparison of the single and double chain variants also allows us to test if the chaining approach is internally consistent more generally; adult VSLs should not vary significantly across these variants.

A further insight is provide by switching from the MSG to a more conventional Standard Gamble (SG) format (as discussed previously). Comparison of the single chain VSL obtained in this final study with that given in the previous study allows us to inspect the magnitude of any "certainty effect" within SG derived VSL values.

Questionnaire design

The questionnaire employed a customised Computer Aided Personal Interviewing (CAPI) program to visually communicate the risk probabilities[19] and easily randomise the order of treatments. Straightforward descriptions of the ill-health states were adopted using an approach similar to that of Baker et al. (2008) and yielding the following ill-health states (copies of the description cards seen by respondents are given in Appendix 5, the complete questionnaire is in Appendix 6, and further supplementary materials are in Appendix 7):

- *Temporary Illness Affecting Adult (Ta):* Severe stomach pains affecting the respondent with diarrhoea and vomiting for 2-3 days every 2 weeks for 12 months;
- *Temporary Illness Affecting Child (Tc):* Severe stomach pains affecting the respondents' child with diarrhoea and vomiting for 2-3 days every 2 weeks for 12 months;

[19] The CAPI system conveyed risk probabilities both in terms of percentages and via a coloured grid similar to those used to convey risk in other stated preference studies (e.g. Zhang et al., 2013).

- *Permanent Illness Affecting Adult (Pa):* Severe stomach pains affecting the respondent with diarrhoea and vomiting for 2-3 days every 2 weeks for the rest of life;
- *Permanent Illness Affecting Child (Pc):* Severe stomach pains affecting the respondents' child with diarrhoea and vomiting for 2-3 days every 2 weeks for the rest of life.

An initial, simple ranking exercise was used to raise respondents' understanding of these four ill-heath states[20]. All respondents were then asked to state their willingness-to-pay to avoid the certainty of each of the above illnesses (the first stage of the chaining procedure). WTP responses were elicited using a set of cards[21] (given in Appendix 7) each detailing a separate payment amount which respondents sorted into three categories: 'definitely would pay', 'definitely would not pay' and 'uncertain'. The respondent is then asked to give a final WTP[22]. As before, this results in an estimate of WTP which could take any value (i.e. it is a continuous variable) but does so in a way which capitalises on the cognitive ease of binary question formats. The order in which cards were presented to respondents was randomised (shuffled in front of the respondent) with the value on the first card being recorded to allow inspection of a potential starting point bias (Herriges and Shogren, 1996; Bateman et al., 2001).

Respondents were then presented with the risk trade-off questions variants using the SG format outlined previously. Respondents were asked to choose between the certainty of suffering one of the illness scenarios (*Ta*, *Tc*, *Pa*, *Pc* above) and an alternative risky treatment with some chance, 1-π_j, of complete recovery to full health and a π_j risk of a worse health outcome. This risky 'worse health state' was either: (1) the permanent condition (*Pa* or *Pc*) when considering the certainty of a

[20] Following best-practice guidance (e.g. Bateman et al., 2002; Champ et al., 2017) more than half of the sample completed a budget constraint task. Subsequent testing revealed that this had no significant impact upon subsequently stated WTP values.

[21] Cards ranged in value from £60 to £6,000,000 expressed as both lump-sum payments and as per month equivalents if costs were spread over ten years.

[22] Note again that we use only the WTP estimate where Carthy et al. (1999) use the weighted average of WTP and WTA. We reiterate that doing so will only underestimate any bias.

temporary condition (*Ta* or *Tc*)[23] or (2) death when considering the certainty of a permanent condition (*Pa* or *Pc*). Starting from an initial level of π_j = 0.5 the CAPI varied this value according to the responses given until the respondent considered the risk of the worse health outcome as just equivalent to the certainty of the alternative health outcome, the algorithm used for this updating is available in Appendix 8.

Combining the WTP and SG responses allows us derive VSL estimates. The 'single chain' VSL is estimated using Equation (3):

$$\frac{WTP_p}{\pi_p} \tag{3}$$

While the 'double chain' approach estimates VSL using Equation (4):

$$\frac{WTP_t/\pi_t}{\pi_p} \tag{4}$$

The 'single chain' approach derives VSL by directly linking the willingness to pay to avoid the certainty of permanent illness (WTP_p) with that risk of death which the respondent feels is equivalent to the certainty of the permanent ill-health condition (π_p). The 'double chain' variant derives VSL by first dividing the willingness to pay to avoid the certainty of temporary illness (WTP_t) by that risk of permanent ill-health which the respondent feels is equivalent to the certainty of the temporary ill-health condition (π_t). This sum is then divided by that risk of death which the respondent feels is equivalent to the certainty of the permanent ill-health condition (π_p). Proponents of the chaining method (Carthy et al., 1999; Chilton et al., 2015; Jones-Lee and Loomes, 2015) have repeatedly

[23] The subject (adult or child) was kept constant at this stage. So if the adult was the subject of the permanent condition the adult would also be the subject of the temporary condition (and vice versa where the child was the subject).

emphasised that a respondent's WTP_P should be equal to WTP_t/π_t, hence the VSL values derived from the single and double chained variants should not differ significantly. Significant differences would suggest inconsistencies within the approach. Moreover, if any inconsistency is particularly apparent for child values then this would suggest that even the single chain VSL may not be robust to double counting.

The questionnaire concluded with a variety of socio-economic and follow-up questions, including the elicitation of respondents' household income[24].

Sampling procedure

Sampling was undertaking by a professional surveying company at multiple locations across the UK[25] with respondents recruited using a recruitment questionnaire designed to ensure a representative quota sample of parents with children aged less than 18 years old. In total, 996 parents completed the survey, a far larger sample than the only previous study (Carthy et al., 1999) of the chaining method applied to the VSL. The survey was administered on a face-to-face basis by professional interviewers, with the respondents having access to laptops to visualise risks. Respondents were paid for taking part. Interviewers were trained so as to minimise bias as per best practice (Bateman et al., 2002). Interviews took place on both weekends and weekdays to avoid sampling bias. Tests confirmed no significant difference in sub-samples across the various versions of the questionnaire.

Results

[24] Analysis of these variables showed that they did not materially affect the central results of this study and so they are excluded from further discussion, see Appendix 11.

[25] Locations include: Bexleyheath, Cardiff, Chiswick, Colchester, Croydon, Glasgow, Hull, Leeds, Lewisham, London, Romford, Sheffield, Southend, and York.

(a) Ranking and WTP to avoid illness

As per previous studies (Baker et al. 2008), the warm-up exercise showed that respondents generally rank impacts upon child health as more important that those affecting adults, with permanent impacts outranking temporary symptoms (details in Appendix 9).

Turning to consider respondents' WTP to avoid the four different ill-health states (*Pa*, *Pc*, *Ta*, *Tc*), very few respondents were observed to state a zero WTP value in the temporary illness valuations (1% for adult and 0.3% for child), and for permanent conditions all WTP values were strictly positive and non-zero. These represent much lower proportions of zero responses than those typical of CV studies (see previous discussions), a finding consistent with our first field study.

Resultant WTP values are presented in Table 6 which is solely calculated from responses to the first ill-health state valued so as to avoid any possibility of ordering effects. Results conform to prior expectations with the values given to avoid a permanent ill-health condition always being significantly higher than those for avoiding a temporary condition[26] and adult values being significantly lower than child values. As the temporary condition lasts for one year only, irrespective of the person affected, then results reflect a pure child premium. However, for the permanent condition this difference is likely to have been exacerbated by the higher life-remaining expectancy of the child relative to the parent. This is reflected in the greater excess of mean WTP for children as opposed to adults in the permanent (as opposed to temporary) condition.

[26] This result – that stated WTP values are scope sensitive – is highlighted in Appendix 11, which also shows that the socio-economic characteristics of the respondent do not affect her scope sensitivity

	Mean (£) *Median* (St. Dev.)		Are values to prevent permanent ill-health higher than those to prevent temporary ill-health?* p value (z statistic)
	Temporary ill-health	Permanent ill-health	
Adult	13,155 *3600* (46958)	27,766 *6000* (101906)	0.006 (2.50)
Child	18,354 *5999* (39289)	64,424 *9000* (427456)	0.001 (3.04)
Are child values higher than adult values?* p value (z statistic)	0.010 (2.32)	0.002 (2.83)	

Table 6: WTP to avoid the certainty of negative health outcomes
Note: Heavier weight grid cells denote data rather than test results
* Non-parametric one-tailed Mann-Whitney Wilcoxon test

The encouraging findings of Table 6 are tempered by those of Table 7 which report results from a regression analysis to test for starting point bias. This examines the effect on stated maximum WTP of the value displayed on the randomly selected first card shown to respondents. After controlling for the four ill-health states (*Pa*, *Pc*, *Ta*, *Tc*) we see a clear, positive and statistically significant relationship between the amount shown on this first card and the final stated WTP. While such anchoring effects are common and long established in CV studies (Bateman et al., 1995; Green et al., 1998; Chien et al., 2005; Flachaire and Hollard, 2006) and indeed have been observed in incentivised, real payment experiments (Bateman et al., 2006), nevertheless the results of Table 7 suggest that the chaining method is not immune from such phenomena.

Table 7: results of a regression analysis testing for starting point bias

Predictor	Parameter (SE)	t value	p value
Intercept (*Pa*)	6.262 (0.209)	30.006	<0.001
Pc	0.369 (0.150)	2.470	0.011
Ta	-0.449 (0.175)	-2.564	0.014
Tc	-0.071 (0.175)	-0.404	0.686
Ln(starting bid)	0.301 (0.023)	13.137	<0.001

Notes: Dependent variable = natural logarithm of final stated (maximum) WTP
Adjusted R-squared (OLS estimator) = 0.175; N = 996.

(b) Standard Gamble results

Summary statistics of acceptable levels of risk (of the permanent condition when faced with a certainty of the temporary condition, and of death when faced with the certainty of the permanent condition) are reported in Table 8.

	Mean risk *Median* (St. Dev.)	
	Temporary	Permanent
Adult	0.212 *0.075* (0.266)	0.188 *0.065* (0.253)
Child	0.182 *0.075* (0.237)	0.132 *0.006* (0.229)
Adult vs child values* p value (z statistic)	0.092 (-1.33)	0.003 (-2.79)

Table 8: Summary statistics for the risk values
Note: Heavier weight grid cells denote data rather than test results
* Non-parametric one-tailed Mann-Whitney Wilcoxon test

Table 8 reveals that parents are unwilling to allow their children to accept the same levels of risk that they would accept for themselves, with this difference in acceptable mortality risk being particularly significant for the more serious permanent ill-health state. Such results conform well to expectations and findings both in the health and other fields (Kahnemann and Tversky 1982; Jones-Lee, 1992; Gilovich and Medvec 1995; Connolly and Zeelenber 2002; Søgaard et al., 2012), however they suggest that respondents are applying a child premium in their risk responses, just as they did previously in the WTP questions. The implications for the chaining method of this double expression of a child premium are obvious and it is to these we now turn.

(c) VSLs for adult and child

As discussed earlier, the mean value for VSLs estimated through the chaining approach is highly susceptible to hyper-inflation by a few very extreme positive values. To combat this, one could calculate a 'double-mean' (or 'double-median') value; using the mean (median) of the sample WTP and acceptable risk level values to arrive at the mean (median) VSL. Indeed, simply calculating this from the statistics in Tables 6 and 8 is both easy and yields results which are plausible if low in the case of adults[27]. However, this imposes a set of assumptions on societal preferences which are difficult to defend and yield values which are challenging to interpret. Instead, we calculate VSL at an individual level, using only the single or double chain first responses given by that individual (to minimise any ordering effect as respondents pass through the four, randomly ordered, ill-health states; *Pa*, *Pc*, *Ta*, *Tc*) and trimming the resultant data to remove the top and bottom 5%[28] of values to combat extremes; these are reported in Table 9. As with any positively skewed distribution of individuals' VSL estimates, further trimming of the data would result in an estimate of the VSL which is closer to the median value

[27] Single chain VSL for the parent and child respectively; mean: £147,691 and £488,061; median: £92,308 and £1,500,000

[28] Chilton et al., (2015) defend the trimming of data. In the present case trimming the top and bottom 5% reduces mean values by roughly one order of magnitude

which in turn is more similar to those reported elsewhere in the literature, but in the process this would gloss over the certainty bias and double counting anomalies observed.

		Mean VSL (£million) *Median* *(St. Dev.)*		*Is the single chain value lower than the corresponding double value?** *p value* *(z statistic)*
		Single chain	Double chain	
Adult		1,743 0.22 (4,991)	332,747,600 3.69 (1,578,980,000)	<0.001 (-22.17)
Child		4,436 2.53 (11,069)	1,549,329,000 519.48 (5,958,649,000)	<0.001 (-23.24)
*Adult vs child values**	p value (z statistic)	<0.001 (-13.60)	<0.001 (-13.18)	

Table 9: Chained estimates of VSL for adults and children
Note: Calculated using Equations (3) and (4)
Heavier weight grid cells denote data rather than test results
* Non-parametric one-tailed Mann-Whitney Wilcoxon test

Ignoring the absolute values recorded in Table 9, at first glance these results appear promising. The VSL values for children are significantly larger than those for adults, conforming well to our expectations. However, comparing the mean single chain VSL with those estimated in the first field study, highlights that the "certainty effect" (induced by our switch from the MSG to SG format for the second field study) hyper-inflates estimated VSLs; respondents seem very unwilling to accept even small mortality risks when even a very adverse alternative ill-health state involves no risk of death. This inflation in resultant VSL is very substantially exacerbated when we move from the single to double chain format with the latter values being very significantly larger than the former[29]. This exacerbation applies to both the child and adult values suggesting that not only does the method

[29] Similarly to calculating the VSL with the single chain, using the double chain approach but with just population mean values does inflate the VSL, but this is much less than in the case the double chained VSL is calculated on the individual level and then averaged. We reiterate that such an approach would only misrepresent people's preferences.

double count any child premium, it also double counts adults utility for their own health. An interesting extension to this questions of values placed on child's lives, may investigate whether this premium is driven by being an individual who is cherished by the respondent, or by an age premium; such an insight could be gained by asking respondents about their partner's life rather than their own.

Concluding remarks

We present a set of lab and field exercises to examine the robustness of the CV and Chaining methods for estimating VSL values for both adults and children. Findings across these studies reveal a number of consistent results. The CV approach of asking respondents to value compound goods consisting of both risk levels and outcomes reveals a number of anomalies. Despite a series of exercises to improve understanding of risk, respondents struggle to comprehend risk levels; giving inconsistent responses to the same probability levels expressed in different formats, and over-valuing small as opposed to larger reductions in risk. The CV method also seems prone to rejection in the form of high rates of zero WTP bids for health risk reductions which cannot reasonably be described as having no value.

The chaining method therefore potentially offered an innovative response to the various problems exhibited by the CV approach, not least an unwillingness on the part of respondents to engage with such questions. The chaining method performs well in this respect with respondents appearing to understand and accept the constituent certainty valuation and risk trade-off elements of the method. However, the chaining approach appears just as vulnerable to starting point bias as does the CV method. More uniquely the chaining approach seems vulnerable to an inflationary certainty effect when the risk trade-off is framed using conventional SG (as opposed to MSG) formats, and is susceptible to small errors in stated risk levels over-estimating the VSL. Furthermore, and of most concern, when exposed to the test for internal consistency, the chaining approach clearly fails, double counting any premium to yield infeasibly high VSL values.

In short our study reveals substantial challenges to the application of both the CV and chaining methods. Given the vital importance of deriving robust VSL estimates for practical project appraisal and benefit cost analysis there is clearly considerable work to be done before these problems can be solved. However, both of our field studies using either method do reveal a very clear message to the policy question which prompted this investigation; we find strong evidence that parents place a higher VSL on their child that they do for their own lives.

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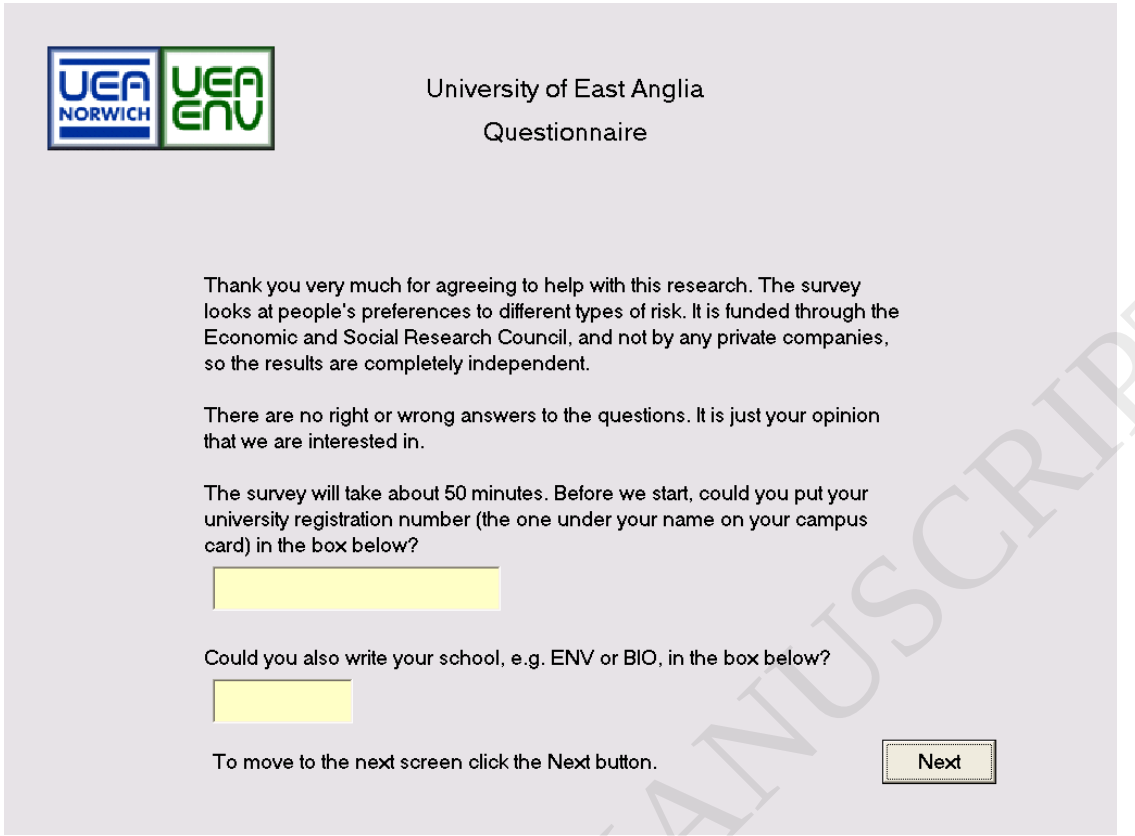
Appendix 1: Screenshots of the survey respondents completed in the lab experiment



University of East Anglia

Questionnaire

Thank you very much for agreeing to help with this research. The survey looks at people's preferences to different types of risk. It is funded through the Economic and Social Research Council, and not by any private companies, so the results are completely independent.

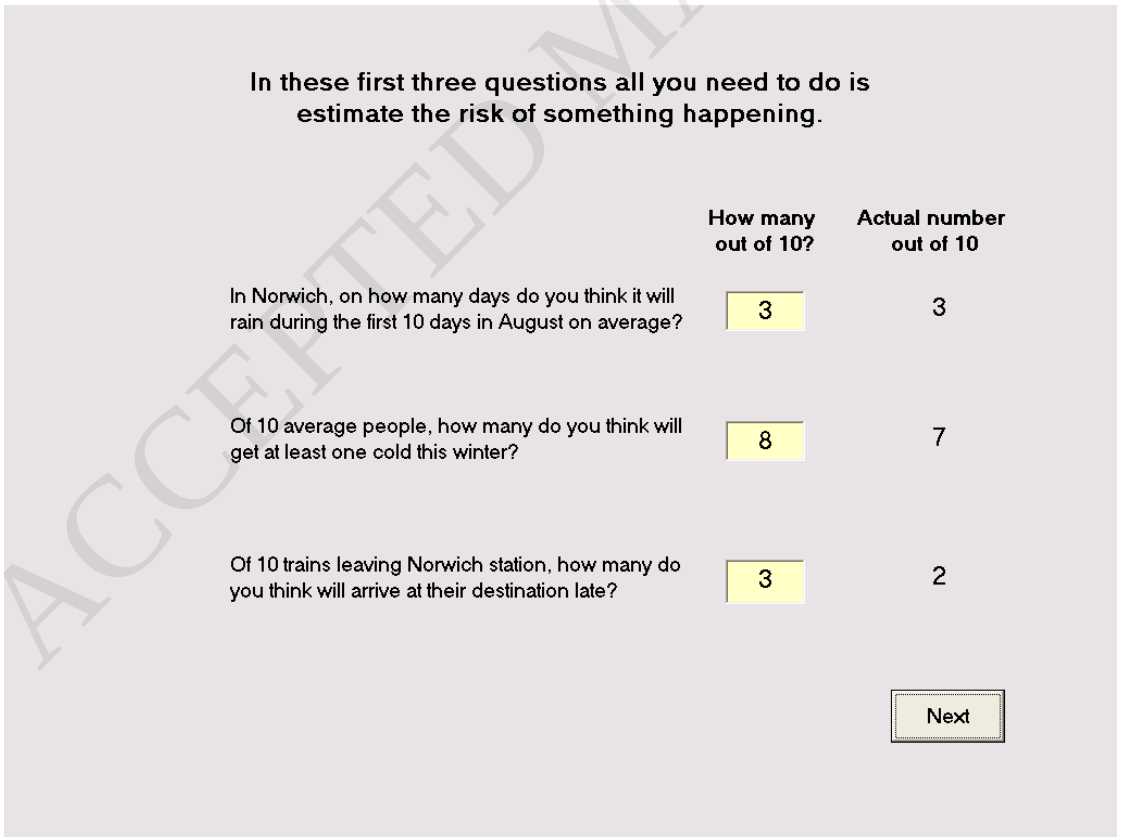
There are no right or wrong answers to the questions. It is just your opinion that we are interested in.

The survey will take about 50 minutes. Before we start, could you put your university registration number (the one under your name on your campus card) in the box below?

Could you also write your school, e.g. ENV or BIO, in the box below?

To move to the next screen click the Next button.

Next



In these first three questions all you need to do is estimate the risk of something happening.

	How many out of 10?	Actual number out of 10
In Norwich, on how many days do you think it will rain during the first 10 days in August on average?	3	3
Of 10 average people, how many do you think will get at least one cold this winter?	8	7
Of 10 trains leaving Norwich station, how many do you think will arrive at their destination late?	3	2

Next

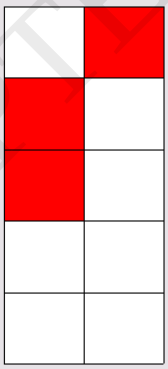
Now I want you to think about the risk of something happening to you. This may be different to what you think the average risk is to other people.

	Your risk out of 10?
The risk of you getting at least one cold in the next 12 months	
The risk that the next train you get will arrive at its destination late	

Next

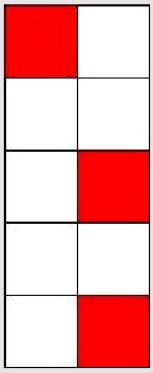
The risk of something happening can also be shown visually on a grid.

Take the risk of it raining. Out of 10 days at the beginning of August, on average it rains on 3 days. This is shown on the grid below.



- The 10 squares represent 10 days
- The 3 red squares represent 3 rainy days
- The 7 white squares represent 7 dry days

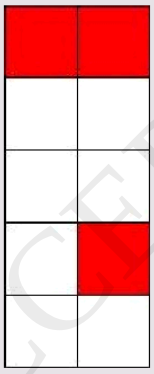
Next



While we know that on average it will rain on 3 days in the first 10 days in August, we can't say for certain on which particular days you'll need an umberella.

As shown by the grid on the left, any combination of 3 rainy and 7 dry days is possible.

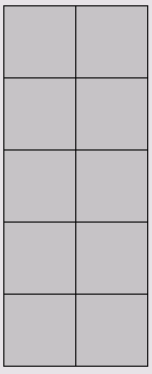
Next

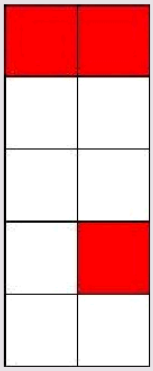


Imagine that you're planning a BBQ on one of the first 10 days in August. You have to pick a day to hold it on and you know there's a 3 in 10 chance that it will rain on that day.

I want you to pick a square on the grey grid on the right. The risk that it is a red square is the risk that you pick a rainy day for your BBQ.

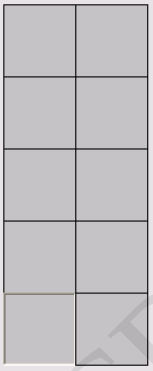
Click on one of the squares on the grey grid.

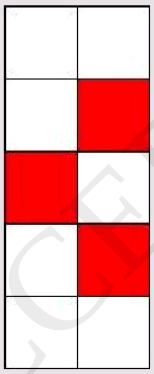




When you're ready click on the button below to reveal whether you've picked a sunny or a rainy day for your BBQ.

Click to reveal grid

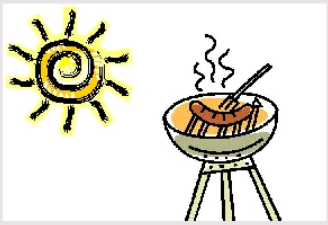


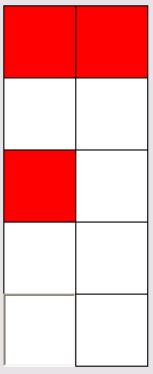


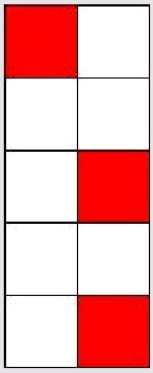
Lucky you. You picked a white square so you have your BBQ on a sunny day.

Just for fun, try again to see whether you pick a rainy or dry square.

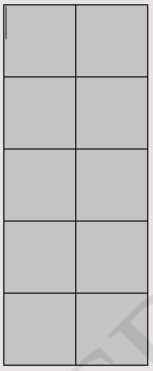
Try Again

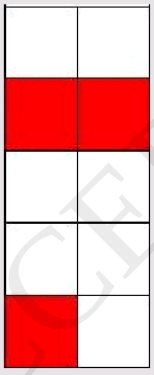






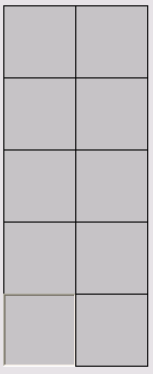
Choose and click on another square.

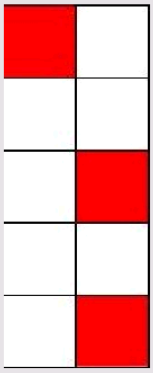




When you're ready click on the button below to reveal whether you've picked a sunny or a rainy day for your second BBQ.

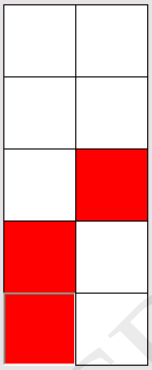
Click to reveal grid





Shame... You've chosen a red square so your BBQ is rained off.

OK, so let's move on.

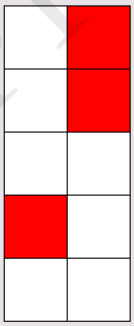


Next

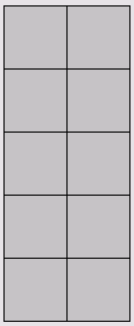
As you saw earlier, the risk of it raining over 10 summer days at the beginning of August is 3 in 10.
(This risk is shown on the grid on the left below.)

- The 10 days in the year with the LOWEST risk of rain are the 10 summer days at the beginning of August
- The 10 days in the year with the HIGHEST risk of rain are the 10 winter days at the beginning of January

Summer grid
First 10 days in August



Winter grid
First 10 days in January



Risk out of 10

How many squares on the winter grid on the right above do you think would be coloured red to show rainy days?

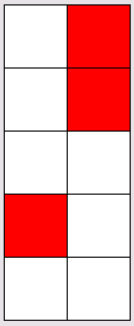
5

Next

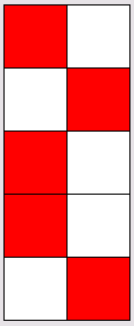
As you saw earlier, the risk of it raining over 10 summer days at the beginning of August is 3 in 10.
(This risk is shown on the grid on the left below.)

- The 10 days in the year with the LOWEST risk of rain are the 10 summer days at the beginning of August
- The 10 days in the year with the HIGHEST risk of rain are the 10 winter days at the beginning of January

Summer grid
First 10 days in August



Winter grid
First 10 days in January



How many squares on the winter grid on the right above do you think would be coloured red to show rainy days?

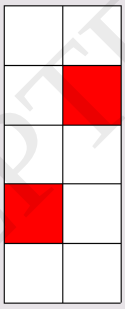
Risk out of 10: 5

Actual risk out of 10: 5

Next

The risk of something happening can be shown on a grid with more than 10 squares.

Take the example of trains arriving at their destination. Suppose that, on average, 2 out of 10 trains arrive late. This is shown on the grid below.

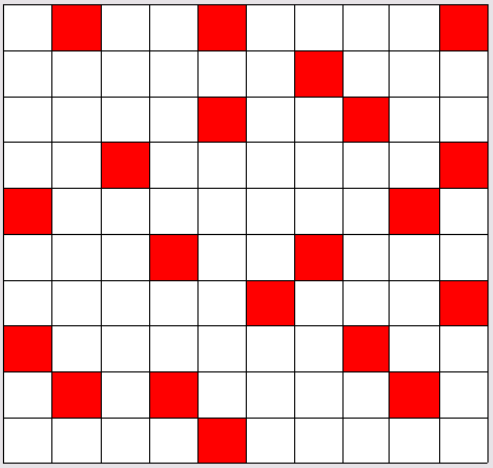


- The 10 squares represent 10 trains
- The 2 red squares represent 2 trains that were late
- The 8 white squares represent 8 trains that arrived on time

So, what if we considered 100 trains?

Next

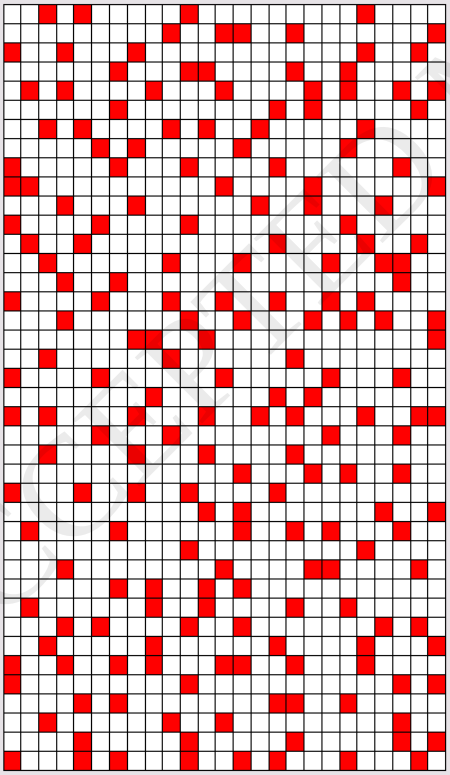
Risk of a train being late



- The 100 squares represent 100 trains
- The 20 red squares represent 20 trains that were late
- The 80 white squares represent 80 trains that were on time

So, what if we considered 1,000 trains?

Previous Next



Risk of a train being late

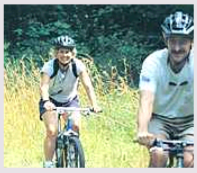
- The 1,000 squares represent 1,000 trains
- The 200 red squares represent 200 trains that were late
- The 800 white squares represent 800 trains that were on time

Previous Next

While some risk in our lives is inevitable, our behaviour can influence the level of risk that we face. We all decide whether the benefit of doing something risky is "worth it".

Driving a car

- Driving faster can get you to an appointment on time
- But, driving faster increases your risk of an accident



Riding a bike

- Cycling has a risk of serious injury or even death
- Spending money on a cycling helmet (and then using it) can reduce this risk

So, in our everyday lives we trade-off different risks and different benefits. For example,

The risk of being burgled

- Every homeowner faces some risk of being burgled
- Spending money on security devices can reduce this risk

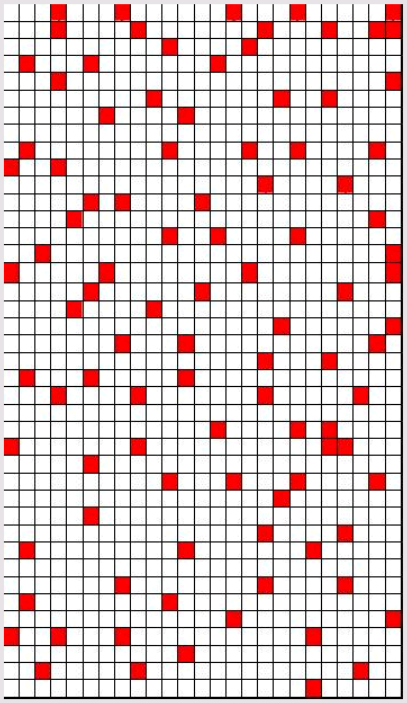
Previous Next

Imagine that you've just bought and moved into a new house. Imagine that you have the same belongings in the house as you do in your current accomodation.

You're happy with everything about the house but it has very limited home security. As the owner you're considering whether it's worth buying some security devices.

Previous Next

Risk WITHOUT deadlocks
100 in 1,000

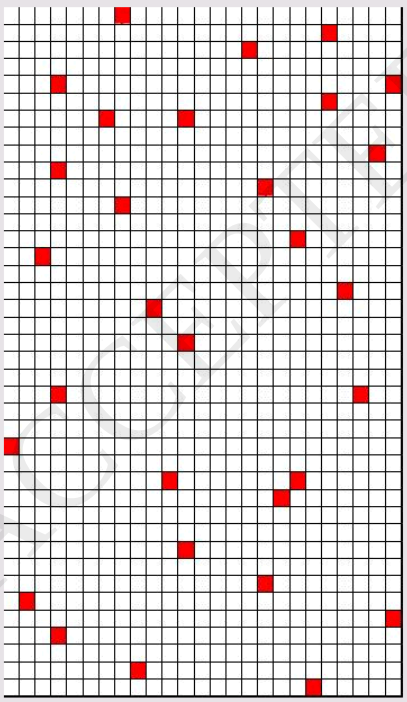


As the house currently has no security devices your risk of being burgled in the next 12 months is 100 in 1,000.

This is shown on the grid to the left.

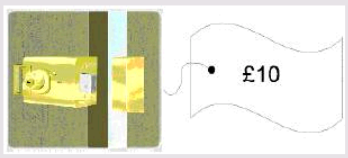
Next

Risk WITH deadlocks
30 in 1,000



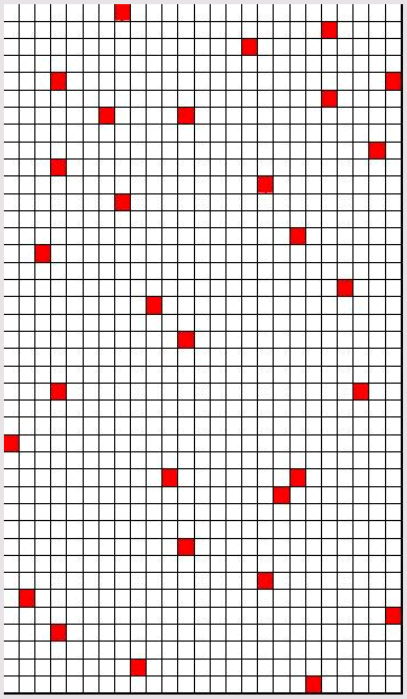
You could buy and fit deadlocks to your external doors for £10. This would reduce your risk of being burgled from 100 in 1,000 to 30 in 1,000.

Your risk of being burgled with the deadlocks of 30 in 1,000 is shown on the grid on the left.



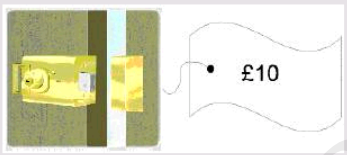
Next

Risk WITHOUT deadlocks 100 in 1,000 | Risk WITH deadlocks 30 in 1,000

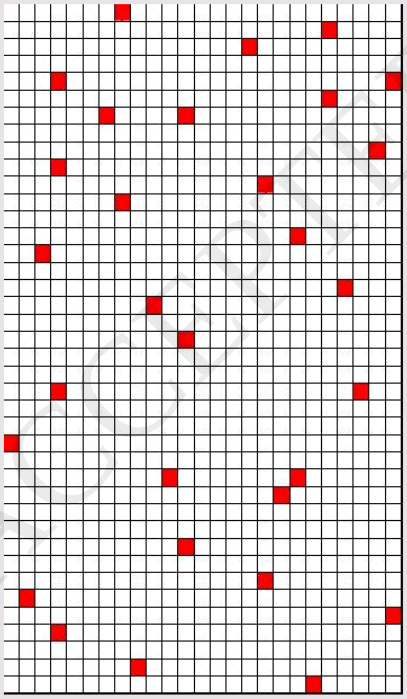


You can see your risk of being burgled WITH and WITHOUT the deadlocks by clicking on the buttons above the grid.

Try clicking each button to compare your current risk of being burgled without the deadlocks and your risk if you bought and fitted the deadlocks.

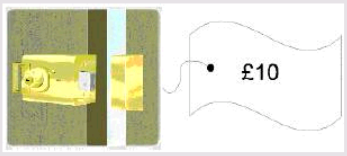


Risk WITHOUT deadlocks 100 in 1,000 | Risk WITH deadlocks 30 in 1,000



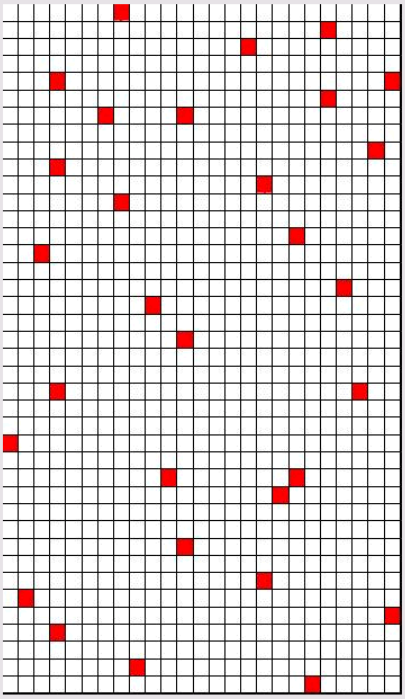
Would you be willing to pay £10 for deadlocks that would reduce your risk of being burgled from 100 in 1,000 to 30 in 1,000?

- Yes
- No



Next

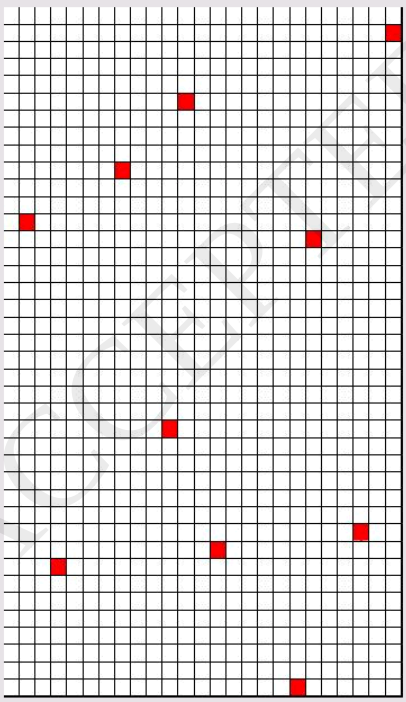
Risk WITH deadlocks 30 in 1,000



So, now your house has deadlocks and your risk of being burgled in the next 12 months is 30 in 1,000. This is shown on the grid to the left.

Next

Risk WITH burglar alarm 10 in 1,000



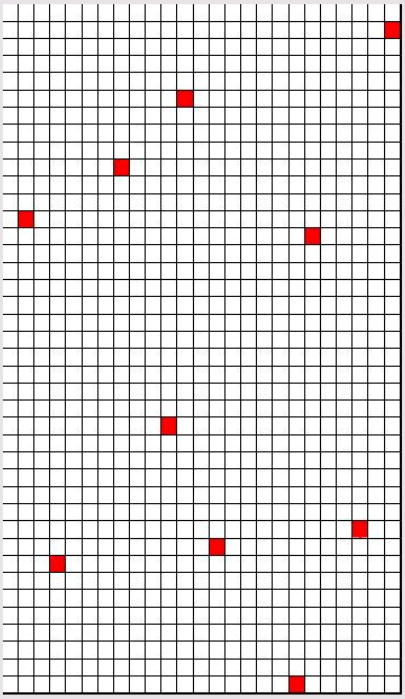
You could buy and fit a burglar alarm to your new house for £250. This would reduce your risk of being burgled from 30 in 1,000 to 10 in 1,000.

Your risk of being burgled with the burglar alarm fitted of 10 in 1,000 is shown on the grid on the left.

Next

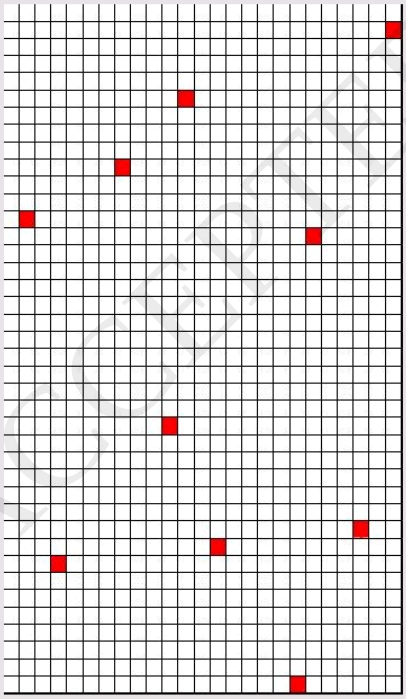
Risk WITHOUT burglar alarm 30 in 1,000

Risk WITH burglar alarm 10 in 1,000



As before you can compare your risk of being burgled with and without the burglar alarm by clicking the buttons on the left.

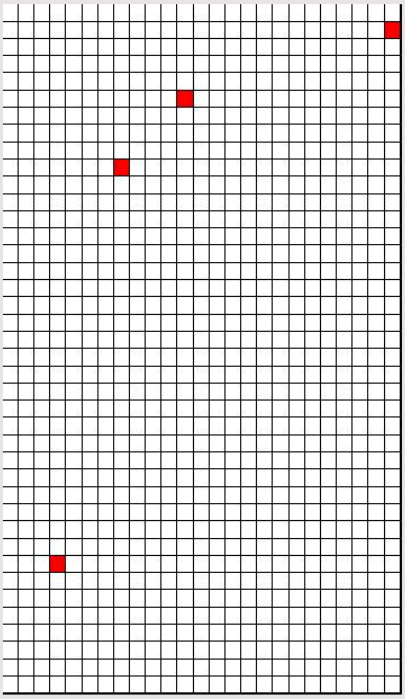
Risk WITH burglar alarm 10 in 1,000



With the deadlocks and the burglar alarm your current risk of being burgled in the next 12 months is 10 in 1,000. This is shown on the grid to the left.

Next

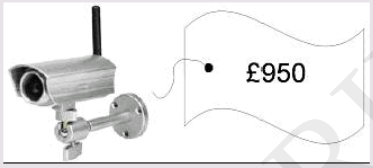
Risk WITHOUT CCTV 10 in 1,000 | Risk WITH CCTV 4 in 1,000



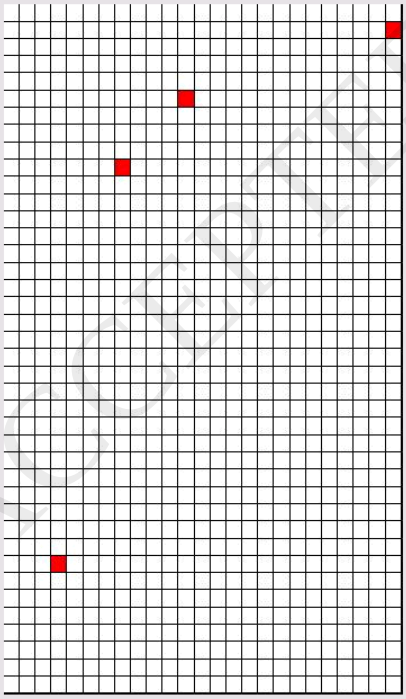
You could buy and fit close circuit television to your new house for £950. This would reduce your risk of being burgled to 4 in 1,000.

This is shown by the grid on the left.

Switch between the current risk grid and new risk grid by clicking the buttons on the left.

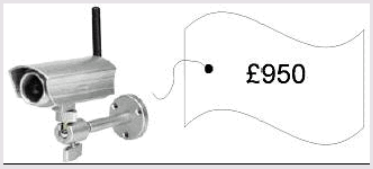


Risk WITHOUT CCTV 10 in 1,000 | Risk WITH CCTV 4 in 1,000



Would you be willing to pay £950 for a CCTV camera that would reduce your risk of being burgled from 10 in 1,000 to 4 in 1,000?

- Yes
- No



Next

So you decided that you would NOT pay £950 to reduce the risk of being burgled from 10 in 1,000 to 4 in 1,000.

You may be willing to pay some amount less than £950 to reduce your risk of being burgled from 10 in 1,000 to 4 in 1,000.

Next

I want to know the maximum amount, if anything, you would be willing to pay for the CCTV.

You indicate this maximum amount in the bid box to the right.

There are two ways of doing this.

Click the Next button to reveal the first way.

Bid box

£0.00

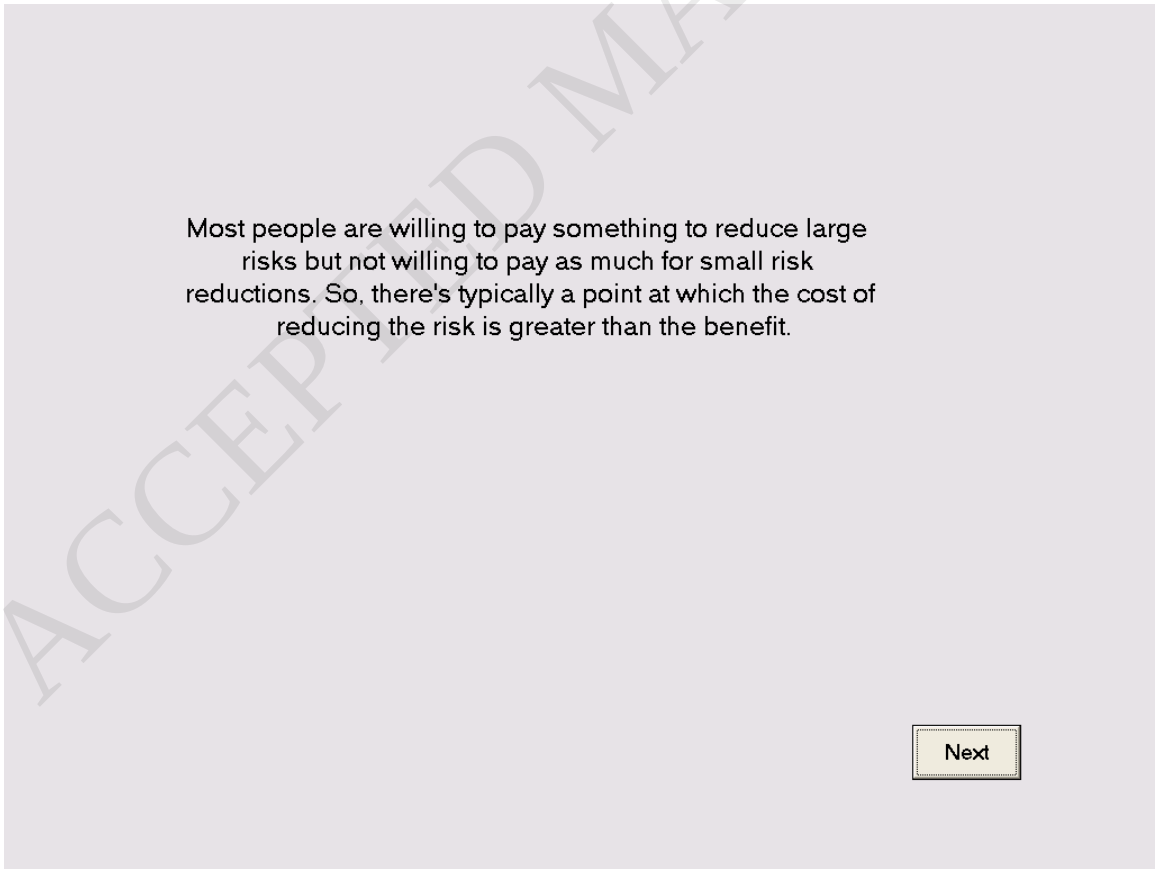
Next

You can use the slider by dragging the pointer.

Click the Next button to reveal the second way.

Or you can click on either the Up or Down buttons.

Holding the button down will change the amount in the bid box faster.



The next exercises will ask you to weigh the costs and the benefits of reducing risks

Next

First Scenario

Suppose that for some reason you must put £75 in a jar and leave it at a specified location overnight.

There is a risk that a thief will steal your money overnight. If the thief steals the money you will lose your £75. If he doesn't, you can collect your money from the jar the next day.

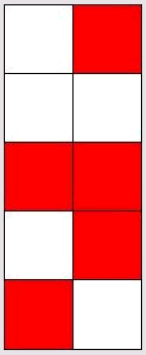
However, there is a security device you can buy which will reduce the chance that the thief will steal the money.

A copy of this scenario is on the desk in front of you.

Next

Risk WITHOUT security device 5 in 10

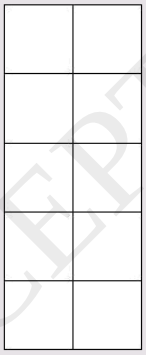
Risk WITH security device 0 in 10



You have a risk of having your £75 stolen of 5 in 10.

Click on the buttons on the left to see your new risk if you buy the security device.

Risk WITH security device 0 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the security device that reduces your risk from 5 in 10 to 0 in 10.

Bid box

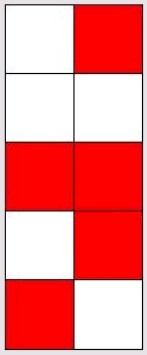
£0.00

Up

Down

Next

Risk WITHOUT security device 5 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the security device that reduces your risk from 5 in 10 to 0 in 10.

Bid box

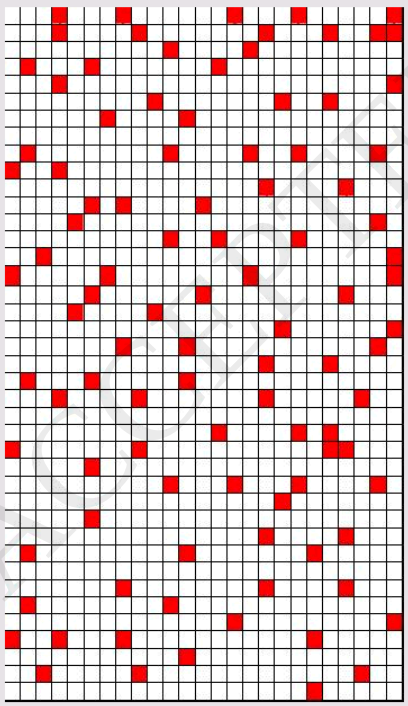
£0.00

Up Down

Next

Risk WITHOUT security device 100 in 1,000

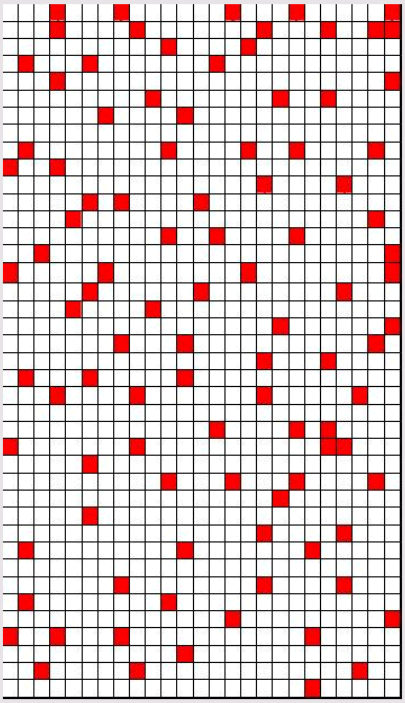
Risk WITH security device 0 in 1,000



Now imagine that you have a risk of having your £75 stolen of 100 in 1,000.

Click on the buttons on the left to see your new risk if you buy and take a security device.

Risk WITHOUT security device 100 in 1,000



In the bid box below, put the maximum amount you'd be willing to pay for the security device that reduces your risk from 100 in 1,000 to 0 in 1,000.

Bid box

£0.00

Up Down

Next

The next exercise will focus on another scenario:
That of going blind.

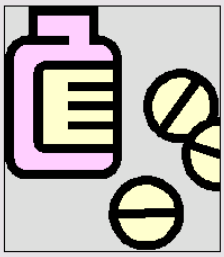
A copy of the scenario is on the desk in front of you.

Next

Blind Scenario

There is a virus that leads you to lose your sight completely for 3 days. For people who get the virus they are unable to see anything at all—not even any light.

- You are completely blind for 3 days
- But sight returns to normal on the 4th day



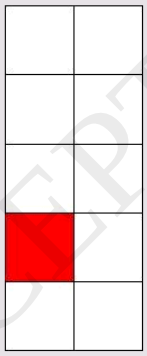
There is a pill available that will reduce your risk of getting the virus and losing your sight for 3 days. The pill is:

- 100% effective
- thoroughly tested and has absolutely no side effects

Next

Risk WITHOUT pill 1 in 10

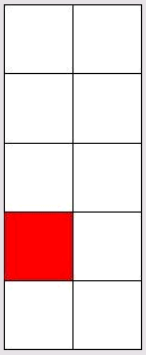
Risk WITH pill 0 in 10



Imagine that you currently have a risk of getting a virus and going blind of 1 in 10.

Click on the buttons on the left to see your new risk if you buy and take a pill.

Risk WITHOUT pill
1 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the pill that reduces your risk today from 1 in 10 to 0 in 10.

Bid box

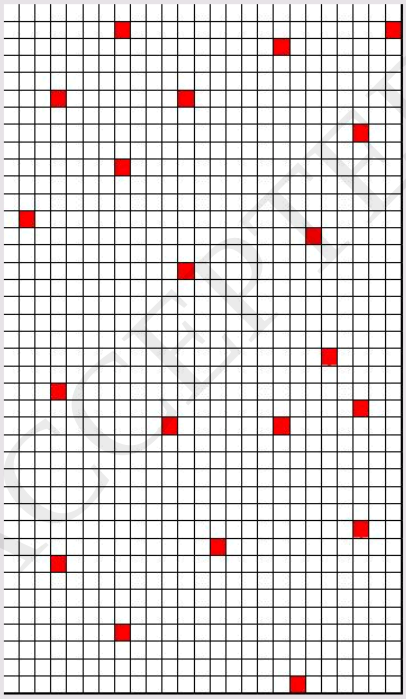
£0.00

Up Down

Next

Risk WITHOUT pill
20 in 1,000

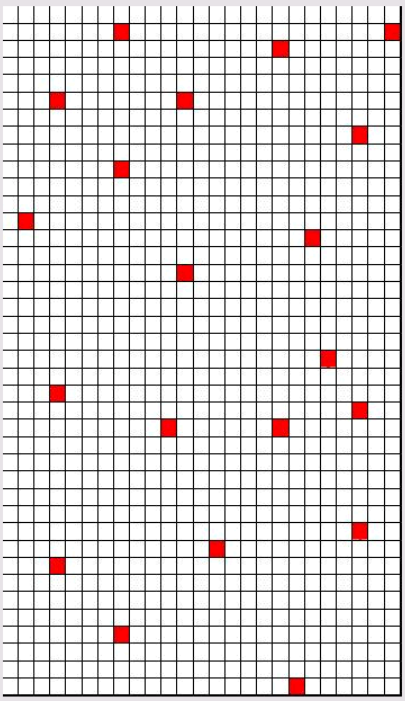
Risk WITH pill
0 in 1,000



Now imagine that you have a risk of getting a virus and going blind of 20 in 1,000.

Click on the buttons on the left to see your new risk if you buy and take a pill.

Risk WITHOUT pill
20 in 1,000



In the bid box below, put the maximum amount you'd be willing to pay for the pill that reduces your risk today from 20 in 1,000 to 0 in 1,000.

Bid box

£0.00

Up Down

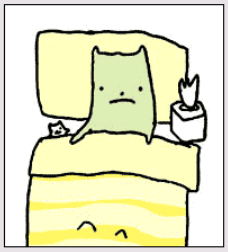
Next

The next exercise will focus on another scenario: That of getting a stomach bug

A copy of the scenario is on the desk in front of you.

Next

Stomach Bug Scenario

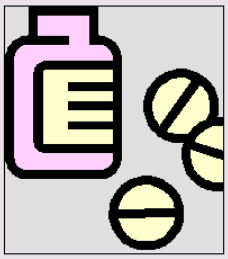


There is a risk that you will get a stomach bug. It affects everyone:

- Young and old
- Fit & healthy and ill & weak

If you get the stomach bug you will have the following symptoms for 3 days:

- Vomiting every two hours
- Diarrhoea every two hours
- Continuous stomach cramps
- Continuous exhaustion



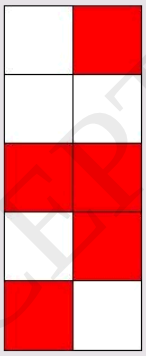
There is a pill available that will reduce your risk of getting the stomach bug.
The pill is:

- 100% effective
- thoroughly tested and has absolutely no side effects

Next

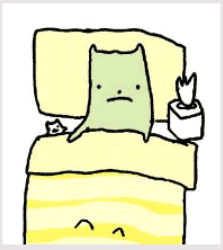
Risk WITHOUT pill 5 in 10

Risk WITH pill 0 in 10

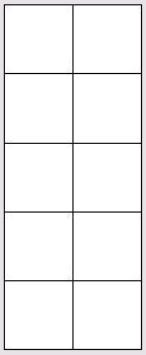


You have a risk of getting the stomach bug of 5 in 10.

Click on the buttons on the left to see your new risk if you buy a pill.



Risk WITH pill 0 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the pill that reduces your risk today from 5 in 10 to 0 in 10.

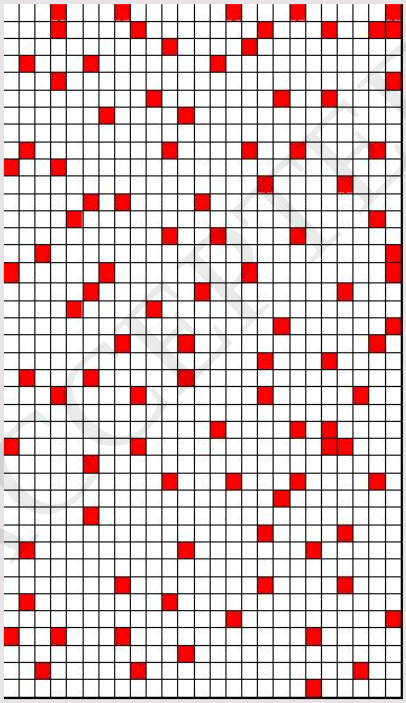
£0.00

Up Down

Next

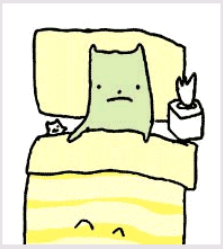
Risk WITHOUT pill 100 in 1,000

Risk WITH pill 0 in 1,000

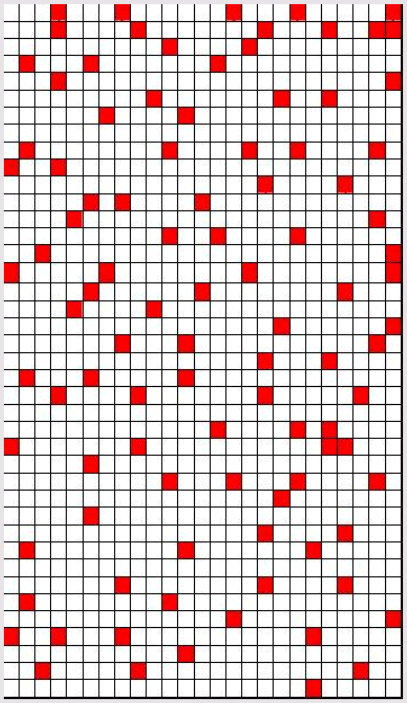


Now imagine that you have a risk of getting the stomach bug of 100 in 1,000.

Click on the buttons on the left to see your new risk if you buy a pill.



Risk WITHOUT pill 100 in 1,000



In the bid box below, put the maximum amount you'd be willing to pay for the pill that reduces your risk today from 100 in 1,000 to 0 in 1,000.

£0.00

Up Down

Next

Take a look in envelope A on the desk in front of you.

There are 7 cards. Each card shows an event that has some chance of happening.

What I'd like you to do is order the cards in front of you according to how likely you think it is that these events will occur. Put the event you think is:

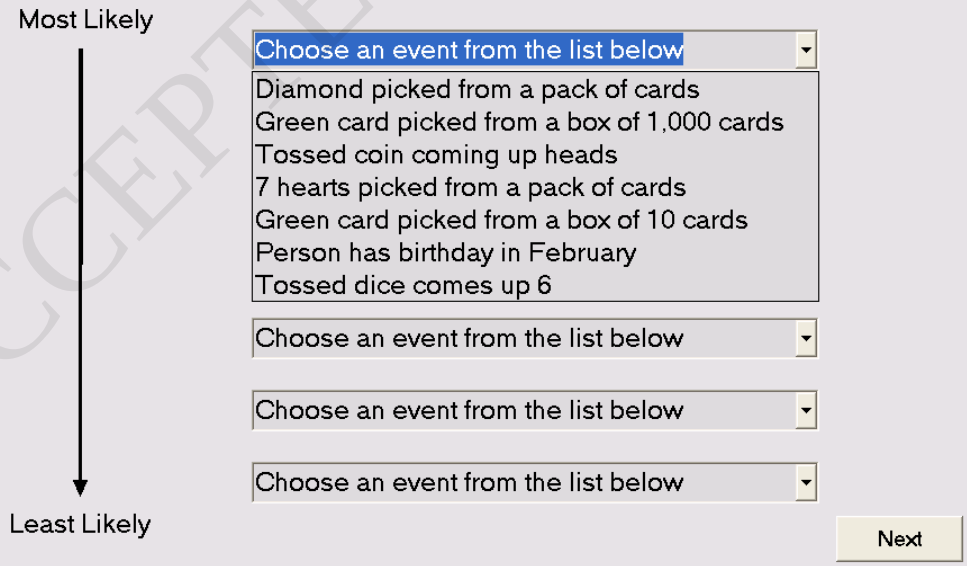
- Most likely to occur at the top
- Least likely to occur at the bottom.

When you're happy with your ranking click to the next screen to record your answers

Next

Please rank the events from most likely to least likely using the drop down menus below

Please rank the events from most likely to least likely using the drop down menus below

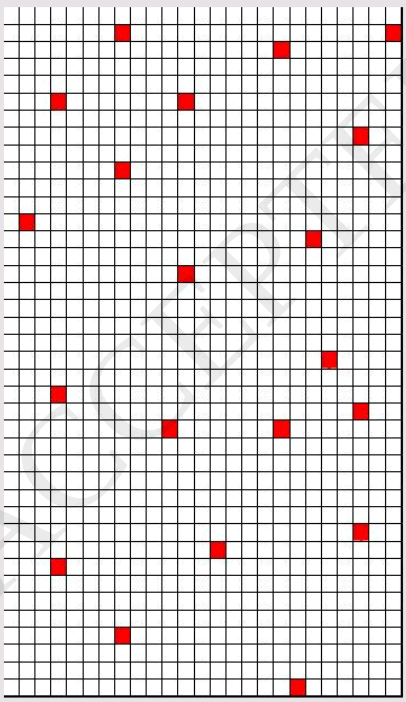


Let's go back to the first scenario: The risk of you having £75 stolen. A description of the scenario is on the desk in front of you.

Next

Risk WITHOUT security device 20 in 1,000

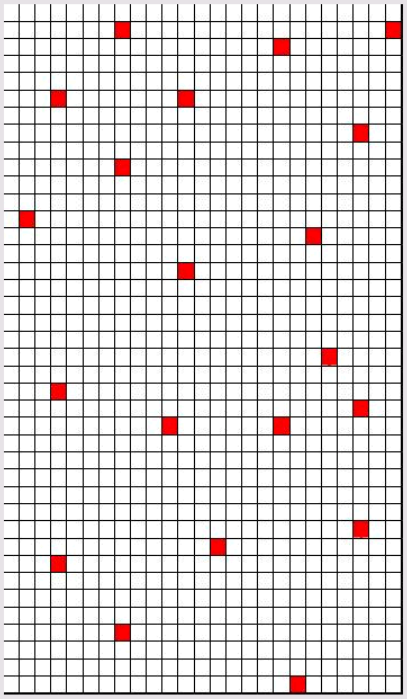
Risk WITH security device 0 in 1,000



You have a risk of having your £75 stolen of 20 in 1,000.

Click on the buttons on the left to see your new risk if you buy the security device.

Risk WITHOUT security device 20 in 1,000



In the bid box below, put the maximum amount you'd be willing to pay for the security device that reduces your risk from 20 in 1,000 to 0 in 1,000.

Bid box

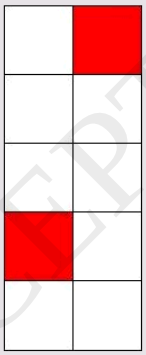
£0.00

Up Down

Next

Risk WITHOUT security device 2 in 10

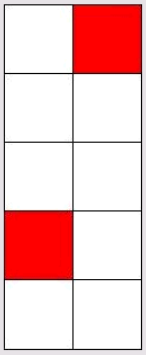
Risk WITH security device 0 in 10



Now imagine that you have a risk of having your £75 stolen of 2 in 10.

Click on the buttons on the left to see your new risk if you buy and take a security device.

Risk WITHOUT security device 2 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the security device that reduces your risk from 2 in 10 to 0 in 10.

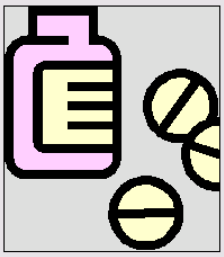
Bid box

£0.00

Up Down

Next

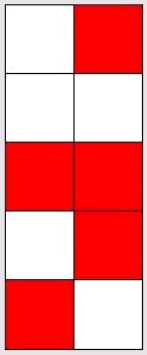
Please go back to the scenario of the risk you getting a virus and going blind for 3 days. A description of the scenario is on the table in front of you.



Next

Risk WITHOUT pill 5 in 10

Risk WITH pill 0 in 10

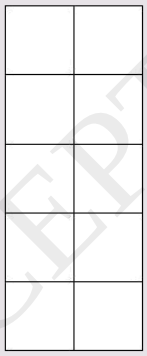


You have a risk of getting a virus and going blind of 5 in 10.

Click on the buttons on the left to see your new risk if you buy and take a pill.

Risk WITHOUT pill 5 in 10

Risk WITH pill 0 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the pill that reduces your risk today from 5 in 10 to 0 in 10.

Bid box

£0.00

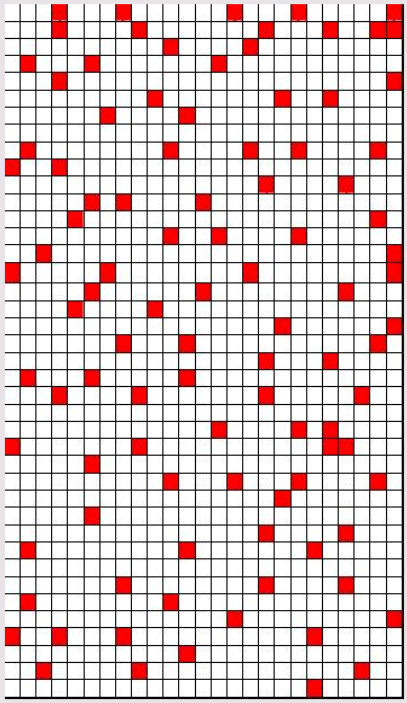
Up

Down

Next

Risk WITHOUT pill
100 in 1,000

Risk WITH pill
0 in 1,000

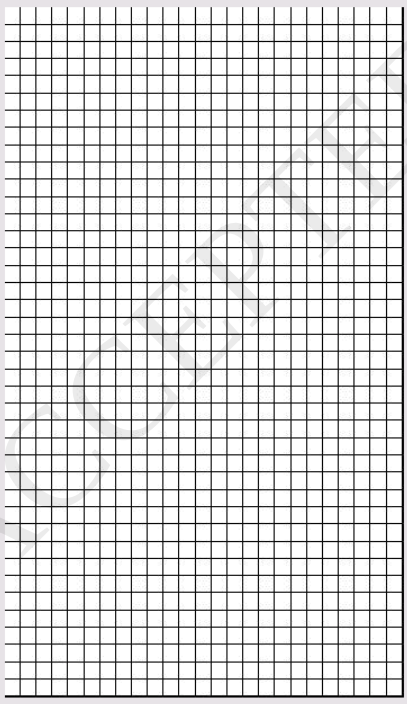


Now imagine that you have a risk of getting a virus and going blind of 100 in 1,000.

Click on the buttons on the left to see your new risk if you buy and take a pill.

Risk WITHOUT pill
100 in 1,000

Risk WITH pill
0 in 1,000



In the bid box below, put the maximum amount you'd be willing to pay for the pill that reduces your risk today from 100 in 1,000 to 0 in 1,000.

Bid box

£0.00

Up

Down

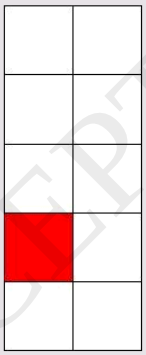
Next

Once again, I want you to go back to the scenario of the risk of you having £75 stolen. A description of the scenario is on the table in front of you.

Next

Risk WITHOUT security device 1 in 10

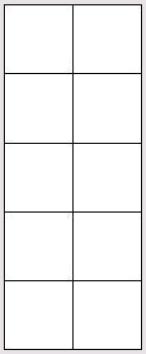
Risk WITH security device 0 in 10



You have a risk of having your £75 stolen of 1 in 10.

Click on the buttons on the left to see your new risk if you buy a security device.

Risk WITH security device 0 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the security device that reduces your risk from 1 in 10 to 0 in 10.

Bid box

£0.00

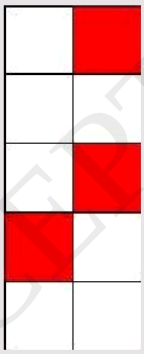
Up

Down

Next

Risk WITHOUT security device 3 in 10

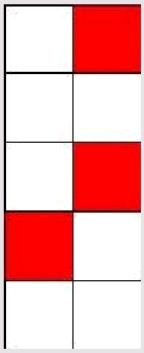
Risk WITH security device 1 in 10



Now imagine that you have a risk of having your £75 stolen of 3 in 10.

Click on the buttons on the left to see your new risk if you buy a security device.

Risk WITHOUT security device 3 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the security device that reduces your risk from 3 in 10 to 1 in 10.

Bid box

£0.00

Up Down

Next

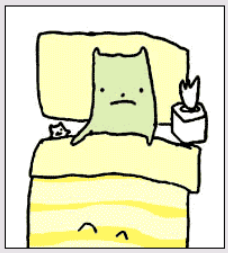
Please think back to the events in envelope A. I want you to think about the maximum amount you'd be willing to pay for a lottery ticket that had a prize of winning **£10** where you'd win if the following event happens.

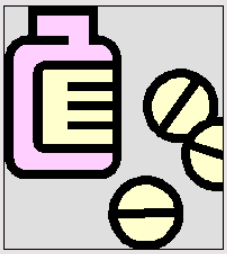
Please put your maximum willingness to pay in the boxes on the right.

	Max £_._ _
When a coin is tossed it comes up heads	.
When a diamond is picked from a deck of cards	.
When a single dice thrown comes up 6	.
When a green square is picked from a box of 1,000 square bits of card (390 green, 610 yellow)	.
When a green square is picked from a box with 10 square bits of card (4 green, 6 yellow)	.
When a random person chosen has a birthday in February	.
When a 7 of hearts is picked from a deck of cards	.

Next

For the LAST TIME, the next questions are about the risk of you getting a stomach bug. A description of the scenario is on the table in front of you.

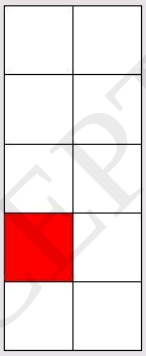




Next

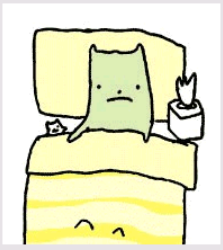
Risk WITHOUT pill 1 in 10

Risk WITH pill 0 in 10



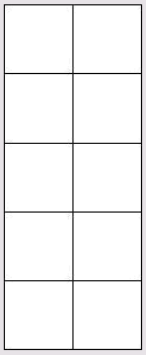
Imagine that you have a risk of getting the stomach bug of 1 in 10.

Click on the buttons on the left to see your new risk if you buy a pill.



Risk WITHOUT pill 1 in 10

Risk WITH pill 0 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the pill that reduces your risk today from 1 in 10 to 0 in 10.

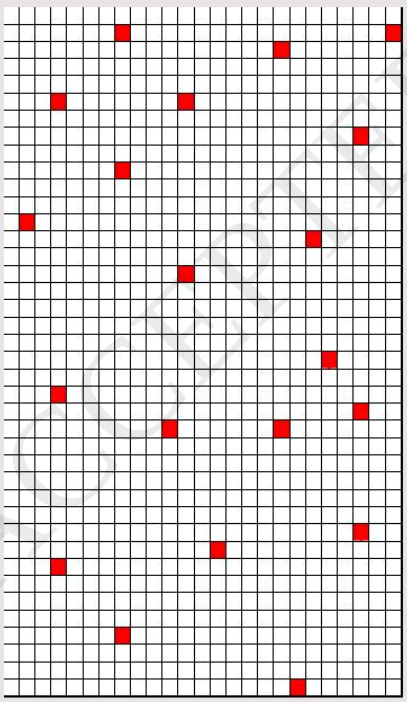
£0.00

Up Down

Next

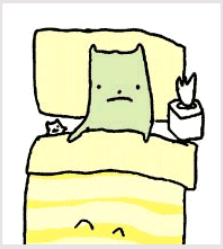
Risk WITHOUT pill 20 in 1,000

Risk WITH pill 0 in 1,000



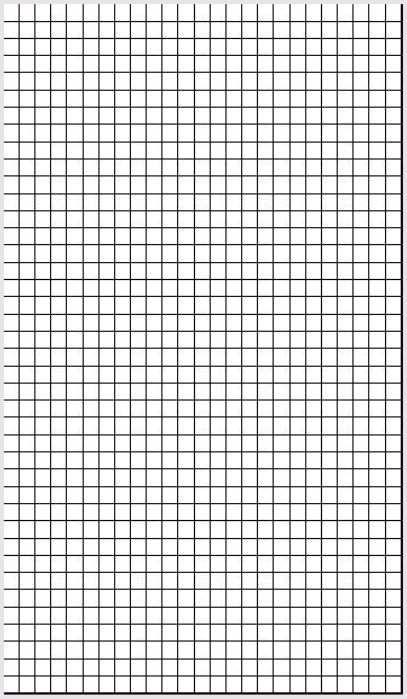
Now imagine that you have a risk of getting the stomach bug of 20 in 1,000.

Click on the buttons on the left to see your new risk if you buy a pill.



Risk WITHOUT pill
20 in 1,000

Risk WITH pill
0 in 1,000



In the bid box below, put the maximum amount you'd be willing to pay for the pill that reduces your risk today from 20 in 1,000 to 0 in 1,000.

£0.00

Up Down

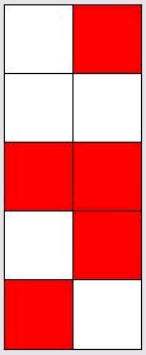
Next

FINALLY, I want to go back to the risk of you having £75 stolen. A description of the scenario is on the table in front of you.

Next

Risk WITHOUT security device 5 in 10

Risk WITH security device 3 in 10

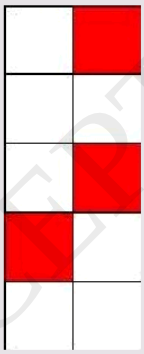


You have a risk of having your £75 stolen of 5 in 10.

Click on the buttons on the left to see your new risk if you buy a security device.

Risk WITHOUT security device 5 in 10

Risk WITH security device 3 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the security device that reduces your risk from 5 in 10 to 3 in 10.

Bid box

£0.00

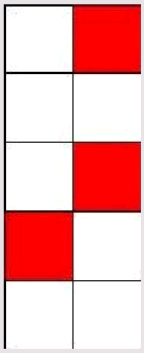
Up

Down

Next

Risk WITHOUT security device 3 in 10

Risk WITH security device 0 in 10

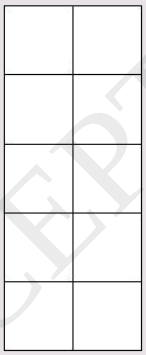


Now imagine that you have a risk of having your £75 stolen of 3 in 10.

Click on the buttons on the left to see your new risk if you buy a security device.

Risk WITHOUT security device 3 in 10

Risk WITH security device 0 in 10



In the bid box below, put the maximum amount you'd be willing to pay for the security device that reduces your risk from 3 in 10 to 0 in 10.

Bid box

£0.00

Up

Down

Next

That's the last of the questions.

Please put your hand up to indicate to the person running the session that you've finished the survey. The next part is where you will get paid and also get the chance to win an extra £10.

Thank you very much for your help.

Please only continue when told to do so

Which option do you want to choose?

- (•) I want to buy a lottery ticket for the box of 1,000 square cards
- ( ) I want to buy a lottery ticket for the box of 10 square cards
- ( ) I don't want to buy a lottery ticket

END

End of the survey

Appendix 2: The eight treatments of the first field survey

Version 1	**Version 2**	**Version 3**	**Version 4**
Chaining Method	**Chaining Method**	**Chaining Method**	**Chaining Method**
1. WTP to prevent ill-health X to parent	1. WTP ill-health Y to parent	1. WTP ill-health X to child	1. WTP ill-health Y to child
2. MSG linking X to death for parent	2. MSG Y for parent	2. MSG X for child	2. MSG Y for child
3. WTP to prevent ill-health Y to child	3. WTP ill-health X to child	3. WTP ill-health Y to parent	3. WTP ill-health X to parent
4. MSG linking Y to death for child	4. MSG X for child	4. MSG gamble Y for parent	4. MSG X for parent
Direct WTP 10 year risk	**Direct WTP 10 year risk**	**Direct WTP 10 year risk**	**Direct WTP 10 year risk**
5. WTP to reduce mortality risk by 5/1000 for parent	5. WTP 5/1000 parent	5. WTP 5/1000 child	5. WTP 5/1000 child
6. WTP to reduce mortality risk by 1/1000 for parent	6. WTP 1/1000 parent	6. WTP 1/1000 child	6. WTP 1/1000 child
7. WTP to reduce mortality risk by 5/1000 for child	7. WTP 5/1000 child	7. WTP 5/1000 parent	7. WTP 5/1000 parent
8. WTP to reduce mortality risk by 1/1000 for child	8. WTP 1/1000 child	8. WTP 1/1000 parent	8. WTP 1/1000 parent
Version 5	**Version 6**	**Version 7**	**Version 8**
Chaining Method	**Chaining Method**	**Chaining Method**	**Chaining Method**
1. WTP ill-health X to parent	1. WTP ill-health Y to parent	1. WTP ill-health X to child	1. WTP ill-health Y to child
2. MSG X for parent	2. MSG Y for parent	2. MSG X for child	2. MSG Y for child
3. WTP ill-health Y to child	3. WTP ill-health X to child	3. WTP ill-health Y to parent	3. WTP ill-health X to parent
4. MSG Y for child	4. MSG X for child	4. MSG gamble Y for parent	4. MSG X for parent
Direct WTP 10 year risk	**Direct WTP 10 year risk**	**Direct WTP 10 year risk**	**Direct WTP 10 year risk**
5. WTP 1/1000 parent	5. WTP 1/1000 parent	5. WTP 1/1000 child	5. WTP 1/1000 child
6. WTP 5/1000 parent	6. WTP 5/1000 parent	6. WTP 5/1000 child	6. WTP 5/1000 child
7. WTP 1/1000 child	7. WTP 1/1000 child	7. WTP 1/1000 parent	7. WTP 1/1000 parent
8. WTP 5/1000 child	8. WTP 5/1000 child	8. WTP 5/1000 parent	8. WTP 5/1000 parent

Appendix 3: Complete questionnaire used in Field Study 1

INTERVIEWER INSTRUCTIONS

- Statements and questions appearing in **bold** are to be read out to the respondent.
- Instructions and comments for interviewers are given [CAPITALS].
- Ensure that any showcards not in use are set aside.
- Please write all comments in BLOCK CAPITALS.
- If the respondent wants to go back to change answers please cross through original and circle revised answer and mark REV.

0.1

INTERVIEWER ID	XXXXXX
DATE	XXXXXX
RESPONDENT ID	XXXXXX
TELEPHONE NUMBER	XXXXXX
START TIME	XXXXXX
FINISH TIME	XXXXXX

INTRODUCTION

Before we start, I'd just like to give you some general background to the study and the interview we're about to do. This study is about safety and health risks. While most of us would want to reduce our risks of illness or premature death by as much as possible, money spent on these things means there is less money to spend on other "good" things. So, there is a need to strike a balance between what members of the public like ourselves want to see spent on safety and what we want to see spent on other "good" things. This study aims to try and find out how people value reductions in injuries to themselves in relation to other "good things".

It is almost certain that different people will have different opinions about the injuries and that people's lifestyles would be affected in different ways. Therefore, there is no one "correct" answer. I'm only interested in your opinion.

The survey will take approximately 45 minutes to complete. I would like to reassure you that your answers will of course be treated in complete confidence and will be used solely as part of this research.

To start, can you tell me a little about the people who live in your household, including yourself?

[COMPLETE TABLE BELOW]
0.2

	Name/Identifier	**Relationship (i.e. wife, son, etc.)**	**Occupation**	**Gender (M/F)**	**Age**
1	XXX	*The respondent*	XXX	XXX	XXX
2	XXX	XXX	XXX	XXX	XXX
3	XXX	XXX	XXX	XXX	XXX
4	XXX	XXX	XXX	XXX	XXX
5	XXX	XXX	XXX	XXX	XXX
6	XXX	XXX	XXX	XXX	XXX

SECTION 1

1.1 In the next couple of sections we're interested in what people think about various types of injuries. For now, I'd like you to concentrate on injuries that may arise from road accidents.

1.2 For the purpose of this exercise please imagine you had just had a road accident where you suffered an injury. Please assume that the road accident involved no one else and it was nobody's fault; it was a pure accident.

Injuries from road accidents can vary a great deal so I'd like you to consider these three particular injuries described on these cards. Each card describes a particular injury that might result from such an accident. At the moment they are in no particular order.

[HAND RESPONDENT INJURY CARDS X, Y, Z]

What I'd like you to do is to take a few moments to read through the cards. Then sort them into order on the table in front of you with the one you would find most bearable at the top to the one you would least like to experience at the bottom. If you think any of these are equally as bad, you can place them along side each other.

When you're considering how severe an injury is I don't want you to worry about the impact an injury might have on your income. If you're employed assume that an insurance scheme would cover any loss of income whilst on sick leave.

[RECORD RESPONDENTS RANKING RESULTS]

INJURY CARD	RANKING (1 TO 3) 1=least severe, 3=most severe
X	XXX
Y	XXX
Z	XXX

In the next question we're only interested in Injury X.

SECTION 2

[REMOVE INJURY CARDS Y and Z]

2.1 So in this question I want you to consider how much it would be worth to you to avoid the hospitalization, restriction to activities, pain, and the permanent injury associated with injury X.

2.2 To give us an idea of the value to you of a quick recovery, I want you to suppose that an alternative treatment was possible which would return you to your normal health within 3-4 days. Please imagine that this treatment did not happen to be available on the NHS nor would it be covered by private health insurance. Therefore the only way to obtain this alternative treatment would be to pay for it yourself. You may feel that a quick recovery is worth only a very little or even nothing. Then again, you may feel it is worth quite a lot. I don't want you to try to guess the "cost" of the treatment; I really want you to focus on how much it would be worth to you in terms of your welfare.

2.3 Do you think your household would be willing to pay something, however large or small, to avoid you experiencing the consequences of Injury X?

[IF "YES", CONTINUE TO 2.5. IF "NO", GO TO 2.4]

2.4 What is your main reason for not wanting to pay something?

[INSERT REASON]_____XXXXXXXXXX_____

[IF CONCERNED ABOUT NHS OR SIMILAR EXPLAIN THAT SURVEY IS NOT RELATED TO NHS IN ANYWAY. IF CONCERNED THAT WOULD BE TOO MUCH REASSURE THAT IT MAY ONLY BE A VERY SMALL AMOUNT. IF WTP = 0 GO TO SECTION 3]

2.5 Since you would consider paying something, I would like you to give me your best estimate of the largest amount of money that you think your household would be willing to pay for you to not have Injury X. By the largest amount of money you'd be willing to pay I mean the amount which, if any higher, would make you prefer to suffer injury X.

To help you work out your answer to this question, because it's not something people normally think about, I have here a set of cards with some money amounts on. There are a wide range of numbers (from £1 to £1,000,000) since we are not sure what people think.

2.6 So, to help you answer the question, I'll just explain what to do.

[PLACE WTP TEMPLATE IN FRONT OF RESPONDENT; ONLY GIVE MONEY CARDS AFTER INSTRUCTIONS HAVE BEEN READ OUT]

In this top box you should place all the cards showing amounts of money you think it would definitely be worth to you to return to your normal health quickly rather than suffer the consequences of Injury X.

[POINT TO "DEFINITELY WOULD PAY" BOX ON SHOWCARD]

Place all the cards showing amounts of money that would definitely not be worth it to you to pay to return to your normal health quickly, preferring instead to put up with the consequences of the injury, in this box.

[POINT TO "DEFINITELY WOULD NOT PAY" BOX ON SHOWCARD]

Any cards showing amounts that you are initially unsure about whether or not you would pay can be placed in this middle "Unsure" box.

[POINT TO "UNSURE" BOX ON SHOWCARD]

[SHOW RESPONDENT ALL MONEY CARDS. SHUFFLE AND GIVE TO RESPONDENT.]

When answering the question, please bear in mind:

- **You could pay for example out of current income/savings/investment or take out a loan.**

- **But whatever you pay or borrow to get better quickly will reduce the amount of money available to you to spend on other things, such as bills, holidays, and other things.**

[RESPONDENT SORTS CARDS]

[RECORD LOWEST AND HIGHEST AMOUNT IN "UNSURE" BOX]

LOWEST AMOUNT £	HIGHEST AMOUNT £
XXXXXX	XXXXXX

2.7 So, the cards were just meant to help you think about your answer. Now you've sorted the cards and keeping your income in mind, could you tell me the largest amount that you think the household would definitely pay? So, it might be an amount on one of the cards, or it might not.

[ENCOURAGE RESPONDENT TO VERBALISE/INDICATE THEIR HOUSEHOLD'S OWN WTP. COMPLETE TABLE BELOW]

RESPONDENTS BEST ESTIMATE OF THE LARGEST WTP TO RETURN TO NORMAL HEALTH QUICKLY, RATHER THAN SUFFER INJURY X	£ XXXXXX

SECTION 3

[REMOVE INJURY CARD, MONEY CARDS, AND TEMPLATE]

3.1 In this next section, we are no longer interested in money. Instead we are interested in what you feel about risk; which in one way or another is part of all our day-to-day lives.

In the following questions, we'll be asking you to think about how much extra risk you might be willing to take on for hospital treatments that have certain benefits.

3.2 So, once again please suppose that you were injured in a road accident, involving only yourself, and were taken to hospital. The doctors tell you that, due to the nature of the injury you have sustained, if you were *not* treated you would *certainly die*. However, they also tell you that you can choose between two treatments - this time both are available free of charge. Of course, as with any reasonably serious hospital treatment both carry a risk of failure. I'll say more about this in a moment. From your point of view, you will not notice much difference between the treatments when you undergo them, so we are not asking you to choose between them on those grounds.

[SHOW RESPONDENT TREATMENT CARD 'A' AND 'B'.]

3.3 The two treatments are shown on these cards. We've called them Treatment A and Treatment B. I'll say something about the failed outcome first, because it's the same in both treatments. If the treatment fails, either for A or B, then you'll fall unconscious and will die shortly afterwards.

3.4 However, each treatment has a different successful outcome.

If Treatment A were to be successful you would experience the consequences shown on Treatment card A.

[POINT TO SUCCESSFUL OUTCOME ON TREATMENT CARD A AND READ THROUGH]

In contrast, if Treatment B were to be successful you would return to your normal health in 3-4 days.

[POINT TO SUCCESSFUL OUTCOME ON TREATMENT CARD B AND READ THROUGH]

3.5 So, first of all, I want you to think about how you would choose between the treatments if the chance of the failed outcome were the same in both. Which treatment do you think you would choose if the chance of the failed outcome was exactly the same for both Treatment A and Treatment B?

[ALLOW RESPONDENT TO INDICATE CHOICE EITHER VERBALLY OR BY POINTING. IF THEY ARE UNWILLING TO CHOOSE EITHER OR INDIFFERENT BETWEEN THE TWO PROBE FURTHER AND REMIND IF NECESSARY THAT IF NOT TREATED THEY WILL CERTAINLY DIE/FAILED OUTCOME IS THE SAME IN BOTH TREATMENTS.]

[IF THE RESPONDENT CHOOSES TREATMENT A PROBE FURTHER TO TRY AND IDENTIFY WHERE EXTRA CLARIFICATION OF THE SCENARIO MAY BE NEEDED.]

[IF THE RESPONDENT CHOOSES TREATMENT B ALSO PROBE TO SATISFY RESPONDENT HAS UNDERSTOOD AND THEN CONTINUE BELOW]

3.6 OK, we have just considered the two treatments when the chances of a failed outcome were the same. Now I want you to think about now is how you would choose between the treatments if the chances were not the same.

Different treatments have different chances of failure. Some may be very high while others may be very low. Taking Treatment A first, I want you to assume in this question that it has a chance of failing of 1 in 1,000 as shown on this risk-card. There are 1,000 squares. 999 are white and one is red. So out of every 1,000 Treatment As undertaken, 999 people would have the successful outcome and [POINT TO SUCCESSFUL OUTCOME ON TREATMENT A] **and one would have the unsuccessful outcome** [POINT TO SUCCESSFUL OUTCOME ON TREATMENT A]**.**

[PLACE GRID WITH 1/1,000 RISK UNDER TREATMENT A]

Now let's think about Treatment B and imagine that it might have a higher chance of the failed outcome. What we want to try and find out is your best estimate of the highest chance of failure you would accept for Treatment B. To help you think about this we'll use some cards again.

[SHOW RESPONDENT RISK CARDS AND SHUFFLE THEM. TAKE TOP CARD FROM PILE. PLACE RISK SORTER TEMPLATE ON TABLE]

Each of the cards shows a different risk of failure for treatment B. For each one, please decide whether or not you would choose Treatment B over Treatment A, bearing in mind that the chance of failure for Treatment A remains at 1 in 1000. As usual, please sort the cards into three piles.

[GIVE RESPONDENT SORTING SHOWCARD]

[IF NECESSARY GO THROUGH SORTING PROCEDURE AGAIN AS FOLLOWS]

Place all the cards showing chances of failure of Treatment B where you would be prepared to take that risk under this heading at the top of the SHOWCARD. This means you would definitely choose Treatment B rather than Treatment A.

[POINT TO "WOULD DEFINITELY CHOOSE B (RATHER THAN A)" HEADING ON TEMPLATE]

Then place all the cards where you would not be prepared to take that risk and would definitely not choose Treatment B under this heading at the bottom. This of course means you would choose Treatment A instead.

[POINT TO "WOULD DEFINITELY NOT CHOOSE B (RATHER THAN A)" HEADING ON TEMPLATE]

Any cards you are unsure about whether or not you would take that risk for Treatment B can be placed under this middle "Unsure" heading.

[POINT TO "UNSURE" HEADING ON TEMPLATE]

[RESPONDENT COMPLETES SORTING TASK]

3.7 [RECORD LOWEST AND HIGHEST RISK IN "UNSURE" BOX]

LOWEST RISK	HIGHEST RISK
XXXXXXXX	XXXXXXXX

[IF THE RESPONDENT IS WILLING TO TAKE EXTRA CHANCES FOR TREATMENT B GO TO 3.9.]

[IF RESPONDENT IS UNWILLING TO TAKE EXTRA CHANCES GO TO 3.8.]

3.8 To find out if there is a chance of failure somewhere between 1 in 1,000 and 2 in 1,000 that you would accept for Treatment B, please consider the following.

[SHOW RESPONDENT SHOWCARD 3]

A 1 in 1,000 chance is the same as saying 10 in 10,000 and 2 in 1,000 is the same as 20 in 10,000. All the chances between 10 in 10,000 and 20 in 10,000 are shown in the list. Would you be willing to take any of these risks for Treatment B - bearing in mind the chance of failure is 10 in 10,000 for Treatment A? If so, can you tell me the highest chance of failure you would accept for Treatment B.

WOULD CHOOSE B 10 in 10,000 (*1 in 1000*)

(RATHER THAN A)	11 in 10,000 12 in 10,000 13 in 10,000 14 in 10,000 15 in 10,000 16 in 10,000 18 in 10,000 19 in 10,000
WOULD NOT CHOOSE B (CHOOSE A INSTEAD)	20 in 10,000 (*2 in 1000*)

[RECORD RESPONSE HERE. IF NOT WILLING TO TAKE ON EXTRA RISK RECORD 1/1,000 RESPONSE. JUMP TO SECTION 4.]

RESPONDENTS BEST ESTIMATE OF HIGHEST RISK OF FAILURE ACCCEPTED FOR TREATMENT B	XXXXXX

3.9 So looking at the cards you have placed in the different boxes, if the chance of failure is 1 in 1,000 for Treatment A, think for a moment and when you are ready, tell me your best estimate of the highest chance of failure you would accept for Treatment B. This may or may not be a risk shown on one of the cards.

[ENCOURAGE RESPONDENT TO VERBALISE/INDICATE THEIR OWN MAXIMUM RISK. COMPLETE TABLE BELOW]

RESPONDENTS BEST ESTIMATE OF HIGHEST RISK OF FAILURE ACCCEPTED FOR TREATMENT B	XXXXXXX

SECTION 4

[CLEAR AWAY RISK and TREATMENT CARDS AND TEMPLATE]

4.1 Now I want to go back to the ranking exercise you did at the beginning of the survey but now I want you to imagine that the injury is to another member of your family who I'll pick at random. The ID number on this survey indicates we will focus on a child under 16 in your family.

[IF RESPONDENT HAS ONE CHILD GO TO 4.2. IF HAS MORE THAN ONE CHILD GO TO 4.3].

4.2 As there is only one child in your family that means the following questions will focus on [INSERT NAME]. [GO TO 4.4]

[RECORD SAMPLE CHILD'S NAME AS IN TABLE 1]

XXXXXXXX

4.3 To pick a child at random can you tell me which of your children has their birthday next?

[RECORD SAMPLE CHILD'S NAME AS IN TABLE 1]

XXXXXXXX

The following questions will focus on [INSERT NAME].

4.4 OK, so here are the injuries that you ranked earlier, only this time they are written to be applicable to a child.

[GIVE RESPONDENT INJURY CARDS, W, X, Y, Z.]

As before I'd like you to take a few moments to read through the cards again and this time think about how severe it would be for your child to suffer each of the injuries. Then sort them into order on the table from the one you regard as THE LEAST SEVERE for [INSERT NAME] **at the TOP, to the one you regard as THE MOST SEVERE - that is the one you think would be worst for your child to suffer - at THE BOTTOM.**

[ENCOURAGE RESPONDENT TO SAY SOMETHING ABOUT THEIR RANKING. RECORD RESPONDENTS CHOICES IN TABLE BELOW]

INJURY CARD	RANKING (1 TO 3) 1=least severe, 3=most severe
X	XXXXXX
Y	XXXXXX
Z	XXXXXX

[REMOVE INJURY CARDS EXCEPT INJURY Y]

4.5 Now suppose that [INSERT NAME] **has been involved in a road accident that affected only [**HIMSELF/HERSELF] **and has resulted in Injury Y**

[POINT TO INJURY CARD Y ON TABLE AND READ]

In this question we would like to find out how much your household would value the opportunity for [INSERT NAME] **to get better very quickly to avoid Injury Y. Imagine that there was an alternative treatment which would return** [INSERT NAME] **to** [HIS/HER] **normal health within 3-4 days and would avoid the permanent injury.**

4.6 Do you think your household would be willing to pay something, however large or small, to avoid the consequences of [INSERT NAME] **having Injury Y?**

[IF "YES", CONTINUE TO 4.8. IF "NO", GO TO 4.7]

4.7 What is your main reason for that?

[RECORD REASON]____ XXXXXX_____

[GO TO SECTION 5]

4.8 Seeing as your household would be willing to pay something I'd like you think about the maximum your household would be willing to pay. So, we'll use the same cards as before… So, bearing in mind what your household could afford and that money spent on this could then not be spent on other things, could you sort the cards as before into piles of amounts you're household would definitely pay, definitely wouldn't and those that you're unsure about.

[SHUFFLE MONEY CARDS AND GIVE TO RESPONDENT ALONG WITH WTP SORTER TEMPLATE]

[RESPONDENT COMPLETES SORTING TASK]

[RECORD LOWEST AND HIGHEST AMOUNT IN "UNSURE" BOX]

LOWEST AMOUNT £	HIGHEST AMOUNT £
XXXXXX	XXXXXX

4.9 As before the cards are only meant to help you think about your answer. Now you've sorted them could you tell me the maximum amount that you think your household would definitely pay for [INSERT NAME] **to return to normal health quickly, rather than suffer Injury Y. So, the largest amount that you would put in this pile.** [POINT TO WOULD DEFINITELY PAY BOX]. **This might be an amount on one of the cards, or may not be.**

RESPONDENTS BEST ESTIMATE OF THE LARGEST AMOUNT THEY WOULD PAY	£ XXXXXX

SECTION 5

[CLEAR AWAY INJURY CARD, MONEY CARDS AND TEMPLATE]

5.1 So, in this next question we're no longer interested in money, but how you feel about risk. For the purpose of this question I want you to assume that [INSERT NAME] **has been injured in a road accident, involving only** [HIMSELF OR HERSELF]**, and has been taken to hospital. The doctors tell you that, due to the nature of the injury** [INSERT NAME] **has sustained, if** [HE/SHE] **is not treated** [HE/SHE] **will certainly die. However, they also tell you that you can choose between two treatments –both free—however, as with any reasonably serious hospital treatment both of these treatments carry a risk of failure.**

[SHOW RESPONDENT TREATMENT CARD E AND F]

5.2 The two treatments are shown on these cards. We've called them Treatment E and F. As before the failed outcome is the same in both. So, if either treatment failed then your child would fall unconscious and die shortly afterwards.

However, each treatment has a different successful outcome.

If Treatment E were to be successful your child [INSERT SAMPLE CHILD NAME] **would experience these consequences.**

[POINT TO SUCCESSFUL OUTCOME ON TREATMENT CARD E AND READ ALOUD.]

In contrast, if Treatment F were to be successful your child [INSERT SAMPLE CHILD NAME] **would return to [**HIS/HER] **normal health in 3-4 days.**

[POINT TO SUCCESSFUL OUTCOME ON TREATMENT CARD F AND READ ALOUD.]

5.3 I want you to assume that the chance of the failed outcome for Treatment E is 1 in 1,000, shown on this risk-card. What I want you to think about is the highest risk you would accept for Treatment F.

These cards, which I want you to sort in a moment, show chances of failure for Treatment F.

[SHUFFLE THE TREATMENT RISK CARDS]

[TAKE TOP RISK CARD FROM PILE]

5.4 [DESCRIBE CARD AND PROCEDURE IF NECESSARY]

5.5 For each one, please decide whether or not you would choose for your child to have Treatment F over Treatment E. Remember that the chance of failure for Treatment E remains in all cases as 1 in 1,000.

[PLACE RISK SORTING TEMPLATE ONTO TABLE]

As before, please sort the cards into the three piles.

[RESPONDENT COMPLETES SORTING TASK]

[RECORD LOWEST AND HIGHEST RISK IN "UNSURE" BOX]

LOWEST RISK	HIGHEST RISK
XXXXXX	XXXXXX

[IF RESPONDENT IS WILLING TO TAKE EXTRA CHANCES FOR TREATMENT F JUMP TO 5.7]

[IF RESPONDENT IS UNWILLING TO TAKE EXTRA CHANCES FOR TREATMENT F GO TO 5.6.]

5.6 To find out if there is a chance of failure somewhere between 1 in 1,000 and 2 in 1,000 that you would accept for Treatment F, please consider the following.

[GIVE RESPONDENT SHOWCARD 4]

A 1 in 1,000 chance is the same as saying 10 in 10,000 and 2 in 1,000 is the same as 20 in 10,000. All the chances between 10 in 10,000 and 20 in 10,000 are shown in the list below. Would you be willing to take any of these risks for Treatment F - bearing in mind the chance of failure is 10 in 10,000 for Treatment E? If so, can you tell me the highest chance of failure you would accept for Treatment F.

WOULD CHOOSE F (RATHER THAN E)	10 in 10,000 (*1 in 1,000*)
	11 in 10,000
	12 in 10,000
	13 in 10,000
	14 in 10,000
	15 in 10,000
	16 in 10,000
	18 in 10,000
	19 in 10,000
WOULD NOT CHOOSE F (CHOOSE E INSTEAD)	20 in 10,000 (*2 in 1,000*)

[RECORD RESPONSE BELOW AND JUMP TO SECTION 6. IF RESPONDENT UNWILLING TO TAKE 11 IN 10,000 RECORD A 1/1,000 RESPONSE]

RESPONDENTS BEST ESTIMATE OF HIGHEST RISK OF FAILURE ACCCEPTED FOR TREATMENT F	XXXXXX

5.7 So, as before the cards are only to help you think about your answer. Now you've sorted the cards, can you tell me your best estimate of the highest risk that you'd accept for Treatment F. So this might be a risk on one of the cards, or it could be another risk.

RESPONDENTS BEST ESTIMATE OF HIGHEST RISK OF FAILURE ACCCEPTED FOR TREATMENT F	XXXXXX

SECTION 6

[CLEAR AWAY RISK CARDS, TEMPLATE, and TREATMENT CARDS]

6.1 In this section, I want you to go back to thinking about risks to yourself. This time, however, not only risks from traffic accidents, but all risks. Of course at all ages we face health risks including risks that can kill us. Usually we aim to reduce these risks as much as possible but it is not always possible to eliminate them completely.

6.2 [SEE TABLE BELOW FOR APPROPRIATE RISK CARD FOR RESPONDENT'S AGE GROUP. PASS CARD TO RESPONDENT]

Risk Charts for different ages

Age	Risk
0-5	16
6-10	18
11-16	22
17-25	31
26-35	41
36-45	57
46-55	78
56-65	158
65 +	250

[HAND RESPONDENT SHOWCARD 5.]

This card shows the average risk of dying from all causes in the next 10 years for a someone in your age group. This is the risk of you dying from now or any time in the next 10 years. So, the risk means you could die today, in 1 year, 3 years, 5 or 7 years for example.

The card shows a [N in 1,000] **chance of dying. This means that out of every 1,000 people your age** [1000-N] **would still be alive 10 years from now and** [N] **people out of the 1,000 would die.**

[HAND RESPONDENT SPECIFIC RISK CARD]

Some of the leading causes of death in your age group for the average person are shown on this card. So, for example out of 1,000 people in your age group on average [N] would die in the next 10 years from cancer. So, the average risk is shown on this card as [N in 1,000]. The leading types of cancer are shown here [POINT TO TEXT UNDER TABLE].

Going back to the risk of dying from everything, this card shows the risk for the average person [POINT TO RISK CARD]. **You may think that you're risk is the same, higher or lower than the average.**

Do you think your risk is the same, higher, or lower than the average?

[RECORD ANSWER]

6.3 In this next question I want you to imagine that there was a product, like a magic wand type thing, that you could buy which would reduce your risk of dying by 5/1,000. For the average person, this risk reduction is shown on this card. [SHOW AND POINT TO RISK CARD 6]**. The product has no other benefit or side effects except reducing your risk of dying. The product is not available on the NHS nor is it covered by health insurance.**

[IF RESPONDENT THINKS THEIR RISK IS DIFFERENT THEN READ THE FOLLOWING] **Even if you think that your risk is different from the average it would reduce everyone's risk by 5/1,000 so it will also reduce your baseline risk by 5/1,000.**

6.4 Do you think your household would be willing to pay something every year for 10 years, however large or small, for this product which would reduce your risk of dying in the next 10 years by 5/1,000?

[IF "YES", CONTINUE TO 6.6. IF "NO", GO TO 6.5.]

[GO TO SECTION 7]

6.5 What is your main reason for not being to willing to pay something?

[INSERT REASON]____XXXXXXXX_____

[GO TO SECTION 8]

6.6 I want you to imagine that to work, the product would have to be bought and used once a year every year for the next 10 years. I want you to think about the maximum amount your household would be willing to pay for this produce once a year, every year for the next ten years. We'll use this set of money cards to arrive at your best estimate of the largest amount that your household would pay to reduce your overall risk of dying by 5/1,000 over the next 10 years. Once again, please sort these cards into piles of amounts that you feel your household would definitely be willing to pay and definitely not be willing to pay and those which you are unsure about. Please remember that it's a once a year payment, every year for 10 years.

[GIVE RESPONDENT MONEY CARDS AND WTP SORTING TEMPLATE. RESPONDENT COMPLETES SORTING TASK]

[RECORD LOWEST AND HIGHEST AMOUNT IN "UNSURE" BOX]

LOWEST AMOUNT £	HIGHEST AMOUNT £
XXXXXXXX	XXXXXXXX

6.7 Again, looking at the cards you have placed in the different boxes, could you tell me your best estimate of the largest amount that your household would be willing to pay once a year for the next 10 years to reduce your risk of dying in the next 10 years by 5/1,000?

[ENCOURAGE RESPONDENT TO VERBALISE/INDICATE TO THEIR OWN WTP. COMPLETE TABLE BELOW]

RESPONDENTS BEST ESTIMATE OF THE LARGEST AMOUNT WOULD PAY TO REDUCE RISK BY 5/1,000	£ XXXXXXX

SECTION 7

7.1 Now I want you to imagine, that product P is not actually available. However, another product is available, Product Q. If bought, product Q would reduce your risk of dying by 1/1,000. This is shown on this card.

[SHOW RESPONDENT CARD 7.]

It reduces everyone's risk by 1/1,000 so it will also reduce your baseline risk by 1/1,000 even if your baseline risk is different from the average.

7.2 Once again the product has to be bought and used once a year for the next 10 years to be effective. Do you think you would be willing to pay something every year, however large or small, for this product which would reduce your risk of dying in the next 10 years by 1/1,000?

[IF "YES", CONTINUE TO 7.4. IF "NO", GO TO 7.3]

7.3 What is your main reason for not wanting to pay something?

[INSERT REASON]_____XXXXXXXX_____

[GO TO SECTION 8]

7.4 We'll use this set of money cards to arrive at your best estimate of the largest amount that your household would pay to reduce your overall risk of dying by 1/1,000 over the next 10 years. Once again, please sort these cards into piles of amounts that you feel your household would definitely be willing to pay and definitely not be willing to pay and those which you are unsure about.

[SHUFFLE AND GIVE RESPONDENT MONEY CARDS AND WTP SORTING TEMPLATE. RESPONDENT COMPLETES SORTING TASK]

[RECORD LOWEST AND HIGHEST AMOUNT IN "UNSURE" BOX]

LOWEST AMOUNT £	HIGHEST AMOUNT £
XXXXXXX	XXXXXXX

7.5 Again, looking at the cards you have placed in the different boxes, could you tell me your best estimate of the largest amount that your household would be willing to pay to reduce your risk of dying in the next 10 years by 1/1,000?

[ENCOURAGE RESPONDENT TO VERBALISE/INDICATE TO THEIR OWN WTP. COMPLETE TABLE BELOW]

RESPONDENTS BEST ESTIMATE OF THE LARGEST WTP	£ XXXXXXXX

SECTION 8

8.1 In this section, I now want you to think about all risks that your child, [INSERT NAME] **faces.**

8.2 [SEE TABLE BELOW FOR APPROPRIATE RISK CARD FOR CHILD'S AGE GROUP. PASS CARD TO RESPONDENT]

Risk Charts for different ages

Age	Risk
0-5	16
6-10	18
11-16	22
17-25	31
26-35	41
36-45	57
46-55	78
56-65	158
65 +	250

Unfortunately children also face risks of illnesses and accidents. This card shows the overall risk of dying in the next 10 years for a child in [INSERT NAME]**'s age group. This is the risk of your child dying from now or any time in the next 10 years.**

The card shows a [N in 1,000] **chance of dying. This means that out of every 1,000 children** [INSERT NAME]**'s age,** [1000-N] **would still be alive 10 years from now and** [N] **children out of the 1,000 would die.**

This card shows the leading causes of mortality for children in [INSERT NAME]**'s age group.** [SHOW CARD WITH SPECIFIC RISKS]. **So, you can see that the average risk of dying from cancer for example is [N in 1,000]. So, that means that out of every 1,000 children in** [INSERT NAME]**'s age group,** [N] **would die from cancer in the next 10 years. Leading types of cancer are shown here** [POINT TO TEXT]**. The other leading causes are shown on the other grids.**

Looking back at the overall risk, this is the average risk, so you might think that [INSERT NAME]**'s overall risk is the same, higher, or lower than this.**

Do you think [INSERT NAME]**'s risk is the same, higher, or lower than this?**

[RECORD ANSWER]

8.3 Imagine that there was a product, Product K, that your household could buy which would reduce [INSERT NAME]**'s risk of dying in the next 10 years by 5/1,000. As with the products we talked about before for you, it would have to be**

bought and used once a year for the next 10 years to be effective. So, for the average child this is shown on this card. [SHOW AND POINT TO CARD 13]**. Even if your child's risk is different from the average it will reduce** [HIS/HER] **risk by 5/1,000. The product has no other benefit except reducing** [INSERT NAME]**'s risk of dying.**

The product is not available on the NHS nor is it covered by health insurance.

8.4 Do you think your household would be willing to pay something once a year for the next 10 years, however large or small, for this product which would reduce [INSERT NAME]**'s risk of dying in the next 10 years by 5/1,000?**

[IF "YES", CONTINUE TO 8.6. IF "NO", GO TO 8.5]

8.5 What is your main reason for not wanting to pay something?

[INSERT REASON]_____XXXXXXXX_____

[GO TO SECTION 9]

8.6 We'll use this set of money cards to arrive at your best estimate of the largest amount that your household would pay to reduce [INSERT NAME]**'s overall risk of dying by 5/1,000 over the next 10 years. Once again, please sort these cards into piles of amounts that you feel your household would definitely be willing to pay and definitely not be willing to pay and those which you are unsure about.**

[GIVE RESPONDENT MONEY CARDS AND SORTING TEMPLATE. RESPONDENT COMPLETES SORTING TASK]

[RECORD LOWEST AND HIGHEST AMOUNT IN "UNSURE" BOX]

LOWEST AMOUNT £	HIGHEST AMOUNT £
XXXXXXX	XXXXXXX

8.7 Again, looking at the cards you have placed in the different boxes, could you tell me your best estimate of the largest amount that your household would be willing to pay to reduce [INSERT NAME]**'s risk of dying in the next 10 years by 5/1,000? It might be a number on a card, or it might not be.**

[ENCOURAGE RESPONDENT TO VERBALISE/INDICATE TO THEIR OWN WTP. COMPLETE TABLE BELOW]

RESPONDENTS BEST ESTIMATE OF THE LARGEST AMOUNT WOULD PAY TO REDUCE CHILD'S RISK BY 5/1,000	£ XXXXXX

SECTION 9

9.1 Now I want you to imagine, that instead of product K another product is available. We'll call it Product C. If bought, product C would reduce [INSERT NAME]**'s risk of dying over the next 10 years by 1/1,000. For the average child this is shown on this card. Once again, even if your child's baseline risk is not the same as the average, the product will reduce** [HIS/HER] **risk by 1/1,000.**

[SHOW RESPONDENT RISK CARD 9.]

9.2 Once again to be effective the product would have to be bought and used once a year. Do you think you would be willing to pay something once a year for the next 10 years, however large or small, for this product which would reduce [INSERT NAME]**'s risk of dying in the next 10 years by 1/1,000?**

[IF "YES", CONTINUE TO 9.4. IF "NO", GO TO 9.3]

9.3 What is your main reason for not wanting to pay something?

[INSERT REASON]_____XXXXXXXX_____

[GO TO SECTION 10]

9.4 We'll use this set of money cards to arrive at your best estimate of the largest amount that your household would pay to reduce [INSERT NAME]**'s overall risk of dying in the next 10 years by 1/1,000. Once again, please sort these cards into piles of amounts that you feel your household would definitely be willing to pay and definitely not be willing to pay and those which you are unsure about.**

[GIVE RESPONDENT MONEY CARDS AND SORTING TEMPLATE. RESPONDENT COMPLETES SORTING TASK]

[RECORD LOWEST AND HIGHEST AMOUNT IN "UNSURE" BOX]

LOWEST AMOUNT £	HIGHEST AMOUNT £
XXXXXXX	XXXXXXX

9.5 Again, looking at the cards you have placed in the different boxes, could you tell me your best estimate of the largest amount that your household would be willing to pay to reduce [INSERT NAME]**'s risk of dying in the next 10 years by 1/1,000?**

[ENCOURAGE RESPONDENT TO VERBALISE/INDICATE TO THEIR HOUSEHOLD'S WTP. COMPLETE TABLE BELOW]

RESPONDENTS BEST ESTIMATE OF THE LARGEST AMOUNT WTP	£ XXXXXX

SECTION 10

10.1 Now I just want to ask you some follow up questions about the interview. This is so I can understand more about your answers and whether there are additional issues that I haven't thought about or included.

10.2 In this questionnaire, we used the concept of probability. How well do you feel you understand this concept on a scale of 1 to 5?

1 2 3 4 5

I do not understand it **I understand it very well**

10.3a Did you find the grids helpful when considering your answers?

1 2 3 4 5

Not at all helpful **Crucial to my understanding**

10.3b When answering the questions did you mostly rely on the grids or the numeric probability? Again on a scale of 1 to 5 where 1 is 'completely relied on numeric probabilities and 5 is completely relied on the grids. 3 is relied on both equally.

1 2 3 4 5

completely relied on numeric probabilities completely relied on the grids

10.4a When we showed the probability of dying over the next 10 years for a person like you, did you feel that this was...

❒ More or less what you had expected
❒ higher than you expected
❒ lower than you expected
❒ you had no idea what to expect

10.4b When we showed the probability of your child dying over the next 10 years, did you feel that this was...

❒ More or less what you had expected
❒ higher than you expected
❒ lower than you expected
❒ you had no idea what to expect

10.5 When you answered the question about your willingness to pay for the product that reduces your risk of dying I'm interested to know whether your answer was influenced by any doubts you had about the effectiveness of the product?…

1. yes
2. no
3. I did not think about it

10.6 When you were thinking of the product did anything specific come to mind or did the product remain abstract?

1. ❒ yes
2. ❒ No, it remained abstract

10.6b. (if yes) **What exactly?**
1. ❒ a medical exam
2. ❒ a medication
3. ❒ surgery (a surgical operation)
4. ❒ a dietary supplement
5. ❒ a change in my lifestyle and eating habits
6. ❒ other, please explain

10.7 So now thinking about all the willingness to pay questions, so the injury ones as well as the product ones,

…..Did you think about whether or not the household could afford the payment?

1. yes
2. No

10.8 When you answered the questions about your willingness to pay …
…did you consider your savings or loans, in addition to your income?

1. yes, I considered my savings or loans as well as my income
2. no, I just considered my income.

10.9 When we asked you about your willingness to pay to reduce your probability of dying over the next 10 years, did you understand that the payment would have to be made every year for the next 10 years?

1. yes
2. no

FINISH TIME:

Appendix 4: Resources used to assist with Field Study 1

Adult injury cards X and Y

Injury X

- In hospital for 3 weeks
- Severe restrictions to activities for first 4 months. For example, cannot do household chores easily. After 4 months can resume gentle activities although with some discomfort.
- Severe pain for 4 months then improving over time
- Permanent slight to moderate pain in hip. Unable to undertake high impact exercise.

Injury Y

- In hospital for 2 months
- Severe restrictions to activities for first 4 months. For example, cannot do household chores easily. After 4 months can resume gentle activities although with some discomfort.
- Moderate pain for 4 months then improving over time
- Permanent slight to moderate pain in knee. Unable to undertake high impact exercise.

Child injury cards X and Y

Injury X

- In hospital for 3 weeks
- Severe restrictions to activities for first 4 months. For example, cannot attend school. After 4 months can resume school although cannot play boisterous games. Improves over time.
- Severe pain for 4 months then improving over time
- Permanent slight to moderate pain in hip. Unable to undertake high impact exercise.

Injury Y

- In hospital for 2 months
- Severe restrictions to activities for first 4 months. For example, cannot attend school. After 4 months can resume school although cannot play boisterous games. Improves over time.
- Moderate pain for 4 months then improving over time
- Permanent slight to moderate pain in knee. Unable to undertake high impact exercise.

Money cards

£5	£10	£20	£50
£100	£250	£500	£1,500
£5,000	£10,000	£25,000	£50,000
£150,000	£500,000	£1,000,000	£1

Would definitely pay	Unsure	Definitely would not pay

Treatment A

Successful outcome

- In hospital for 3 weeks
- Severe restriction to activities for first 4 months.
- Severe pain for 4 months then improving over time.
- Permanent slight to moderate pain in hip. Unable to undertake high impact exercise.

Failed outcome

- Immediate unconsciousness
- Followed shortly by death

Treatment B

Successful outcome

- Leave hospital that day
- Very rapid recovery
- Full health in 3-4 days
- No permanent disability

Failed outcome

- Immediate unconsciousness
- Followed shortly by death

WOULD DEFINITELY CHOOSE ‘B’ RATHER THAN ‘A’	UNSURE	WOULD DEFINITELY NOT CHOOSE ‘B’ RATHER THAN ‘A’

Treatment E

Successful outcome

- In hospital for 2 months
- Severe restriction to activities for first 4 months.
- Severe pain for 4 months then improving over time.
- Permanent slight to moderate pain in knee. Unable to undertake high impact exercise.

Failed outcome

- Immediate unconsciousness
- Followed shortly by death

Treatment F

Successful outcome

- Leave hospital that day
- Very rapid recovery
- Full health in 3-4 days
- No permanent disability

Failed outcome

- Immediate unconsciousness
- Followed shortly by death

WOULD DEFINITELY CHOOSE ‘F’ RATHER THAN ‘E’	UNSURE	WOULD DEFINITELY NOT CHOOSE ‘F’ RATHER THAN ‘E’

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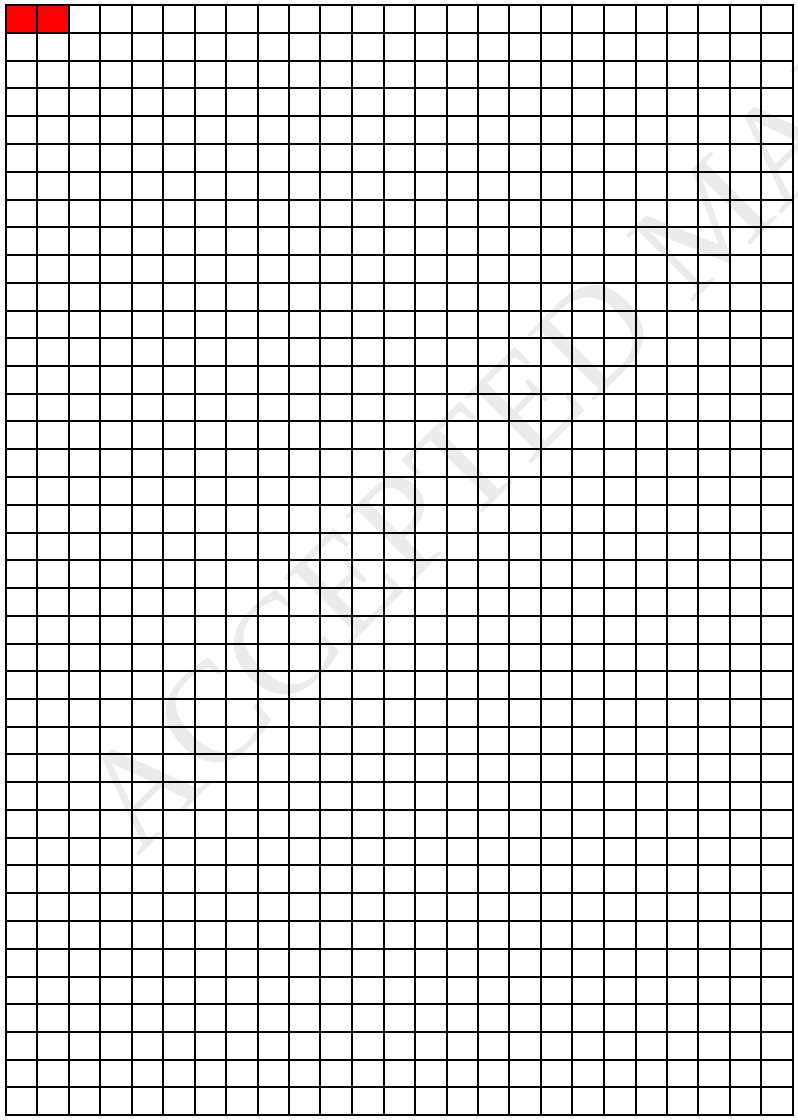

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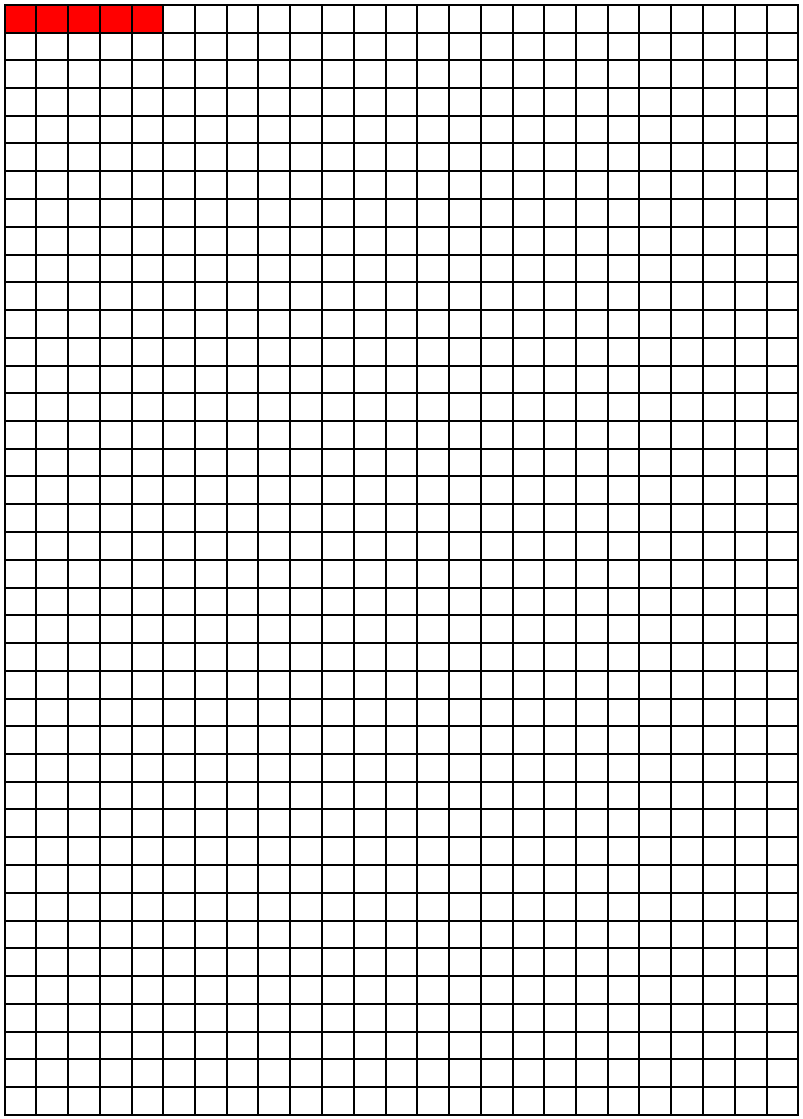

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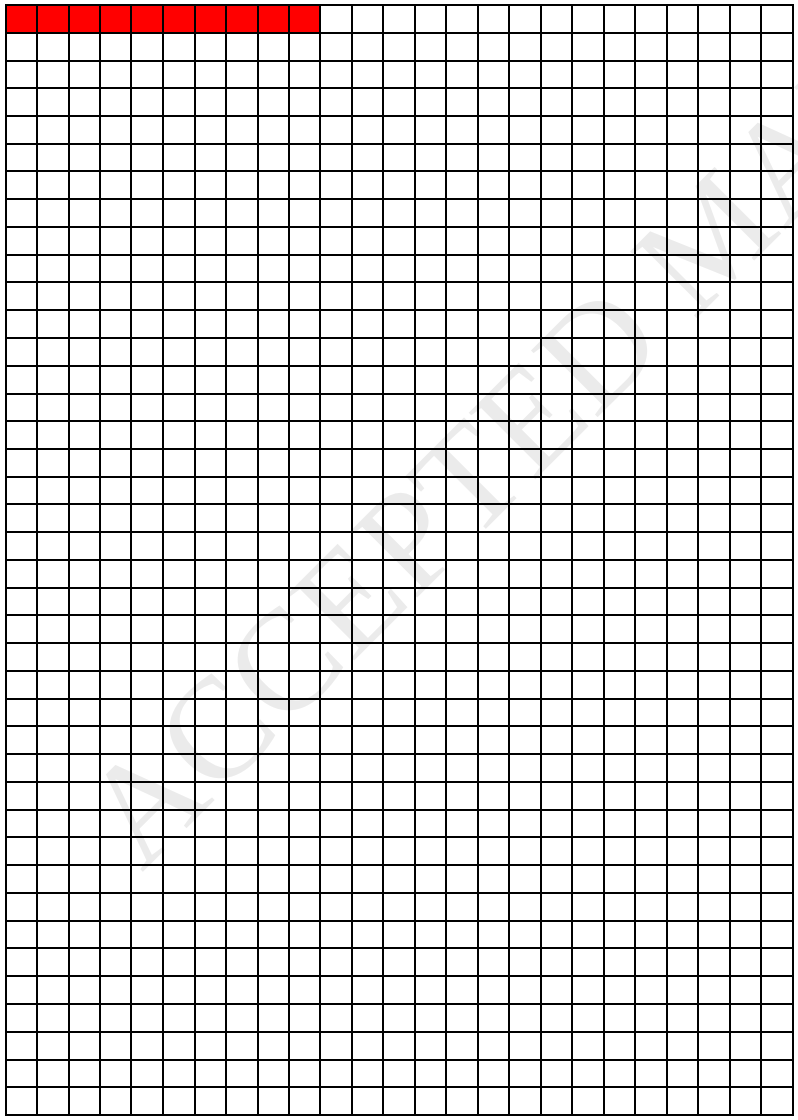

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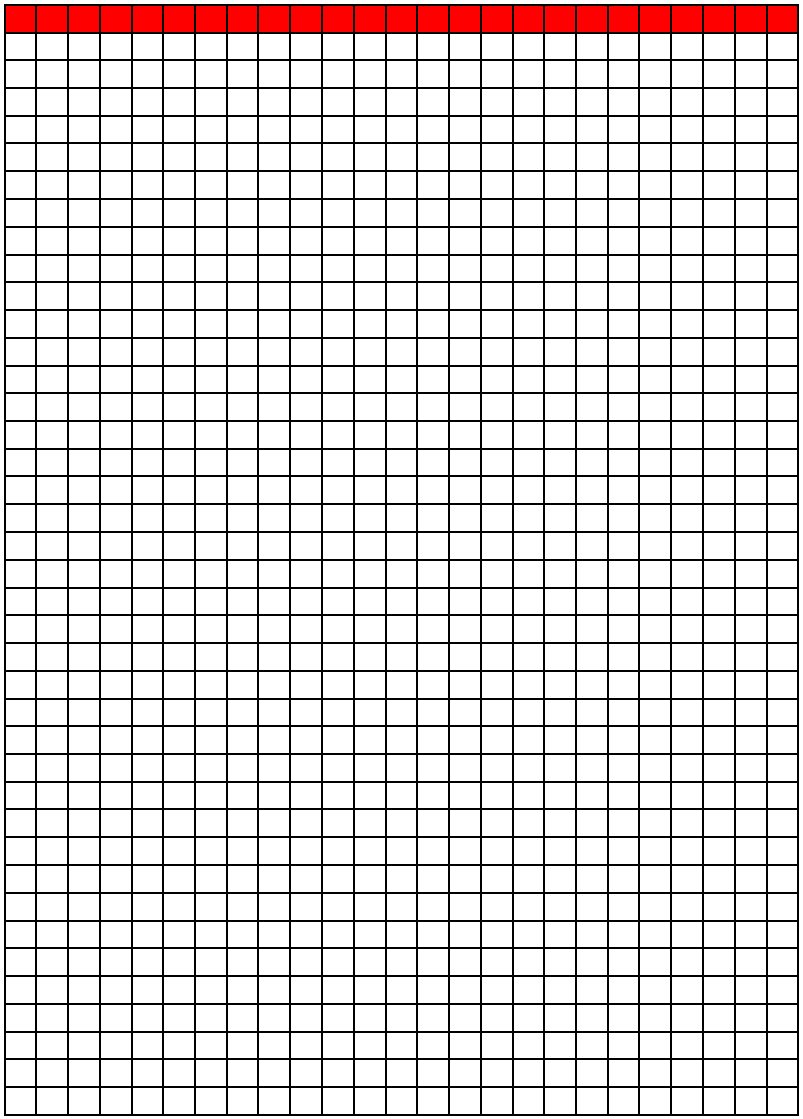

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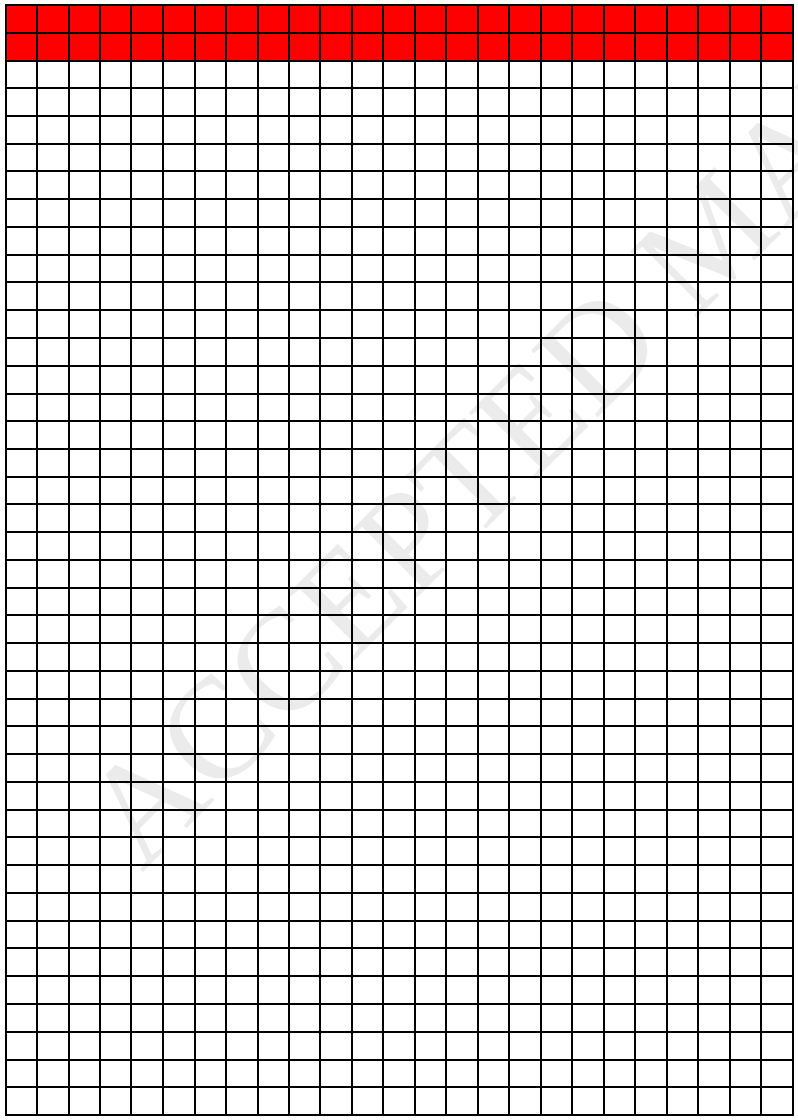

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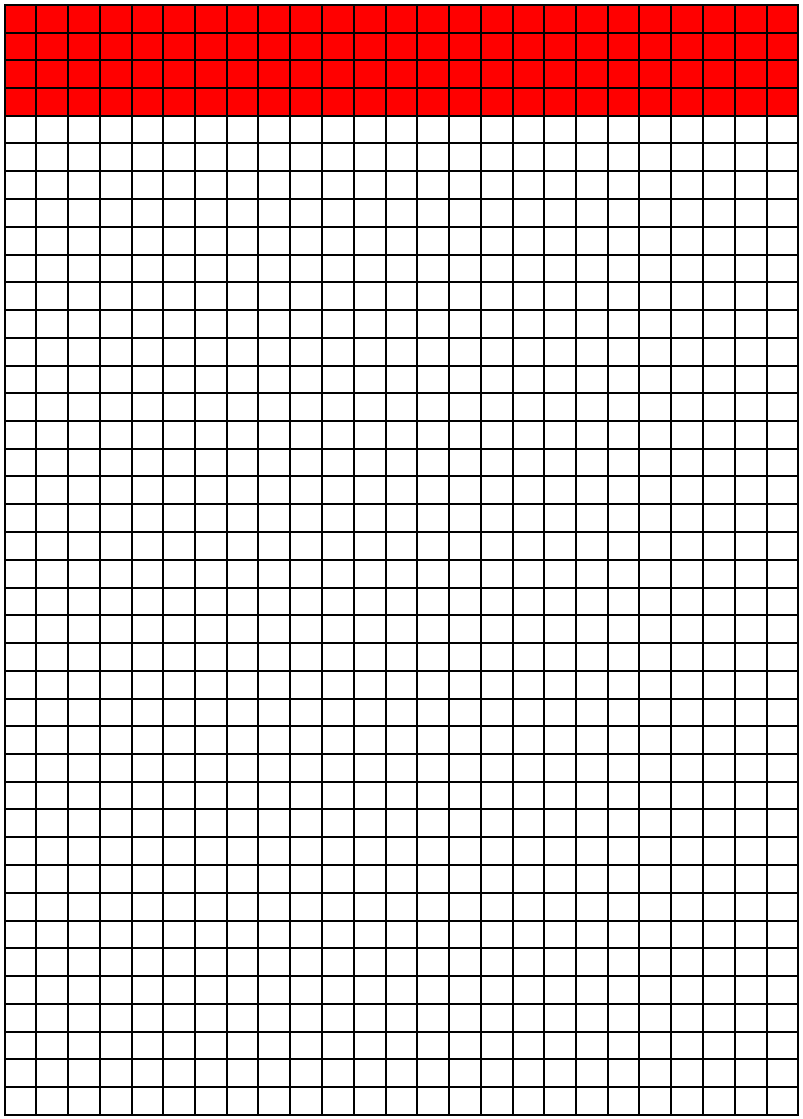

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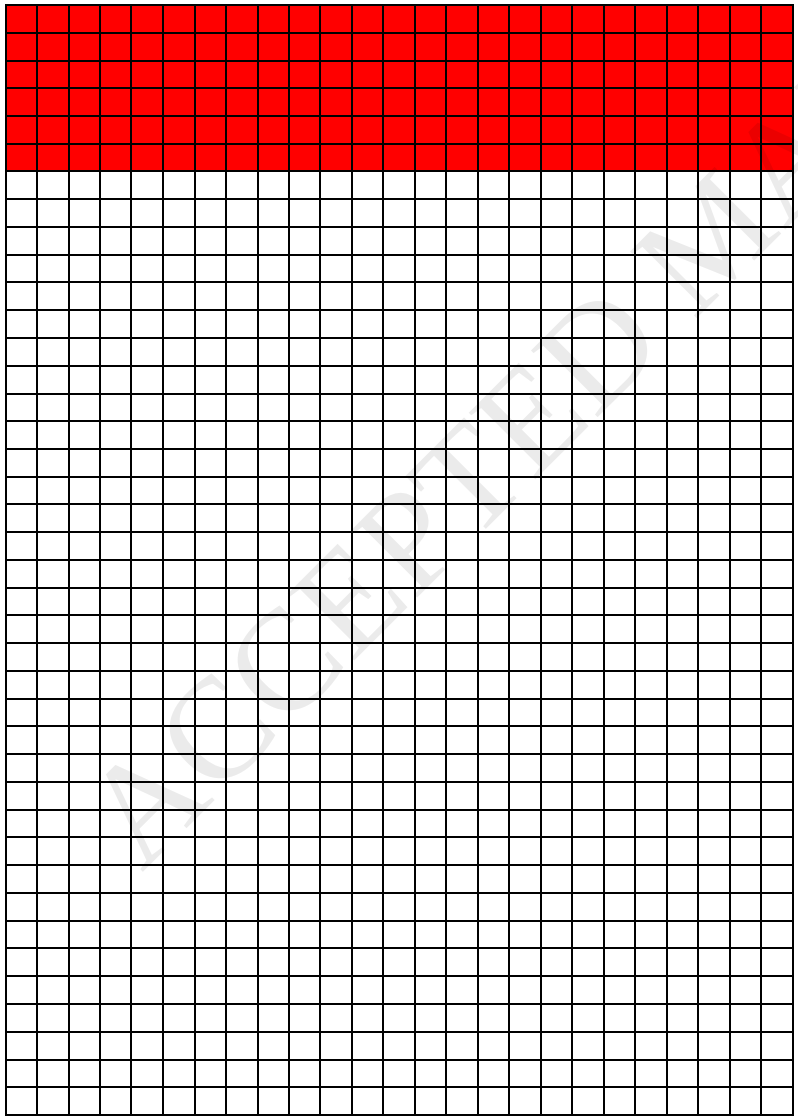

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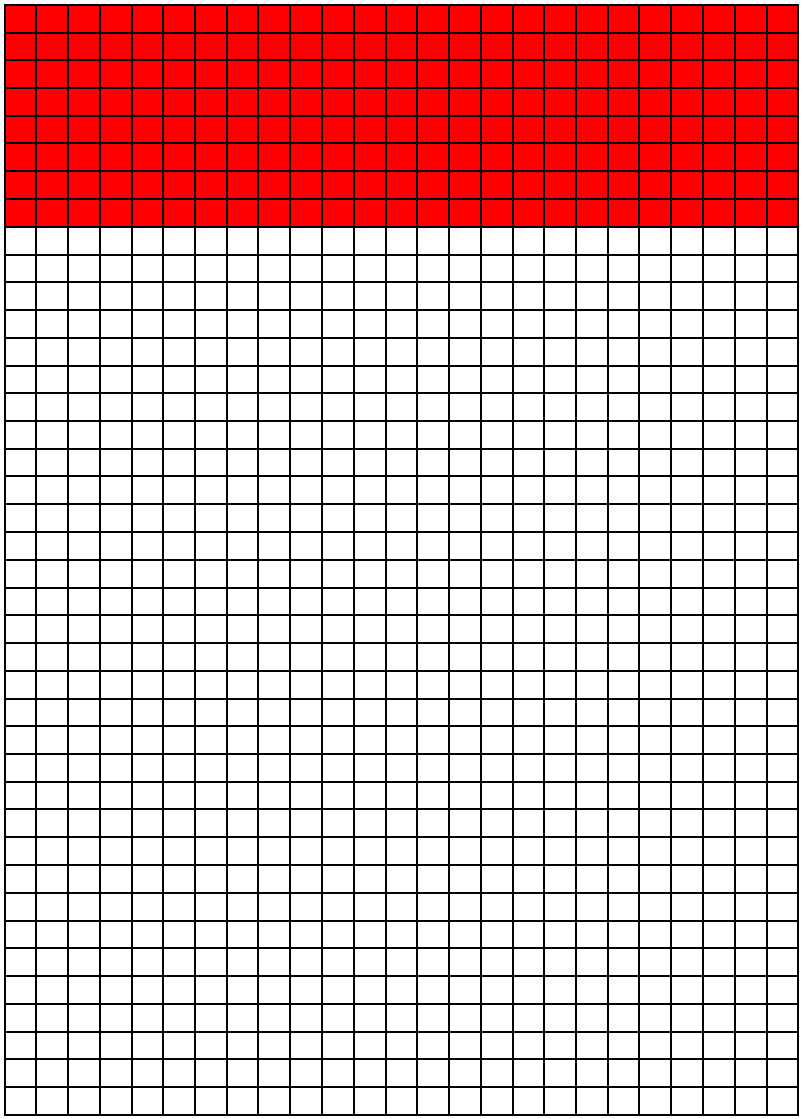

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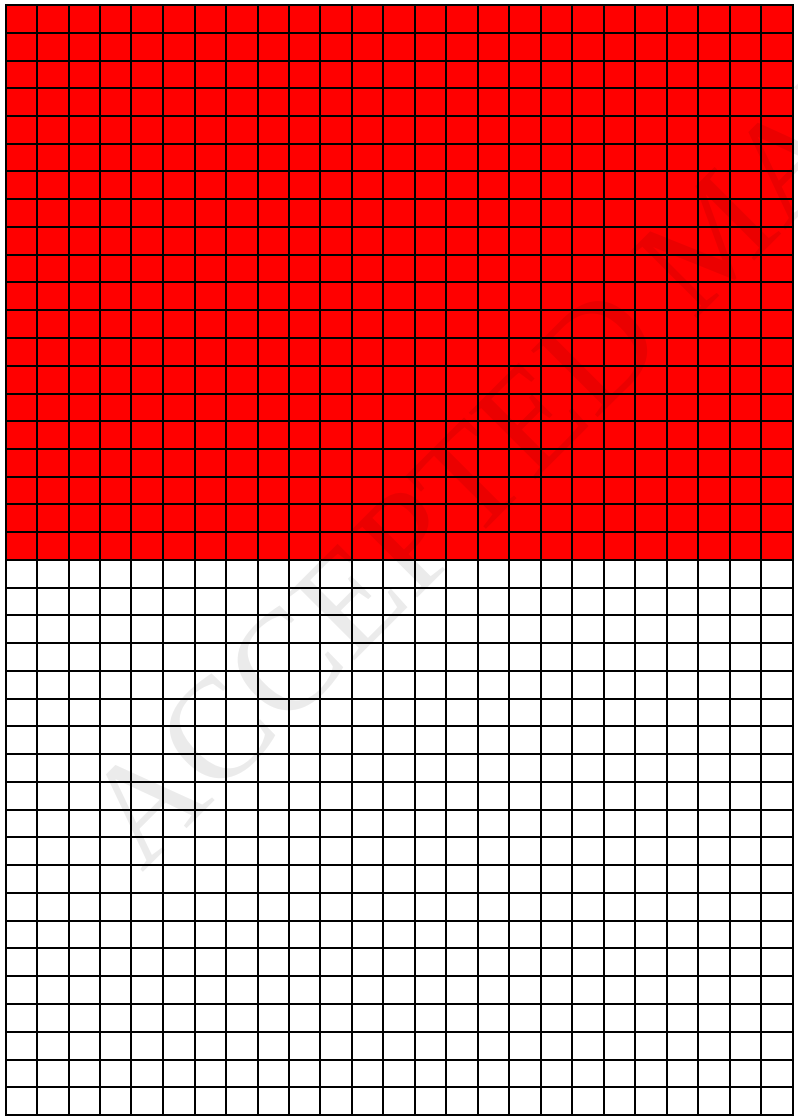

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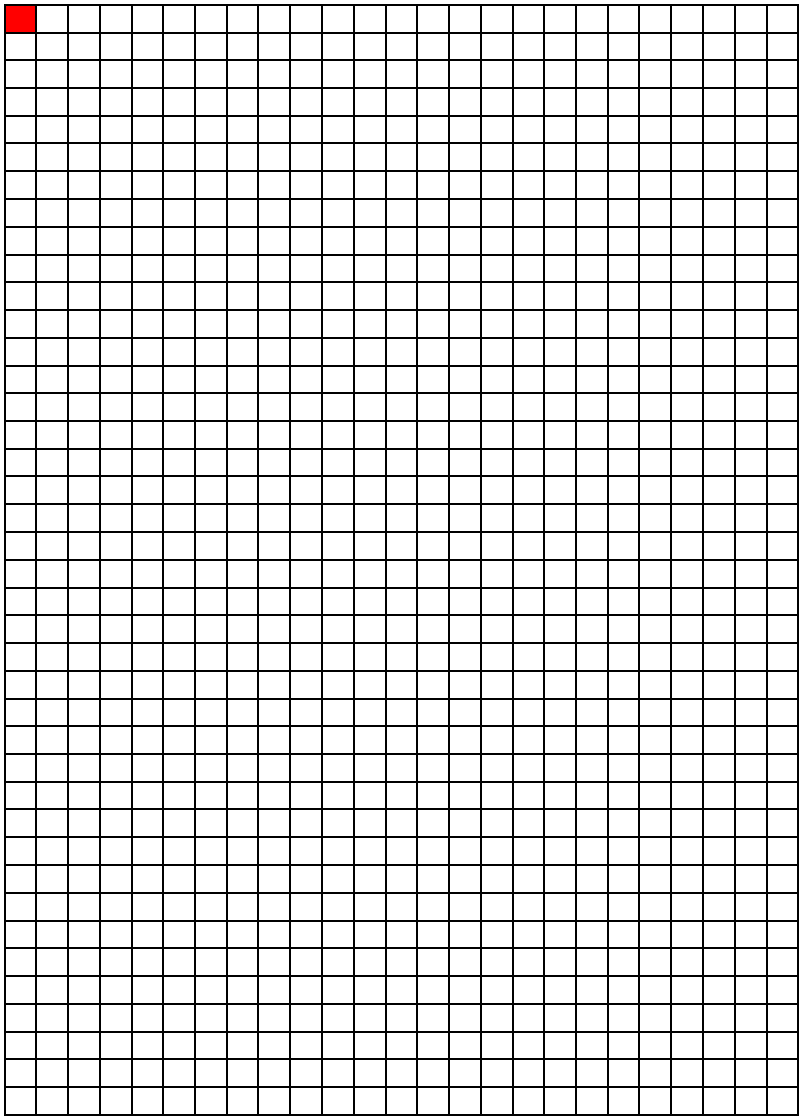

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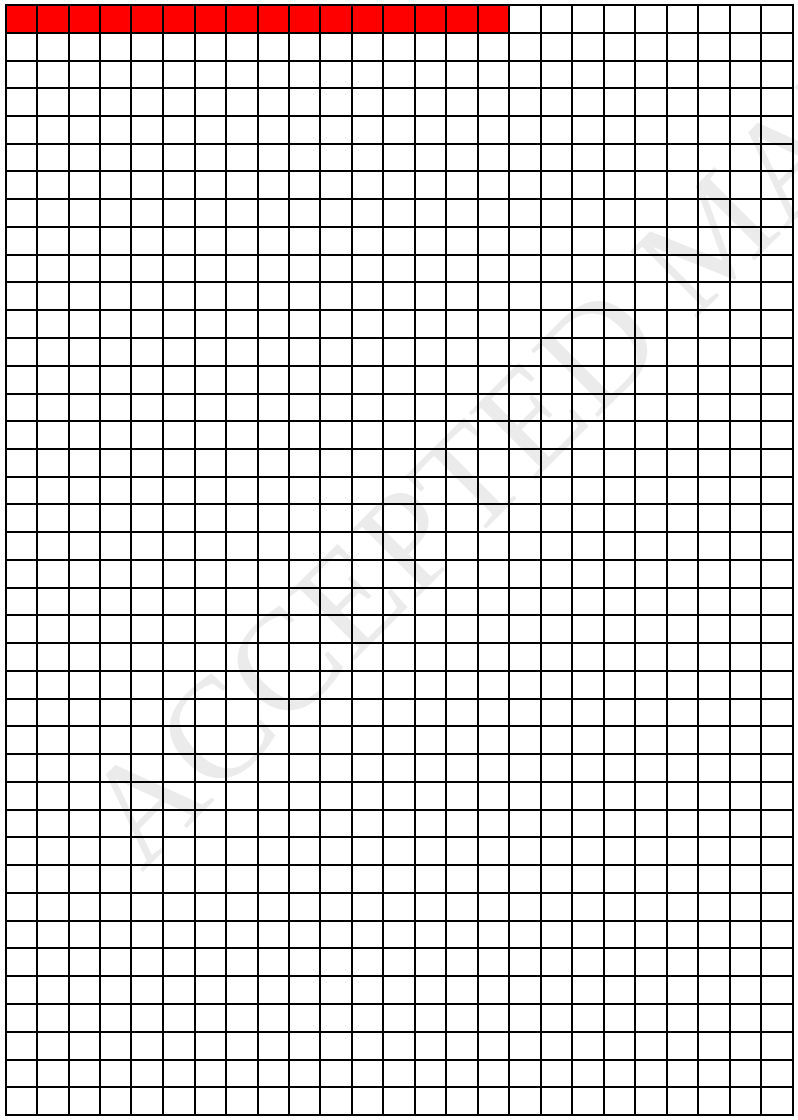

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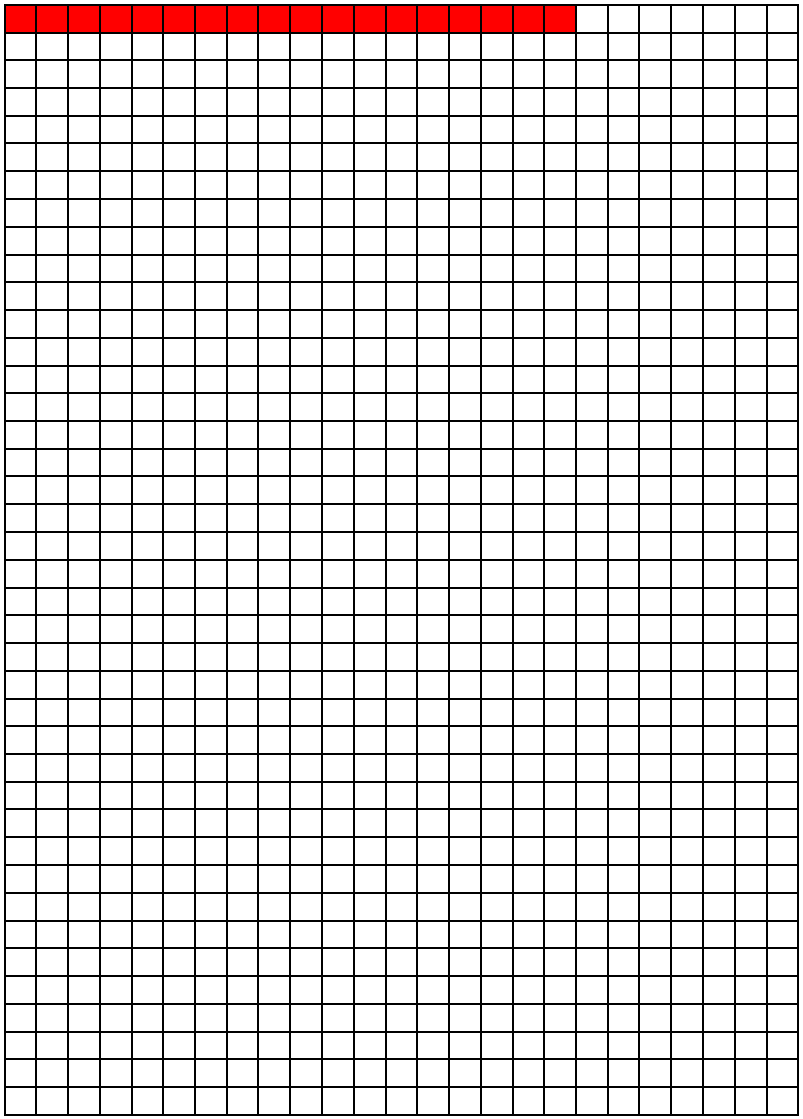

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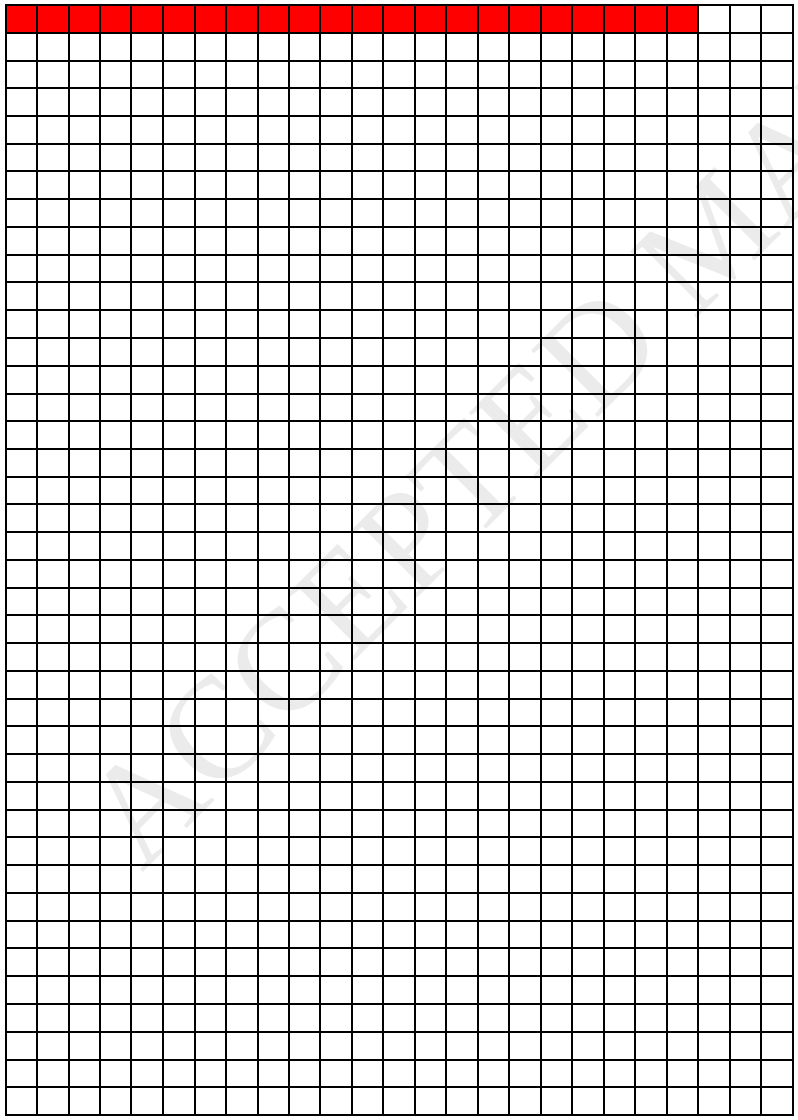

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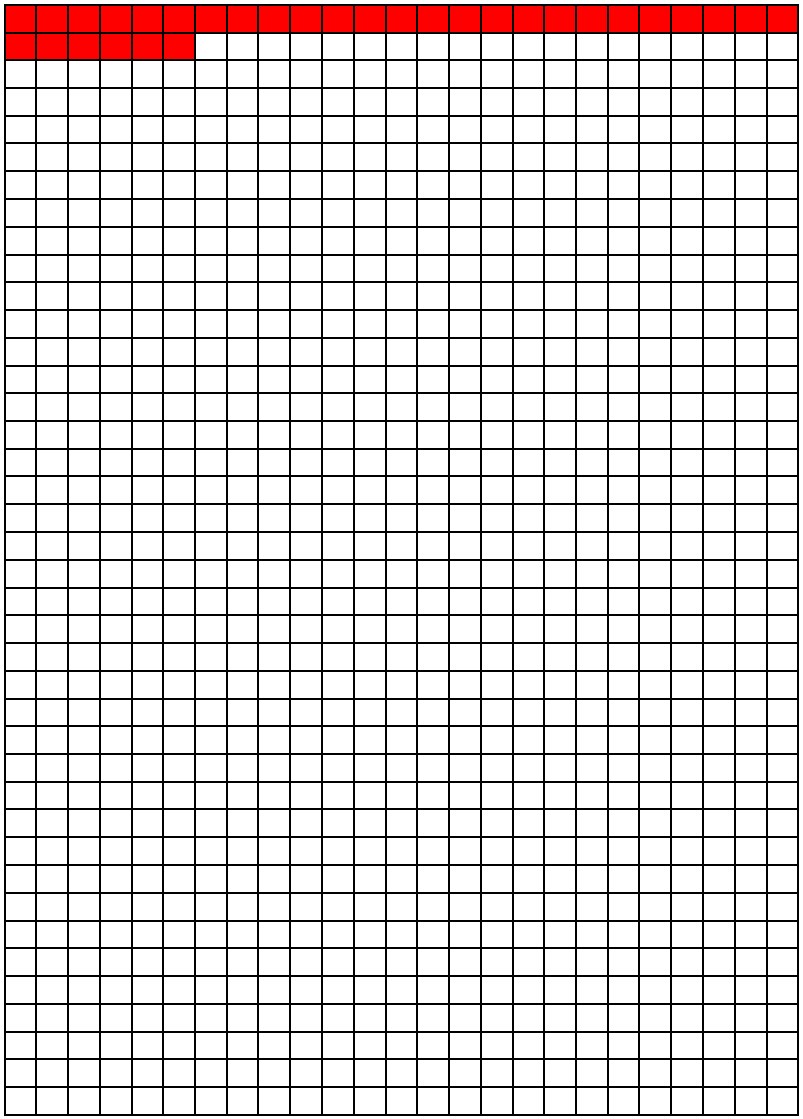

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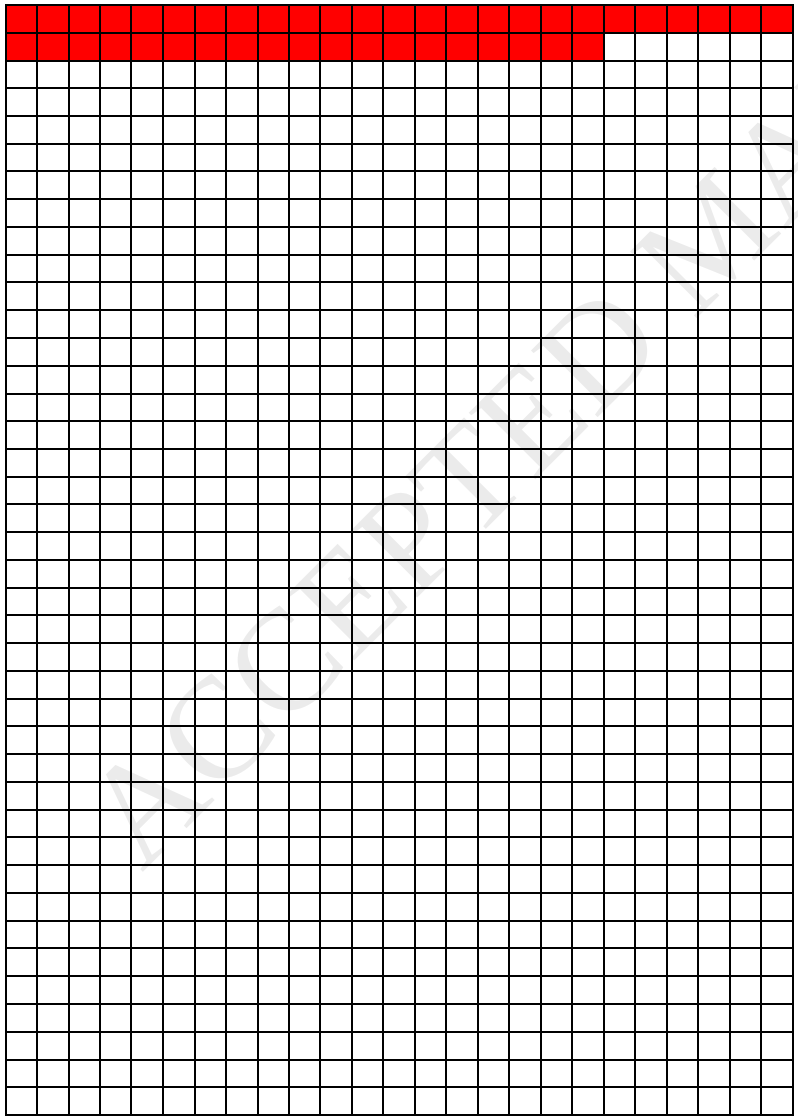

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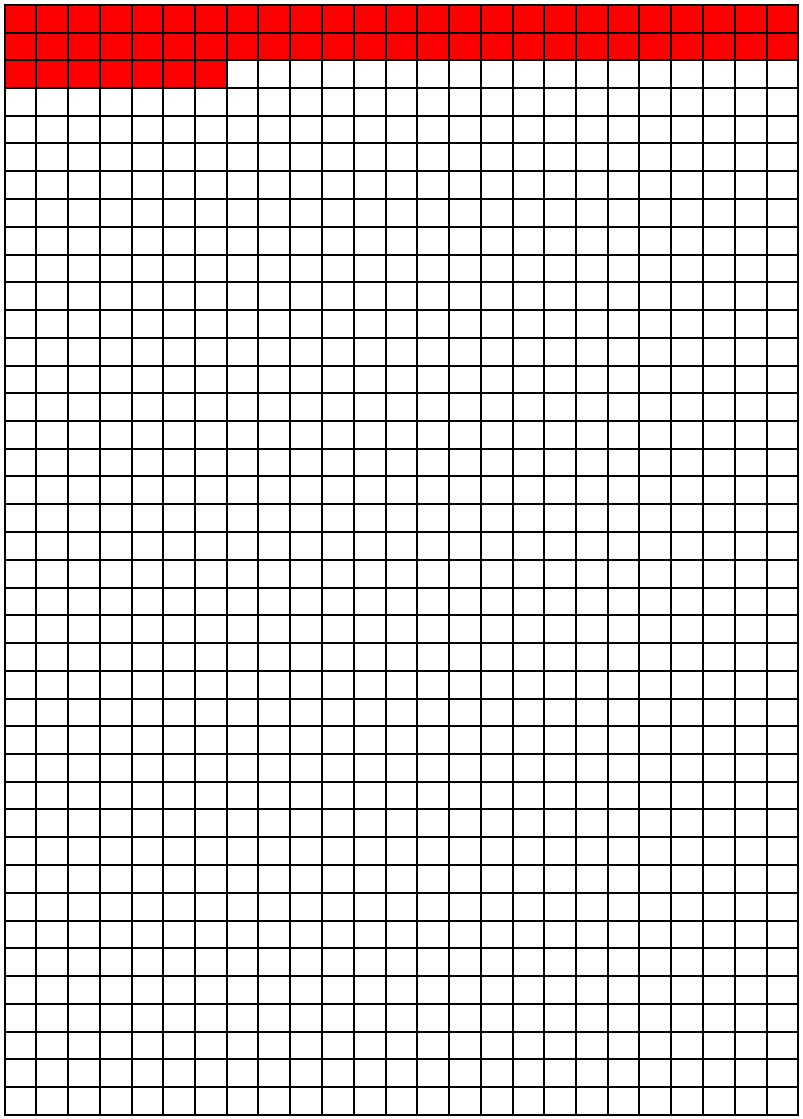

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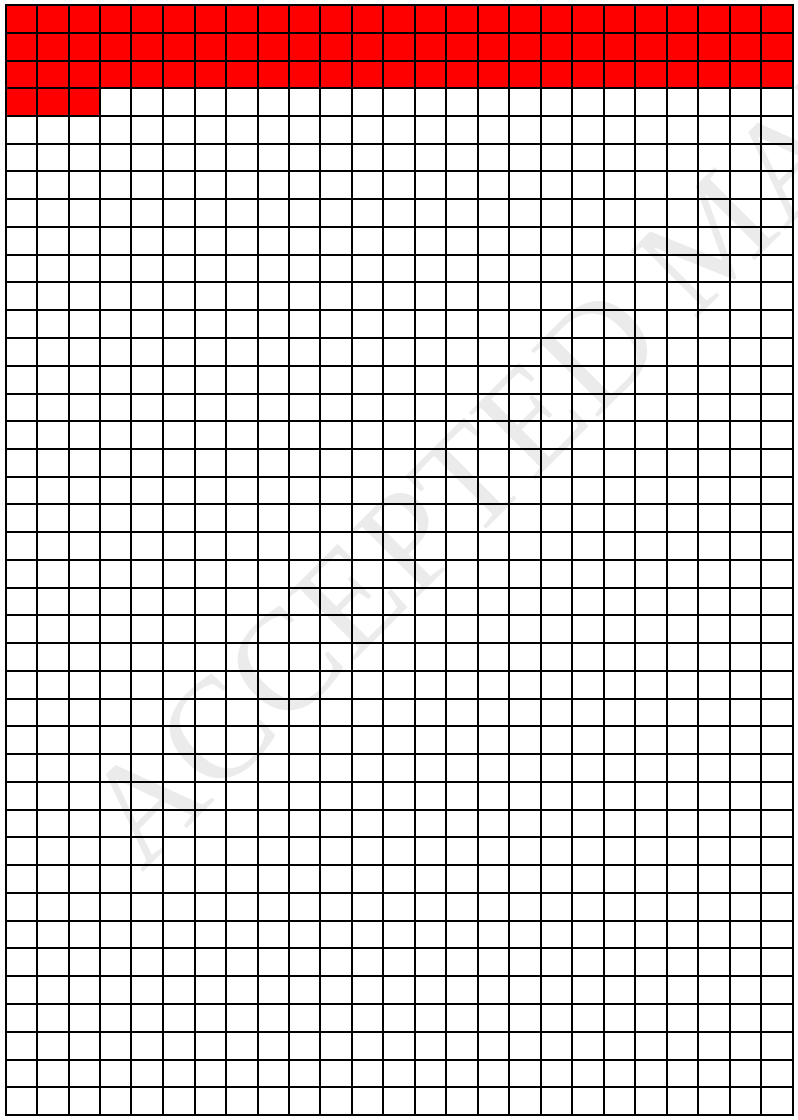

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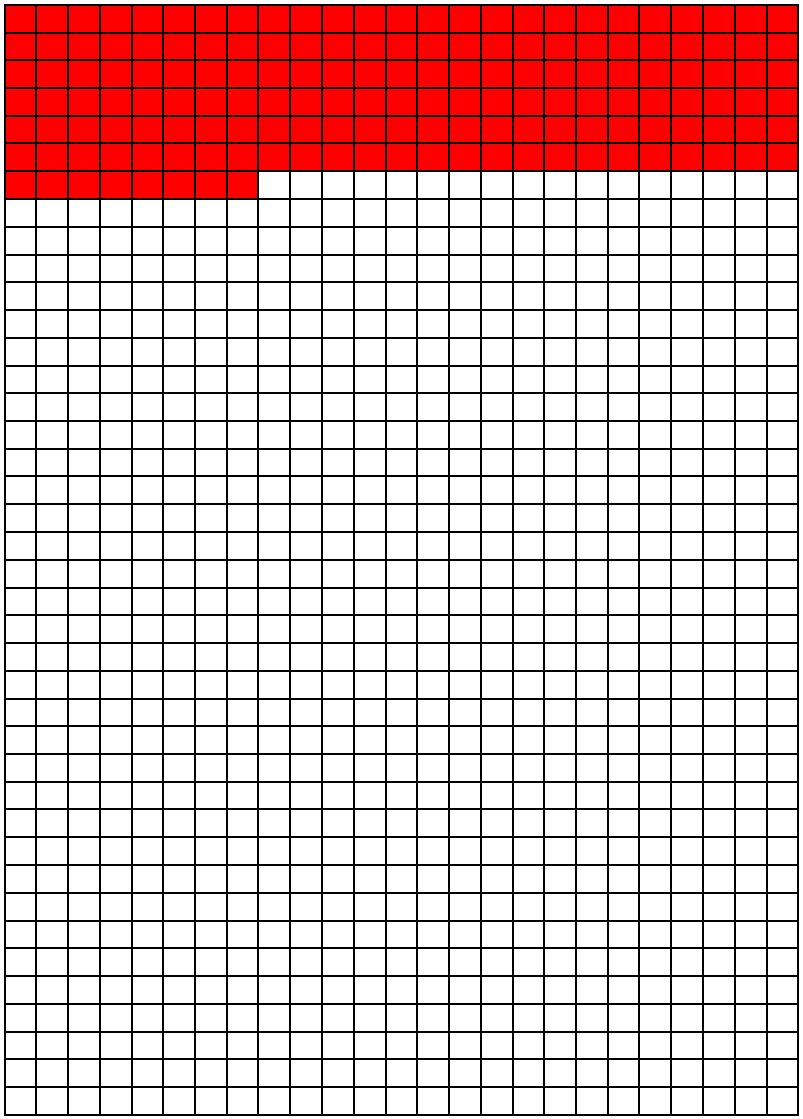

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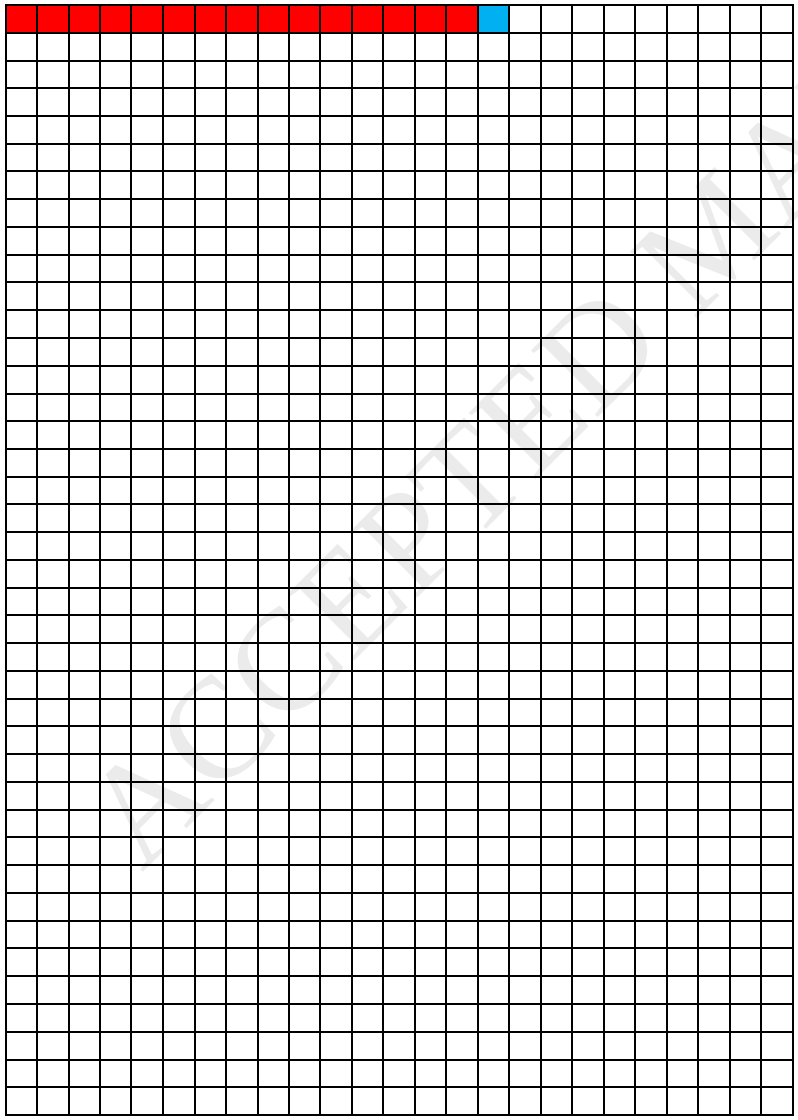

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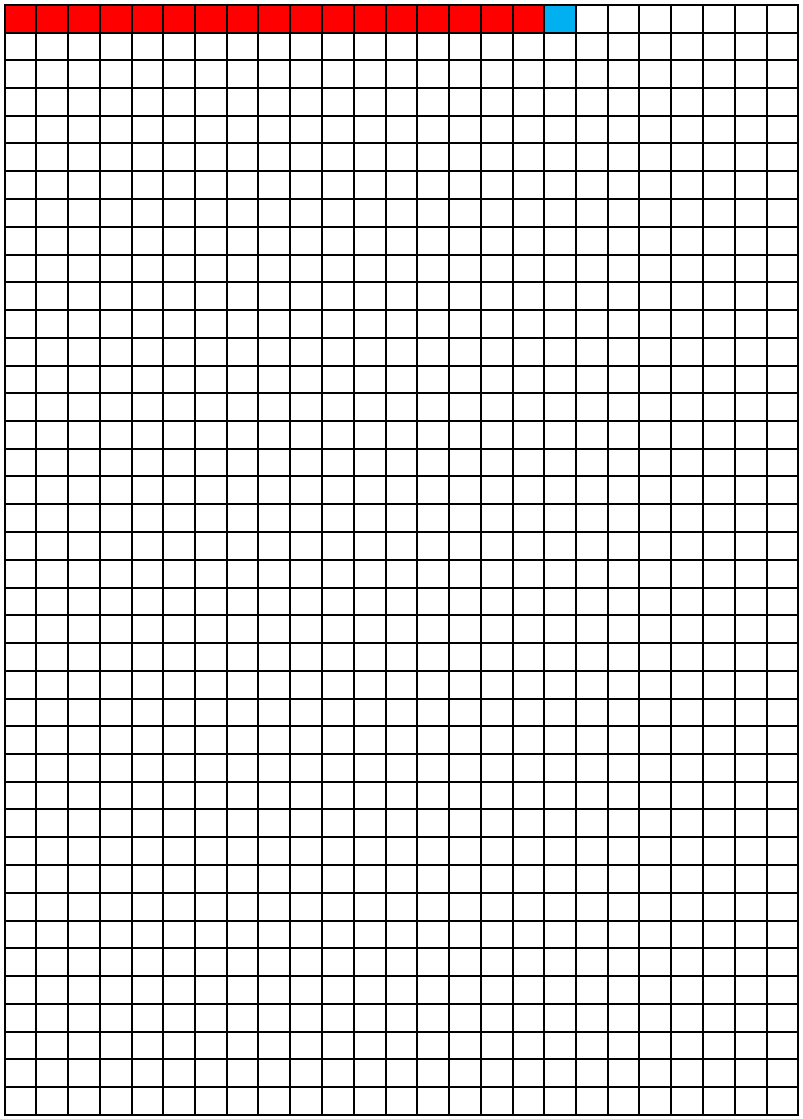

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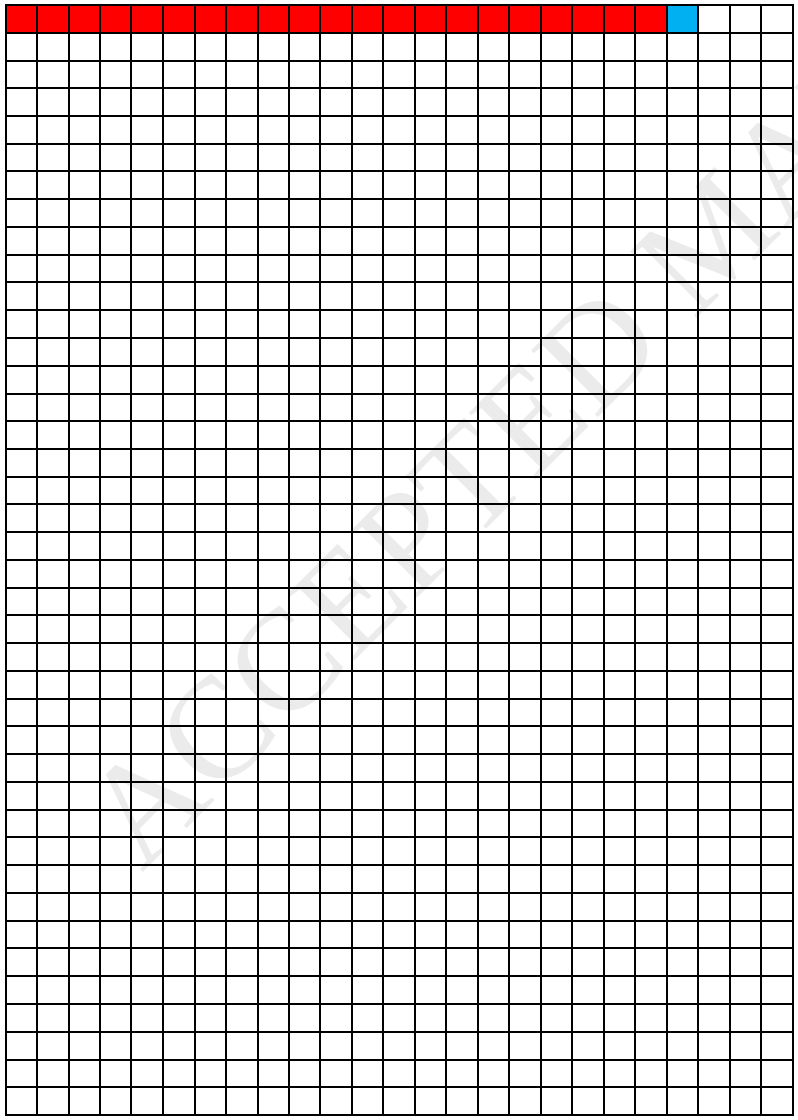

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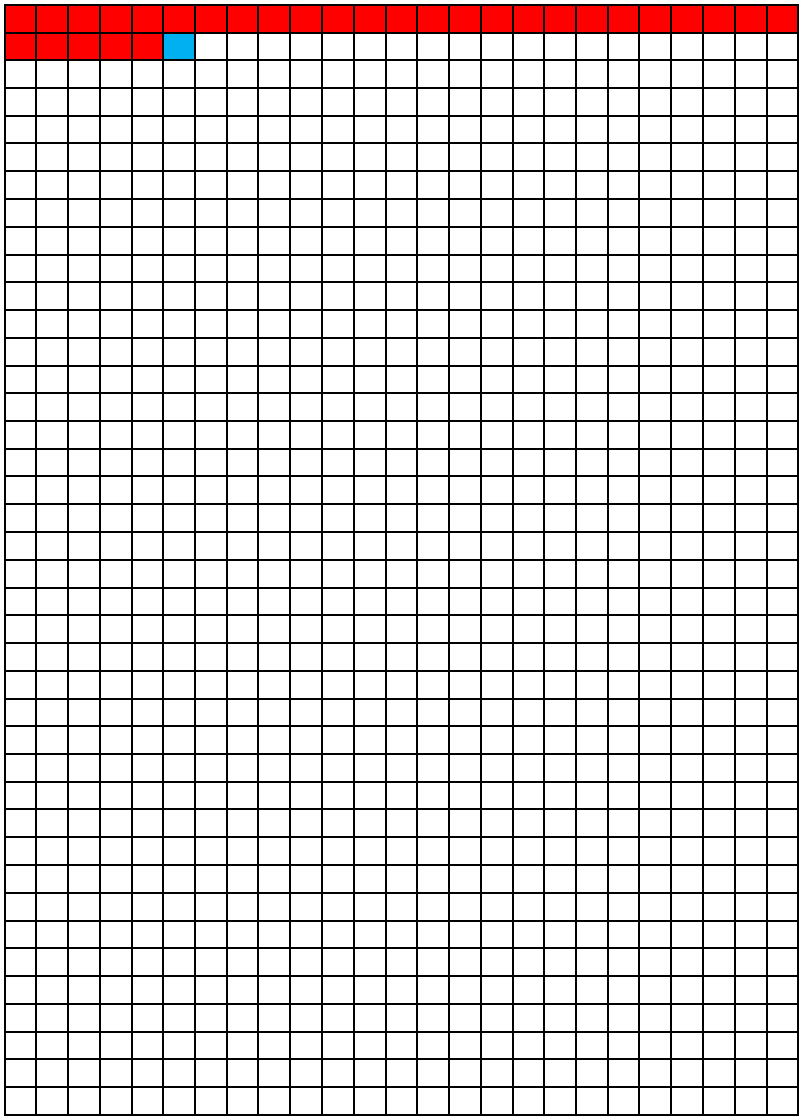
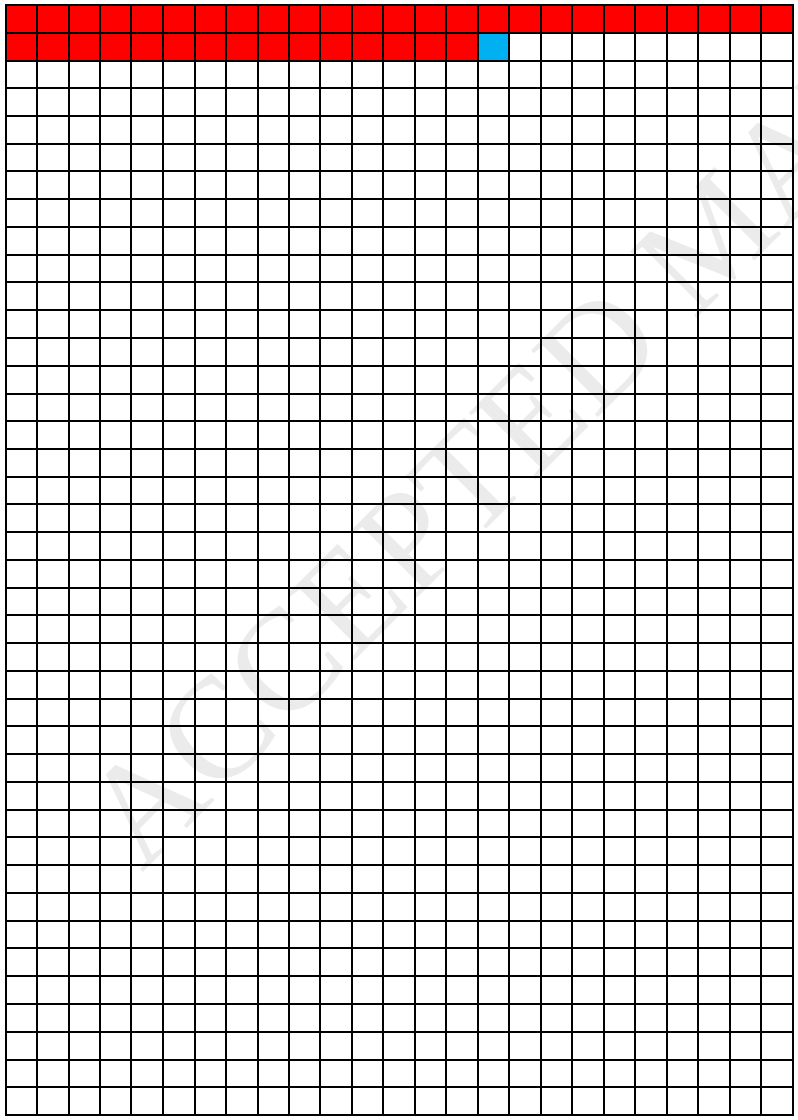
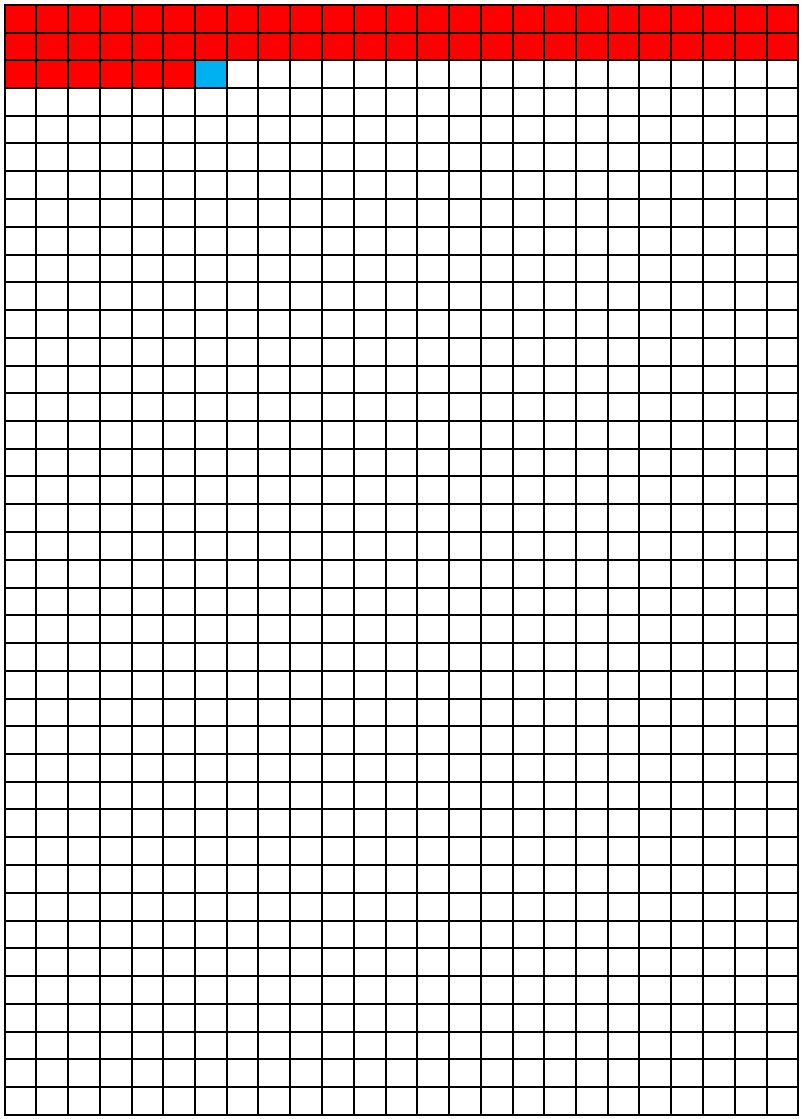


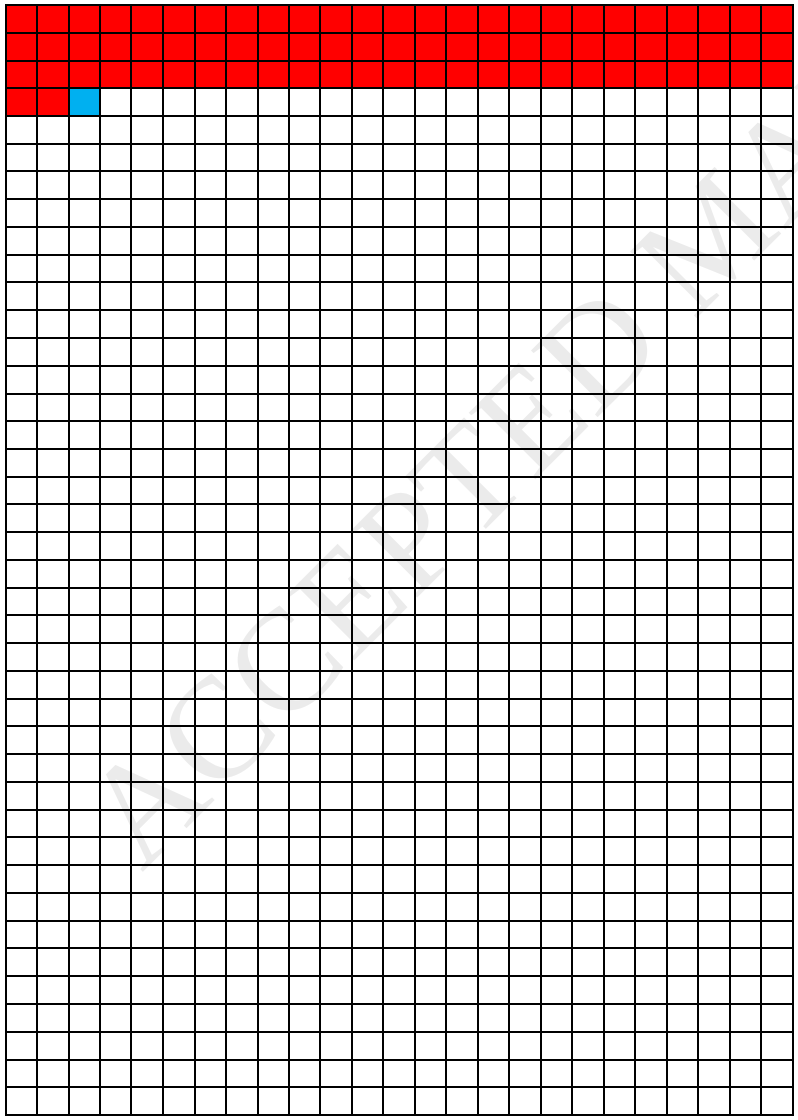
41/1000 to 40/1000



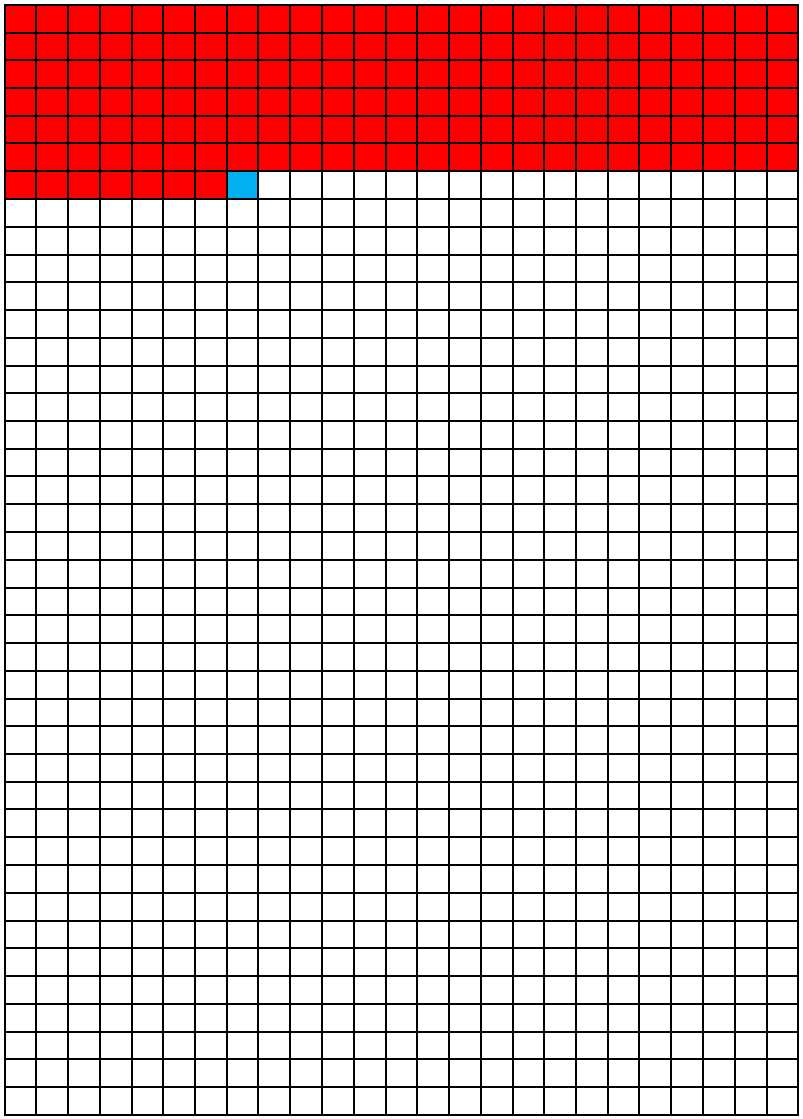
57/1000 to 56/1000



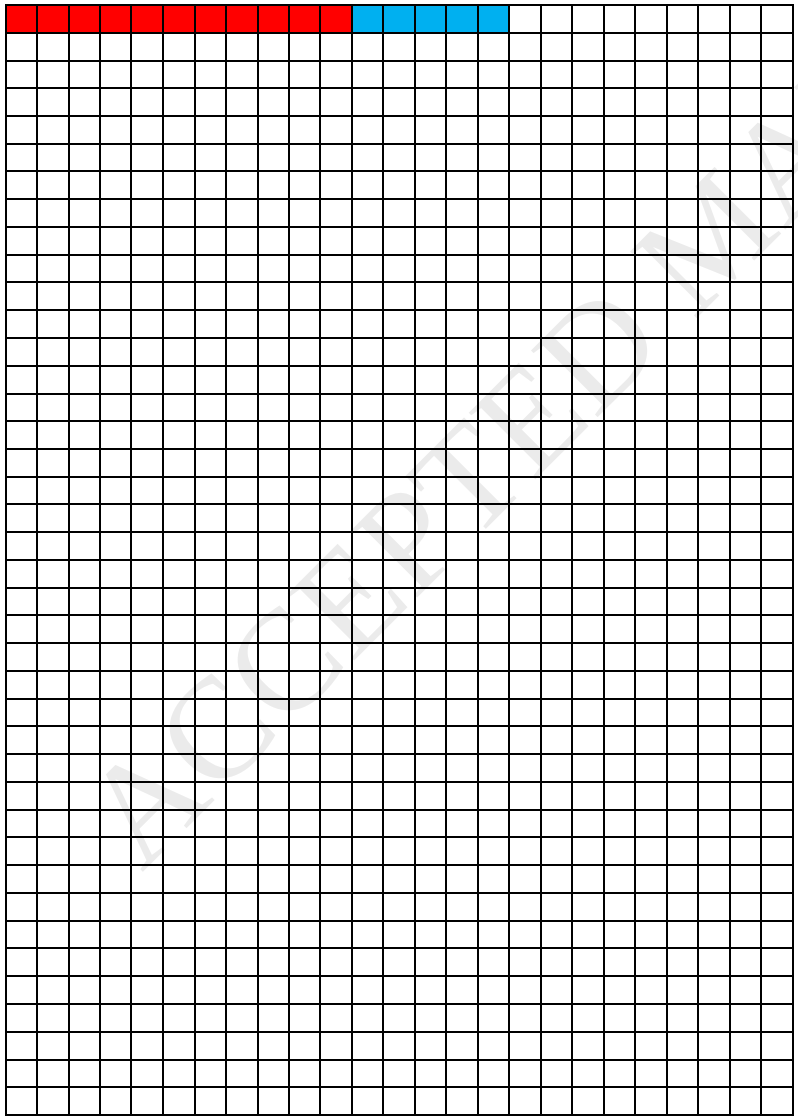
78/1000 to 77/1000



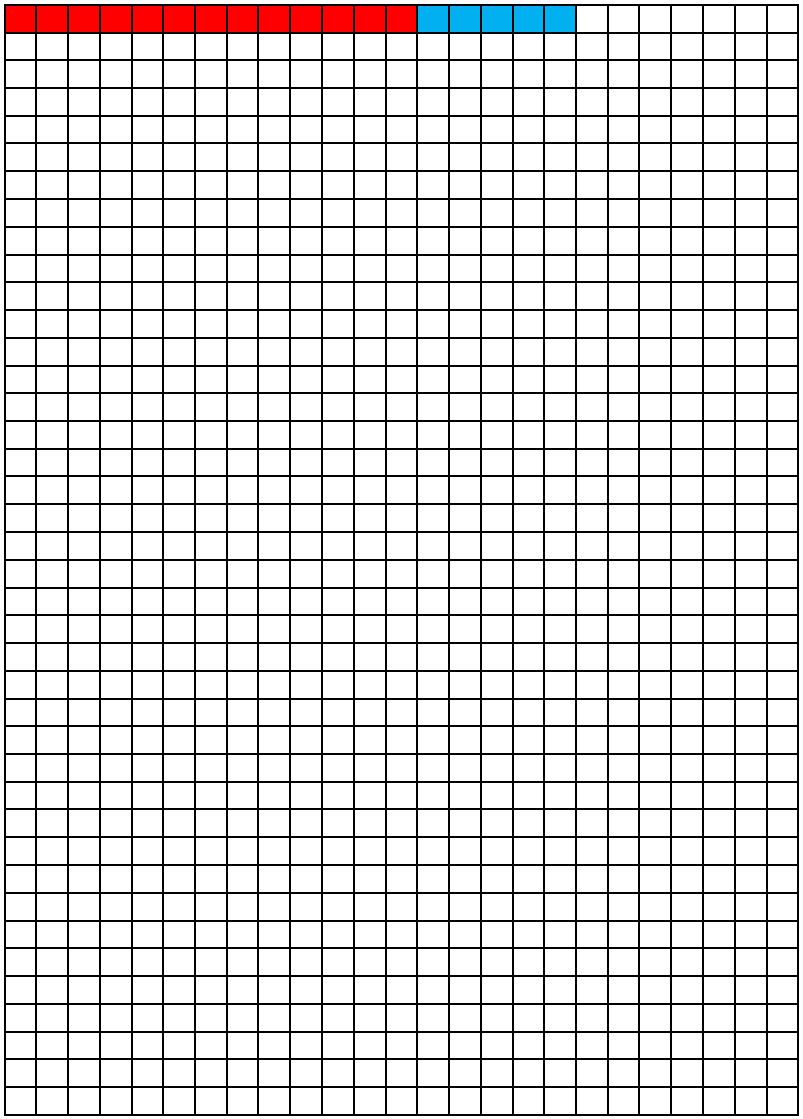
158/1000 to 157/1000



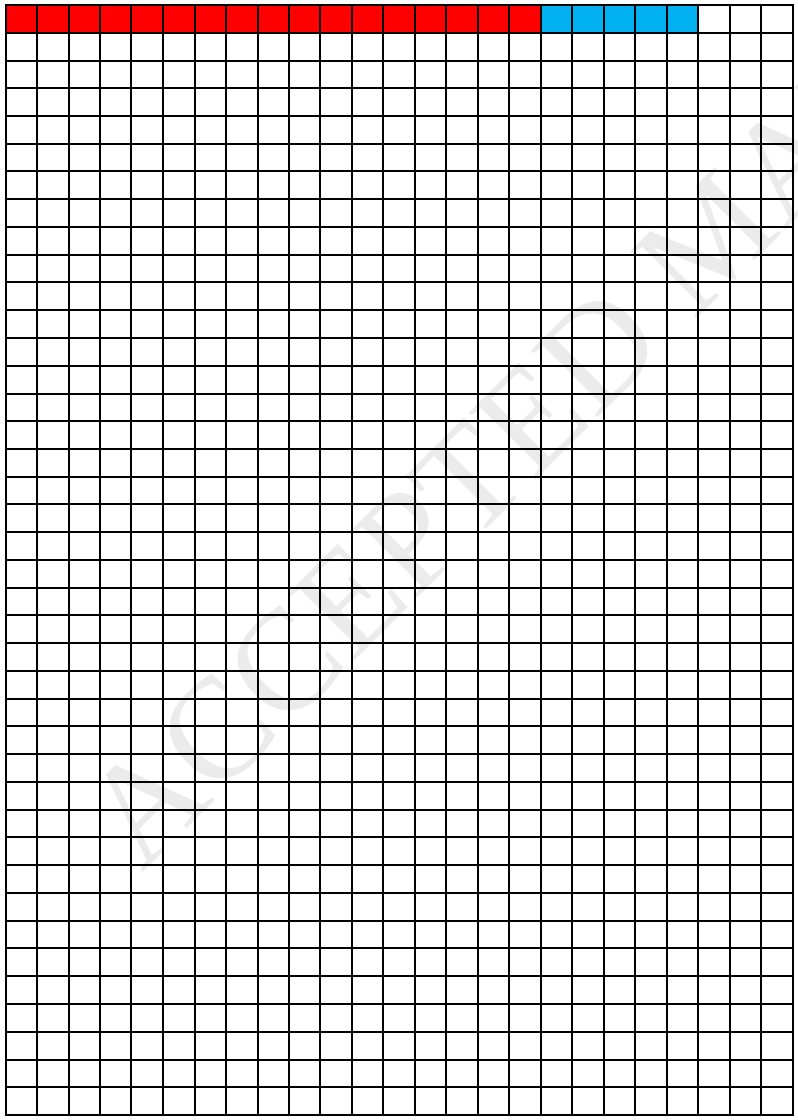
16/1000 to 11/1000



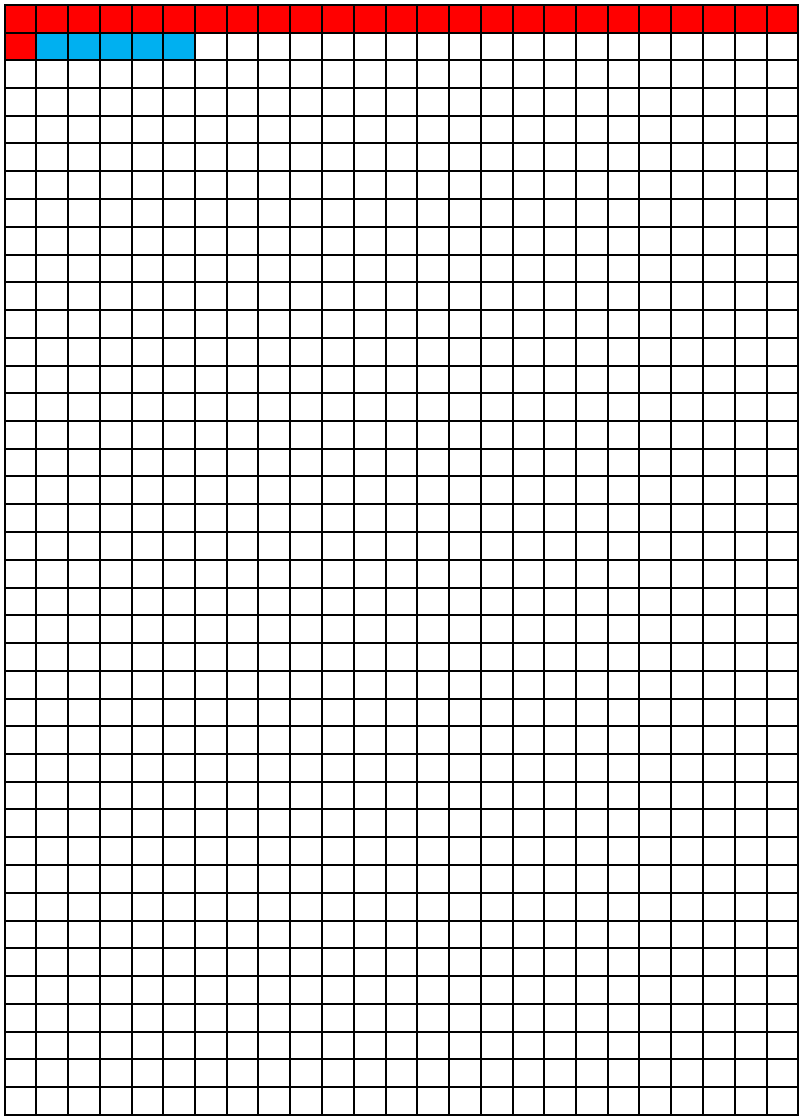
18/1000 to 13/1000



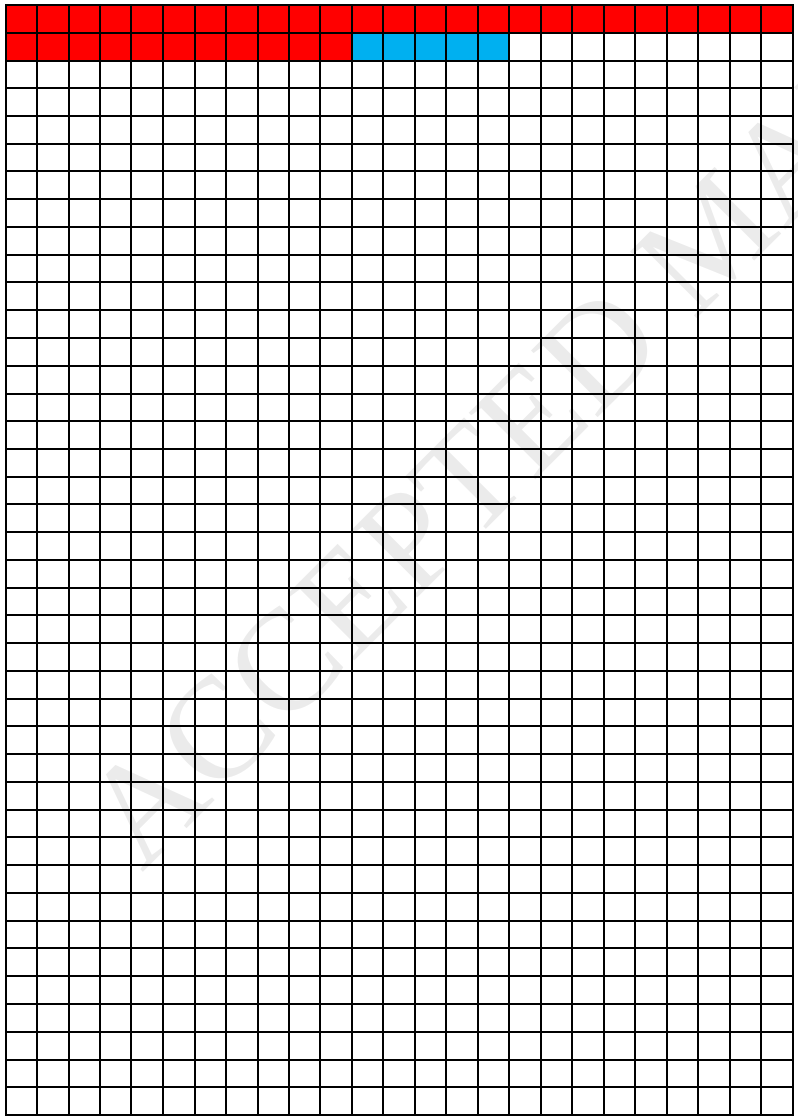
22/1000 to 17/1000



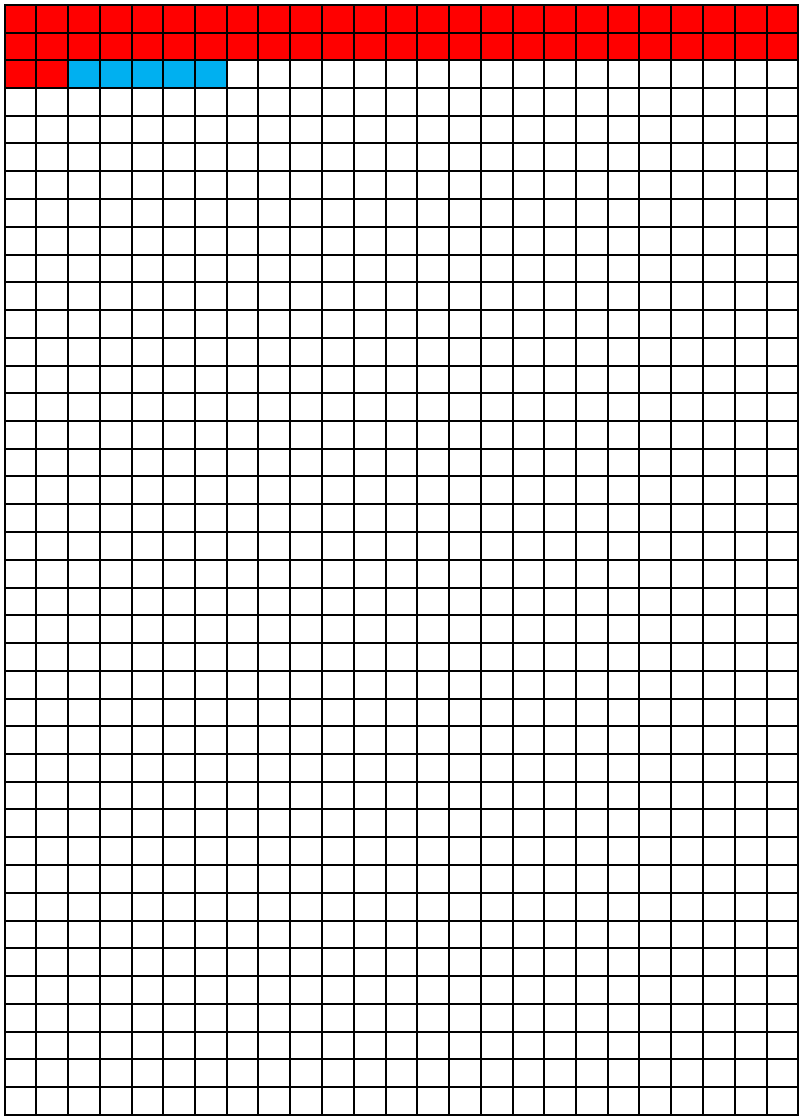
31/1000 to 26/1000



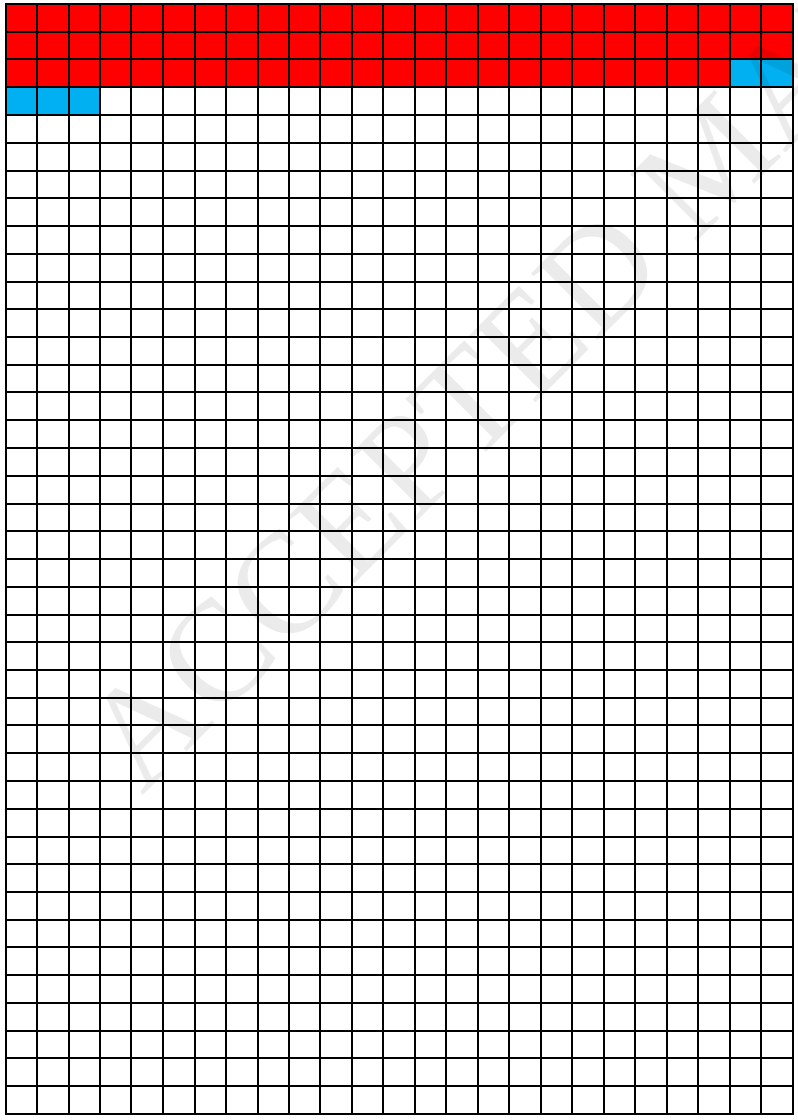
41/1000 to 36/1000



57/1000 to 52/1000



78/1000 to 73/1000



Appendix 5: Illness card descriptors handed to respondents

Ta

WHO IS AFFECTED	***YOU***
SYPTOMS	***SEVERE STOMACH PAINS, DIARRHOEA AND VOMITING FOR 2-3 DAYS EVERY 2 WEEKS***
LENGTH OF ILLNESS	***12 MONTHS***

Tc

WHO IS AFFECTED	***YOUR CHILD***
SYPTOMS	***SEVERE STOMACH PAINS, DIARRHOEA AND VOMITING FOR 2-3 DAYS EVERY 2 WEEKS***
LENGTH OF ILLNESS	***12 MONTHS***

Pa

WHO IS AFFECTED	***YOU***
SYPTOMS	***SEVERE STOMACH PAINS, DIARRHOEA AND VOMITING FOR 2-3 DAYS EVERY 2 WEEKS***
LENGTH OF ILLNESS	***THE REST OF YOUR LIFE***

Pc

WHO IS AFFECTED	***YOUR CHILD***
SYPTOMS	***SEVERE STOMACH PAINS, DIARRHOEA AND VOMITING FOR 2-3 DAYS EVERY 2 WEEKS***
LENGTH OF ILLNESS	***THE REST OF YOUR CHILDS LIFE***

Appendix 6: Complete questionnaire for Field Study 2

Questionnaire for main survey

Note on sample treatments
The sample is to be split into two sample initially, 200 respondents won't be presented with the budget constraint section (question 2a1). These individuals will always answer questions 2a – 2d with the health state cards in the following order: Pc, Pa, Tc, Ta only. They won't have the "how funded" questions labelled as 2a5.1b, 2b3.1 b, 2c3.1 b and 2d3.1 b.

The remaining 800 respondents will answer the budget constraint question (2a1). These individuals will then answer questions 2a – 2d, there are four different ways that the health state cards can be ordered for these respondents

1. Pa, Pc, Ta, Tc
2. Pc, Pa, Tc, Ta
3. Ta, Tc, Pa, Pc
4. Tc, Ta, Pc, Pa

Please note that only these 4 combinations are allowed in the WTP section.
Equal numbers of these 800 respondents need to be allocated randomly between these four groups.

INTERVIEWER INSTRUCTIONS

INTERVIEWER ENTER RESPONDENT DETAILS FROM RECRUITMENT QUESTIONNAIRE

Intro: Number of children in each age group?

1. 0-3 years
2. 4-6 years
3. 7-10 years
4. 11-13 years
5. 14-17 years

Intro: Total number of children.

1. One child
2. 2 children
3. 3 children
4. 4 children

5. 5 children
6. 6 children or more

Intro: Number of adults over 18 in the household.

1. Only myself
2. Two
3. Three
4. Four
5. Five or more

Intro: SEG

AB
C1
C2
DE
Not stated

Intro: Age group

1 18-24
2 25-34
3 35-49
4 50+
5 Refused

Intro: Gender

1 Male
2 Female

Interviewer No. ☐☐

Interview No. ☐☐ ☐☐

Day of Interview 1 2 3 4 5 6 7
(Mon) (Thu (Sun)

Date of Interview: ☐☐/ ☐☐/☐☐

INTERVIEWER RECORD START TIME ☐ ☐ ☐ ☐
Hours Mins

SECTION 0: INTRODUCTION AND PERSON SELECTION

0.1 Good morning/afternoon/evening. My name is ..... and I am from Accent. As I/my colleague explained, we are an independent market research company carrying out research for the University of East Anglia. Thank you very much for agreeing to take part in this research. **This study is about health and the value we place on reducing health risks both to ourselves and to others.**

IF MORE THAN ONE CHILD THEN SKIP QUESTION Q0.2 AND ASK QUESTION Q0.3

0.2 IF ONLY ONE CHILD AT 0 Intro READ OUT: Rather than think about some abstract "other person" that you do not know, we want to select someone from your family who you are responsible for **so we will at some points in this questionnaire refer to your child. Can I just make a note of your child's name?** ENTER CHILD'S NAME BELOW

How old is [ENTER CHILD'S NAME]? _____
Is that a boy or a girl?
Boy
Girl

And what is that child's relationship to you?
Son
Daughter
Stepchild
Grandchild
Foster child
Other (please specify)

GO TO SECTION 1

0.3 IF MORE THAN ONE CHILD AT 0 Intro THEN READ OUT Rather than think about some abstract "other person" that you do not know, we want to select someone from your family who you are responsible for. **We need to select one person at random that you are responsible for so can you tell me which of your children has their birthday next?**
ENTER CHILD'S NAME BELOW
Is that a boy or a girl?
Boy
Girl

And what is that child's relationship to you?
Son
Daughter
Stepchild
Grandchild
Foster child
Other (please specify)

GO TO SECTION 1

SECTION 1: HEALTH STATES

1.1 **Let's start by considering the current state of health of both you and your child. Please circle the number of whichever statement best describes your own situation and then that of your child today (if on medication then we want the self assessment after taking that medication)**

General Health:	**YOU**	**YOUR CHILD**
no real problems in general health	1	1
occasional minor problems in general health	2	2
frequent but mostly minor problems in general health	3	3
quite a lot of problems in general health	4	4
very severe problems in general health	5	5

Please look at these four cards which describe two differing health states either affecting you or your child. The episodes described are severe enough to interfere with some of your usual activities although the person concerned could still go to work or school.

[HAND RESPONDENT SHOWCARDS "HEALTH STATE CARDS Ta, Pa, Tc, Pc"]

Now in considering these cards I want you to assume that they would not affect the household's income. If the person affected is employed assume that an insurance scheme or state benefits would fully cover any loss of income associated with these health states. These illnesses would also not affect a person's life expectancy.

1.2 [PLACE SHOWCARD "HEALTH STATE RANKER" IN FRONT OF RESPONDENT]
What I would like you to do is to take these cards and use this sheet to rank them from the one which would have the [INDICATE UPPER ROW IN "HEALTH STATE RANKER"] **most adverse impact upon your entire household, to the one that would have the** [INDICATE LOWER ROW IN "HEALTH STATE RANKER"] **least adverse impact on your household.**

(RECORD RANKING BELOW: CIRCLE THE APPROPRIATE CARD – SHOULD BE ONE CIRCLE PER ROW WITH NO ITEM CIRCLED TWICE):
Health state with the….

Most adverse impact upon the household: Pc Pa Tc Ta

Second most adverse impact upon the household: Pc Pa Tc Ta

Third most adverse impact upon the household: Pc Pa Tc Ta

Least adverse impact upon the household: Pc Pa Tc Ta

POINT TO THE CARD RANKED AS THE MOST ADVERSE IMPACT ON THE HOUSEHOLD
What is the main reason why you feel this would have the most adverse impact on the household?

RECORD VERBATIM RESPONSE:

……

……

SECTION 2: (Interviewer to administer) WILLINGNESS TO PAY QUESTIONS

2a1 (REMOVE HEALTH STATE CARDS)

Now clearly everyone values good health. This survey tries to assess that value in a meaningful way by examining how much households might pay to avoid each illness.

SKIP NEXT IF "WITHOUT BUDGET CONSTRAINTS QUESTIONNAIRE"
GO TO 2a2

But before we do that, I want you to focus for a short while on how your household would go about funding payments of any kind. So, consider this set of cards (SHOW "MONEY CARDS" SHOWCARDS – HERE THESE SHOULD BE IN NUMERIC ORDER FROM LOWEST TO HIGHEST)**.**

Each card shows, at the top, a different total payment amount. Now some of these amounts are considerably more than almost anyone could pay straight away, so underneath that we show the amount you would have to pay every month for 10 years to add up to that total amount.

For each card in turn I would like you to think about how easy or difficult your household would find it to make that payment if you really had to.

I would like you to sort the cards into four piles on this sheet (SHOW "BUDGET SORTER").

- **In this section** (INDICATE "Can Afford: Easy to find money" BOX ON BUDGET SHEET) **put all the cards showing amounts that you could pay quite easily; that is without having to make cutbacks in what you would normally spend on other things.**
- **In this section** (INDICATE "Can Afford: Must make spending cutbacks." BOX ON BUDGET SHEET) **put amounts that you could afford but only by substantially reducing your spending elsewhere; for example, by buying cheaper food, fewer new clothes, stopping subscriptions to pay-TV or not taking an annual holiday.**
- **In this section** (INDICATE "Can Afford: Must make spending cutbacks AND find money from elsewhere." BOX ON BUDGET SHEET)**, put amounts that would require you to do more than just cut your spending; for example, by cashing-in your savings or selling-off things you own or moving to a cheaper property or borrowing money.**
- **And, in this section** (INDICATE "Can't Afford: Could not make this payment" BOX ON BUDGET SHEET) **put all the amounts that are so large that you do not believe there is any way you could make that payment each month for 10 years.**

So, let's consider the first card which shows a total payment amount of £60. You could pay this as a monthly payment of 50 pence every month for 10 years. So which box would you put that card into? (PLACE CARD IN BOX). **OK, so now please take the remaining cards and work through them, placing each in turn into the appropriate box** (GIVE CARDS TO RESPONDENT).

(INDICATE ALL THOSE CARDS IN ALL THREE "CAN AFFORD" CATEGORIES) **So these amounts are payments that, with different degrees of sacrifice you could afford to make. And these** (NOW INDICATE CARDS IN "CAN'T AFFORD" CATEGORY) **are amounts you could not afford.** (ENSURE RESPONDENT AGREES, IF NOT THEN ALLOW RESORT). (COLLECT ALL "CAN AFFORD" CARDS AND USE IN VALUATION QUESTIONS – SET "CAN'T AFFORD" CARDS ASIDE – THOSE ARE NOT USED AGAIN)

RECORD HIGHEST TOTAL AMOUNT FROM "*CAN AFFORD EASILY*" :BOX	£ _____

RECORD HIGHEST TOTAL AMOUNT FROM "*CAN AFFORD WITH SPENDING CUTS"* BOX	£ _____	
RECORD HIGHEST TOTAL AMOUNT FROM *"SPENDING CUTS, MONEY FROM ELSEWHERE"* BOX	£ _____	

(STRIKE THROUGH TO INDICATE A BOX WHICH DID NOT HAVE ANY CARDS PLACED IN IT)

BUDGET CONSTRAINT SAMPLE ONLY, show on the screen for interviewers use only:
Have you removed the "can't afford" money cards?
Yes or No
The system moves ahead when the answer is yes.

SECTION 2a: WILLINGNESS TO PAY QUESTIONS - First health state; first person

2a2 **BUDGET CONSTRAINT SAMPLE ONLY, SAY: I now want to go back to the four health state cards we saw earlier.**
ALL: [INDICATE SHOWCARDS "HEALTH STATE CARDS Ta, Pa, Tc, Pc"] **We are going to consider, in turn, how much your household would be prepared to pay to avoid each of these illnesses. In each case we want you to imagine that just one of these illnesses has occurred and the others will not occur.**

The computer will randomly select one of these to consider first.

[RANDOM DEVICE CHOOSES EITHER HEALTH STATE Ta, Pa, Tc, Pc]

The selected card is [Ta, Pa, Tc, Pc**]. So, suppose that a test has shown that [you/your child] is going to suffer the effects of illness** (INDICATE SYMPTOMS ON CARD)

[REMOVE NON-SELECTED HEALTH STATE SHOWCARDS. ENSURE THAT THE SELECTED CARD IS CLEARLY VISIBLE THROUGHOUT THE FOLLOWING QUESTIONS]

I want you to suppose that a treatment is available which would avoid all of the effects of illness [Ta, Pa, Tc, Pc**] to (you/your child). Suppose that this treatment was not available on the NHS nor would it be covered by private health insurance. Therefore the only way to obtain this alternative treatment would be to pay for it.**

Please remember that the illness would not affect the household's income. If the person affected is employed assume that an insurance scheme or state benefits would fully cover any loss of income associated with these health states.

You may feel that avoiding these effects is worth only a very little or even nothing. Then again, you may feel it is worth quite a lot.

2a3 cont.

To help you work out how much you think it would be worth, please consider these cards (PICK UP "CAN AFFORD" MONEY CARDS with BUDGET CONSTRAINT QUESTIONNAIRE or ALL CARDS with "NO BUDGET CONSTRAINT QUESTIONNAIRE").**We are going to use them to help you identify how much your household would be prepared to pay to prevent these effects.**

NON BUDGET CONSTRAINT SAMPLE ONLY SAY Each card shows, at the top, a different total payment amount. Now some of these amounts are considerably more than almost anyone could pay straight away, so underneath that we show the amount you would have to pay every month for 10 years to add up to that total amount. For each card in turn I would like you to think about how easy or difficult your household would find it to make that payment if you really had to.

Please imagine that the health state is taking effect immediately. This is how much the treatment will cost and you could pay it off over ten years in monthly instalments.

GIVE "PAYMENT SHEET" TO RESPONDENT

I'm going to ask you to sort them into three piles as shown on this sheet.

In this box (INDICATE "Definitely would pay" ON PAYMENT SHEET) **I'd like you to put all the amounts your household definitely would be prepared to pay to avoid [you/your child] suffering the effects of health state [**Ta, Pa, Tc, Pc**]. In this box** (INDICATE "Definitely would not pay" ON PAYMENT SHEET) **I'd like you to put all the amounts you definitely would not be prepared to pay. And if there are any amounts you are unsure about, we'll put them in this middle box (**INDICATE "Unsure" ON PAYMENT SHEET**) and come back to them later.**

As I show you each amount, please tell me which section you want me to put it into. When you are thinking about this,

with BUDGET CONSTRAINT QUESTIONNAIRE **recall from the previous exercise**

non BUDGET CONSTRAINT QUESTIONNAIRE **please consider**

the sorts of sacrifice you would have to make in order to fund the payment shown on the card. In making your decision, ask yourself, "Which would be worse for my household, enduring those sacrifices or [you/your child] suffering the effects of health state [Ta, Pa, Tc, Pc**]?"**

SHUFFLE THE MONEY CARDS

READ OUT: **I'm shuffling the cards so that they are in no particular order.**

TAKE FIRST CARD FROM THE TOP OF THE PILE, RECORD THIS AMOUNT,

FIRST AMOUNT £ ……

2a4

Suppose it cost your household *(monthly amount on card)* **each month for ten years, which amounts to** *(total amount on card)* **in total, to avoid the illness. Where would you put this card?**

PUT CARD IN APPROPRIATE SECTION OF PAYMENT SHEET
TAKE NEXT CARD FROM THE TOP OF THE PILE AND READ OUT:

ONCE RESPONDENT UNDERSTANDS THE PROCESS, HAND THE PILE OF CARDS TO THEM AND READ OUT:

Now please work your way through the rest of the money amounts, sorting them according to how you feel.

WAIT UNTIL RESPONDENT HAS SORTED ALL CARDS.
IF ANY CARDS IN "UNSURE" PILE ASK IF RESPONDENT WANTS TO RE-ALLOCATE.
WHEN CARDS IN APPROPRIATE PILES ENTER THE HIGHEST AMOUNT FROM THE CARDS PLACED ON THE 'WOULD PAY' PILE AND ENTER THE LOWEST AMOUNT FROM THE CARDS PLACED ON THE 'WOULD NOT PAY' PILE]

2a5

WOULD PAY HIGHEST AMOUNT £	**WOULD NOT PAY** LOWEST AMOUNT £	**UNCERTAIN**

[FOR BUDGET CONSTRAINT SAMPLE, IF HIGHEST WOULD PAY AMOUNT EQUALS HIGHEST "CAN AFFORD" VALUE, ASK FOLLOWING – ELSE SKIP TO NEXT QUESTION. NON BUDGET CONSTRAINT SAMPLE SKIP TO NEXT QUESTION]

2a5.1a **So you would pay all of the amounts that you earlier said you could afford. Do you now think you could afford a higher amount than that?**

No – SKIP TO NEXT SECTION
Yes

Please tell me what that amount would be

AMOUNT £.....

2a5.1b **Given that this amount is more than you earlier indicated you could afford, could you suggest upto two ways in which you would fund the extra expenditure.**

1. **reducing your spending on other things**
2. **not taking holidays**
3. **cashing-in your savings**
4. **selling-off things you own**
5. **moving to a cheaper property**
6. **borrowing money from friends or family**
7. **taking out a loan**
8. **Other (please specify).....**

(SKIP NEXT QUESTION – GO TO SECTION 2B)

2b5.2 **So you would pay** [SAY HIGHEST AMOUNT RESPONDENT WOULD PAY] **but not** [SAY LOWEST AMOUNT RESPONDENT WOULD NOT PAY]. **What amount between these two is the very most you think your household would definitely pay?**

[ENCOURAGE RESPONDENT TO VERBALISE/INDICATE THEIR HOUSEHOLD'S OWN WTP. COMPLETE TABLE BELOW]

RESPONDENT'S BEST ESTIMATE OF THE LARGEST WTP TO AVOID HEALTH STATE T/P FOR SELF/CHILD	£

SECTION 2b: WILLINGNESS TO PAY QUESTIONS - First health state; Second person

2b1 **Now let's consider the next health state.**

[IF FIRST CARD WAS Ta THEN NEXT CARD IS Tc]
[IF FIRST CARD WAS Tc THEN NEXT CARD IS Ta]
[IF FIRST CARD WAS Pa THEN NEXT CARD IS Pc]
[IF FIRST CARD WAS Pc THEN NEXT CARD IS Pa]

[REMOVE NON-SELECTED HEALTH STATE SHOWCARDS. ENSURE THAT THE SELECTED CARD IS CLEARLY VISIBLE THROUGHOUT THE FOLLOWING QUESTIONS]

The selected card is [Ta, Pa, Tc, Pc**]. So, suppose that a test has shown that [you/your child] is going to suffer the effects of illness** (INDICATE SYMPTOMS ON CARD)
As before, imagine that just this illness has occurred and the others will not occur.

Again please remember that the illness would not affect the household's income. If the person affected is employed assume that an insurance scheme or state benefits would fully cover any loss of income associated with these health states.

SHUFFLE THE MONEY CARDS

Again I want to find out the most that your household would pay to prevent this health state and to answer this I again want you to sort through the money amount cards.

2b2 [HAND THE PILE OF CARDS TO THEM AND READ OUT:]

Now please work your way through the rest of the money amounts.

[WAIT UNTIL RESPONDENT HAS SORTED ALL CARDS.
IF ANY CARDS IN "UNSURE" PILE ASK IF RESPONDENT WANTS TO RE-ALLOCATE.

WHEN CARDS IN APPROPRIATE PILES ENTER THE HIGHEST AMOUNT FROM THE CARDS PLACED ON THE 'WOULD PAY' PILE AND ENTER THE LOWEST AMOUNT FROM THE CARDS PLACED ON THE 'WOULD NOT PAY' PILE]

2b3

WOULD PAY HIGHEST AMOUNT £	**WOULD NOT PAY** LOWEST AMOUNT £	**UNCERTAIN**

[FOR BUDGET CONSTRAINT SAMPLE, IF HIGHEST WOULD PAY AMOUNT EQUALS HIGHEST "CAN AFFORD" **AMOUNT, ASK FOLLOWING – ELSE SKIP TO NEXT QUESTION. NON BUDGET CONSTRAINT SAMPLE SKIP TO NEXT QUESTION]**

2b3.1a **So you would pay all of the amounts that you earlier said you could afford. Do you now think you could afford a higher amount than that?**

No – SKIP TO NEXT SECTION
Yes

Please tell me what that amount would be

AMOUNT £.....

2b3.1b **Given that this amount is more than you earlier indicated you could afford, could you suggest upto two ways in which you would fund the extra expenditure.**

1. **reducing your spending on other things**
2. **not taking holidays**
3. **cashing-in your savings**
4. **selling-off things you own**
5. **moving to a cheaper property**
6. **borrowing money from friends or family**
7. **taking out a loan**
8. **Other (please specify).....**

(SKIP NEXT QUESTION – GO TO SECTION 2C)

2b3.2 **So you would pay** [SAY HIGHEST AMOUNT RESPONDENT WOULD PAY] **but not** [SAY LOWEST AMOUNT RESPONDENT WOULD NOT PAY]. **What amount between these two is the very most you think your household would definitely pay?**

[ENCOURAGE RESPONDENT TO VERBALISE/INDICATE THEIR HOUSEHOLD'S OWN WTP. COMPLETE TABLE BELOW]

RESPONDENT'S BEST ESTIMATE OF THE LARGEST WTP TO AVOID HEALTH STATE T/P FOR SELF/CHILD	£

SECTION 2c: WILLINGNESS TO PAY QUESTIONS - Second health state; first person

2c1 [REMOVE THE LAST HEALTH STATE CARD]
The next selected health state is [Pa, Pc, Tc, Ta]

IF SECTIONS 2a AND 2b WERE ORDERED Ta, Tc, THEN PICK HEALTH STATE CARD Pa

IF SECTIONS 2a AND 2b WERE ORDERED Tc, Ta, THEN PICK HEALTH STATE CARD Pc

IF SECTIONS 2a AND 2b WERE ORDERED Pa, Pc, THEN PICK HEALTH STATE CARD Ta

IF SECTIONS 2a AND 2b WERE ORDERED Pc, Pa, THEN PICK HEALTH STATE CARD Tc

ENSURE THAT THE CHOSEN CARD IS CLEARLY VISIBLE THROUGHOUT THE FOLLOWING QUESTIONS]

I now want you to think about this health state affecting (you/your child). Again I want to find out the most that your household would pay to prevent that happening.

SHUFFLE THE MONEY CARDS

2c2

HAND THE PILE OF CARDS TO THEM AND READ OUT:

Now please work your way through the rest of the money amounts.

WAIT UNTIL RESPONDENT HAS SORTED ALL CARDS.
IF ANY CARDS IN "UNSURE" PILE ASK IF RESPONDENT WANTS TO RE-ALLOCATE.

WHEN CARDS IN APPROPRIATE PILES ENTER THE HIGHEST AMOUNT FROM THE CARDS PLACED ON THE 'WOULD PAY' PILE AND ENTER THE LOWEST AMOUNT FROM THE CARDS PLACED ON THE 'WOULD NOT PAY' PILE]

2c3

WOULD PAY HIGHEST AMOUNT £	**WOULD NOT PAY** LOWEST AMOUNT £	**UNCERTAIN**

[FOR BUDGET CONSTRAINT SAMPLE, IF HIGHEST WOULD PAY AMOUNT EQUALS HIGHEST CAN AFFORD AMOUNT ASK FOLLOWING – ELSE SKIP TO NEXT QUESTION. NON BUDGET CONSTRAINT SAMPLE SKIP TO NEXT QUESTION.]

2c3.1a **So you would pay all of the amounts that you earlier said you could afford. Do you now think you could afford a higher amount than that?**

No – SKIP TO NEXT SECTION
Yes

Please tell me what that amount would be

AMOUNT £.....

2c3.1b **Given that this amount is more than you earlier indicated you could afford, could you suggest upto two ways in which you would fund the extra expenditure.**

1. **reducing your spending on other things**
2. **not taking holidays**
3. **cashing-in your savings**
4. **selling-off things you own**
5. **moving to a cheaper property**
6. **borrowing money from friends or family**
7. **taking out a loan**
8. **Other (please specify).....**

(SKIP NEXT QUESTION – GO TO SECTION 2D)

2c3.2 **So you would pay** [SAY HIGHEST AMOUNT RESPONDENT WOULD PAY] **but not** [SAY LOWEST AMOUNT RESPONDENT WOULD NOT PAY]. **What amount between these two is the very most you think your household would definitely pay?**

[ENCOURAGE RESPONDENT TO VERBALISE/INDICATE THEIR HOUSEHOLD'S OWN WTP. COMPLETE TABLE BELOW]

RESPONDENTS BEST ESTIMATE OF THE LARGEST WTP TO AVOID HEALTH STATE T/P FOR SELF/CHILD	£

SECTION 2d: WILLINGNESS TO PAY QUESTIONS - Second health state; Second person

2d1 [REMOVE THE LAST HEALTH STATE CARD]

The next selected health state is [Pa, Pc, Tc, Ta]

[IF PREVIOUS CARD WAS Ta THEN NEXT CARD IS Tc]
[IF PREVIOUS CARD WAS Tc THEN NEXT CARD IS Ta]
[IF PREVIOUS CARD WAS Pa THEN NEXT CARD IS Pc]
[IF PREVIOUS CARD WAS Pc THEN NEXT CARD IS Pa]

ENSURE THAT THE CHOSEN CARD IS CLEARLY VISIBLE THROUGHOUT THE FOLLOWING QUESTIONS]

This is the last of this type of question. So, thinking about this health state affecting (you/your child), again I want to find out the most that your household would pay to prevent that happening.

SHUFFLE THE MONEY CARDS

2d2 HAND THE PILE OF CARDS TO THEM AND READ OUT:

Now please work your way through the rest of the money amounts.

WAIT UNTIL RESPONDENT HAS SORTED ALL CARDS.
IF ANY CARDS IN "UNSURE" PILE ASK IF RESPONDENT WANTS TO RE-ALLOCATE.

WHEN CARDS IN APPROPRIATE PILES ENTER THE HIGHEST AMOUNT FROM THE CARDS PLACED ON THE 'WOULD PAY' PILE AND ENTER THE LOWEST AMOUNT FROM THE CARDS PLACED ON THE 'WOULD NOT PAY' PILE]

2d3

WOULD PAY HIGHEST AMOUNT £	**WOULD NOT PAY** LOWEST AMOUNT £	**UNCERTAIN**

[FOR BUDGET CONSTRAINT SAMPLE, IF HIGHEST WOULD PAY AMOUNT EQUALS HIGHEST CAN AFFORD AMOUNT ASK FOLLOWING – ELSE SKIP TO NEXT QUESTION. NON BUDGET CONSTRAINT SAMPLE SKIP TO NEXT QUESTION]

2d3.1a **So you would pay all of the amounts that you earlier said you could afford. Do you now think you could afford a higher amount than that?**

No – SKIP TO NEXT SECTION
Yes

Please tell me what that amount would be

AMOUNT £.....

2d3.1b **Given that this amount is more than you earlier indicated you could afford, could you suggest upto two ways in which you would fund the extra expenditure.**

1. **reducing your spending on other things**
2. **not taking holidays**
3. **cashing-in your savings**
4. **selling-off things you own**
5. **moving to a cheaper property**
6. **borrowing money from friends or family**
7. **taking out a loan**
8. **Other (please specify).....**

(GO TO NEXT SECTION)

2d3.2 **So you would pay** [SAY HIGHEST AMOUNT RESPONDENT WOULD PAY] **but not** [SAY LOWEST AMOUNT RESPONDENT WOULD NOT PAY**]. What amount between these two is the very most you think your household would definitely pay?**

[ENCOURAGE RESPONDENT TO VERBALISE/INDICATE THEIR HOUSEHOLD'S OWN WTP. COMPLETE TABLE BELOW]

RESPONDENT'S BEST ESTIMATE OF THE LARGEST WTP TO AVOID HEALTH STATE T/P FOR SELF/CHILD	£

SECTION 3: STANDARD DECISION QUESTIONS

SECTION 3a: (Interviewers to administer): First decision; First person

[REMOVE MONEY CARDS AND PAYMENT TEMPLATE]
READ OUT: **The last four questions asked you what your household is willing to pay to avoid different health effects for you and your child. The next four questions are rather different. They ask you to think about treatments with different chances of success and failure, without any reference to the issue of money.**

Some treatments give a very predictable outcome. But there are other treatments that may be more uncertain: sometimes they work well and improve people's health, but sometimes they fail and actually make things worse.

Which treatment you choose will probably depend on the chances of success or failure. In each question we will tell you the chances of failure but we will also show you a picture illustrating these chance. For example [SHOW "RISK PICTURE 10,000 PEOPLE" – THIS SHOULD FILL THE TOP HALF OF THE SCREEN]**, this picture represents 10,000 people, with each person shown as one of these little rectangles** [INDICATE]**. To illustrate a 50% chance of a treatment failing we change the picture like this** [SHOW "RISK PICTURE 50%"]**, where the black figures show people for whom the treatment failed and the others indicate those for whom the treatment succeeded.**

[BOTH "RISK PICTURE 10,000 PEOPLE" AND "RISK PICTURE 50%" ARE REMOVED FROM THE SCREEN]
RANDOM DEVICE CHOOSES WHETHER ADULT OR CHILD USED FOR FOLLOWING QUESTION
AS APPROPRIATE - THIS SHOULD FILL THE TOP HALF OF THE SCREEN POINT TO RELEVANT PARTS ON THE SHOWCARDS.

3a.1 READ OUT: **Let's consider the first of these questions. Suppose that a medical test shows that (you/your child) have/has contracted an illness. Suppose also that there are only two treatments available. Treatment A on the LEFT** (INDICATE) **is totally predictable: if you choose that one, (you/your child) will certainly end up with the health state** [INDICATE Ta/Tc – BOX ON LHS] **shown here.**
CAPI ALGORITHM NEEDED.
The outcome of treatment B on the RIGHT is uncertain. If you choose this then there is a 50% chance that it will succeed, resulting in (you/your child) avoiding all effects of the illness which will not recur in the future [INDICATE UPPER BOX ON RHS]**. However, there is a 50% chance that this treatment will fail resulting in (you/your child) ending up in the health state** [INDICATE Pa/Pc – LOWER BOX ON RHS] **shown here.**

[RETAIN PICTURE IN TOP HALF OF SCREEN; ADD "RISK PICTURE 50%" – TO FILL THE BOTTOM HALF OF THE SCREEN] **This picture illustrates the chances of each outcome under Treatment B**

You have to make the decision about which treatment to follow. Which treatment would you pick; A or B?

circle one only

SECTION 3b: (Interviewers to administer) : First decision; Second person

3b.1

IF ADULT CHOSEN IN PREVIOUS SECTION THEN USE CHILD FOR FOLLOWING QUESTION
IF CHILD CHOSEN IN PREVIOUS SECTION THEN USE ADULT FOR FOLLOWING QUESTION

IF SHOWCARD G1a USED PREVIOUSLY THEN CHANGE TO G1c : DISPLAY IN TOP HALF OF SCREEN
IF SHOWCARD G1c USED PREVIOUSLY THEN CHANGE TO G1a : DISPLAY IN TOP HALF OF SCREEN

POINT TO RELEVANT PARTS ON THE SHOWCARDS.

I now want you to consider the same scenario, but in this case applied to (you/your child).

Suppose that a medical test shows that (you/your child) has contracted an illness. Suppose also that there are only two treatments available. Treatment A on the LEFT *(INDICATE)* **is totally predictable: if you choose that one, (you/your child) will certainly end up with the health state [INDICATE Ta/Tc – BOX ON LHS] shown here.**

CAPI ALGORITHM NEEDED.

The outcome of treatment B on the RIGHT is uncertain. If you choose this then there is a 50% chance that it will result in (you/your child) avoiding all effects of the illness which will not recur in the future [INDICATE UPPER BOX ON RHS]. However, there is a 50% chance that this treatment will fail resulting in (you/your child) ending up in the health state [INDICATE Pa/Pc-LOWER BOX ON RHS] shown here.

[RETAIN PICTURE IN TOP HALF OF SCREEN; ADD "RISK PICTURE 50%" – TO FILL THE BOTTOM HALF OF THE SCREEN] **This picture illustrates the chances of each outcome under Treatment B**

You have to make the decision about which treatment to follow. Which treatment would you pick; A or B?

SECTION 3c: (Interviewers to administer) : Second decision; First person

RANDOM DEVICE CHOOSES WHETHER ADULT OR CHILD USED FOR FOLLOWING QUESTION

DISPLAY IN TOP HALF OF SCREEN G2a OR G2c AS APPROPRIATE

POINT TO RELEVANT PARTS ON THE SHOWCARDS.

3c.1 READ OUT: **Suppose that a medical test shows that (you/your child) have/has contracted an illness. Suppose also that there are only two treatments available. Treatment A on the LEFT** *(INDICATE)* **is totally predictable: if you choose that one, (you/your child) will certainly end up with the health state [INDICATE Pa/Pc – BOX ON LHS] shown here.**

CAPI ALGORITHM NEEDED.

The outcome of treatment B on the RIGHT is uncertain. If you choose this then there is a 50% chance that it will result in (you/your child) avoiding all effects of the illness which will not recur in the future [INDICATE UPPER BOX ON RHS]. However, there is a 50% chance that this treatment will fail resulting in (you/your child) dying.

[RETAIN PICTURE IN TOP HALF OF SCREEN; ADD "RISK PICTURE 50%" – TO FILL THE BOTTOM HALF OF THE SCREEN] **This picture illustrates the chances of each outcome under Treatment B**

You have to make the decision about which treatment to follow. Which treatment would you pick; A or B?

SECTION 3d: (Interviewers to administer): Second decision; Second person

IF ADULT CHOSEN IN PREVIOUS SECTION THEN USE CHILD FOR FOLLOWING QUESTION
IF CHILD CHOSEN IN PREVIOUS SECTION THEN USE ADULT FOR FOLLOWING QUESTION

IF SHOWCARD G2a USED PREVIOUSLY THEN CHANGE TO G2c: THIS SHOULD FILL THE TOP HALF OF THE SCREEN
IF SHOWCARD G2c USED PREVIOUSLY THEN CHANGE TO G2a : THIS SHOULD FILL THE TOP HALF OF THE SCREEN

POINT TO RELEVANT PARTS ON THE SHOWCARDS.

This is the last of this type of question. I want you to consider the same scenario, but in this case applied to (you/your child).

3d.1 READ OUT: **Suppose that a medical test shows that (you/your child) have/has contracted an illness. Suppose also that there are only two treatments available. Treatment A on the LEFT** *(INDICATE)* **is totally predictable: if you choose that one, (you/your child) will certainly end up with the health state [INDICATE Pa/Pc – BOX IN THE LHS] shown here.**

CAPI ALGORITHM NEEDED.

The outcome of treatment B on the RIGHT is uncertain. If you choose this then there is a 50% chance that it will result in (you/your child) avoiding all effects of the illness which will not recur in the future [INDICATE UPPER BOX ON RHS]. However, there is a 50% chance that this treatment will fail resulting in (you/your child) dying.

[RETAIN PICTURE IN TOP HALF OF SCREEN; ADD "RISK PICTURE 50%" – TO FILL THE BOTTOM HALF OF THE SCREEN] **This picture illustrates the chances of each outcome under Treatment B**

You have to make the decision about which treatment to follow. Which treatment would you pick; A or B?

SECTION 4: SOCIO-ECONOMIC CHARACTERISTICS

In order to ensure that we survey people from all walks of life and from all areas, I would now like to ask you some questions about you and your household. I would like to reassure you that all responses will be kept strictly confidential.

Q.S.1. Can you tell me your full postcode – I won't be asking for the house number.

Full postcode					-			

Q.S.2. Have your family ever had to face these sorts of health decisions in real life?

Circle Yes No Refused

Q.S.2b Does the child who we've been referring to in this interview live with you all or most of the time or do they live elsewhere?

1. Lives with me all or most of the time
2. Lives with me half of the time
3. Lives with someone else all or most of the time
4. Refused

QS3A: What is your working status? SHOWCARD

Working full time (30+ hours/week)
Working part time (less than 30 hours/week)
Not working, seeking employment
Not working, not seeking employment
Retired
Student
Other

Q.S.3. Are you the chief income earner in your household?

Chief income earner	1
Not chief income earner	2
No income earners	3

QS3B IF NOT CHIEF INCOME EARNER AT QS3 ASK: And what is your occupation?

.....

Q.S.4. Which of these statements best describes your marital status?

Married	1
Single	2
Cohabiting	3

Q.S.5. Which level best describes the highest level of education you have obtained until now?

SHOW CARD: CIRCLE ONE ONLY

O levels / CSEs / GCSEs (any grades)	1
A levels / AS level / higher school certificate	2
NVQ (Level 1 and 2). Foundation / Intermediate / Advanced GNVQ / HNC / HND	3
Other qualifications (e.g. City and Guilds, RSA/OCR, BTEC/Edexcel))	4
First degree (e.g. BA, BSC)	5

Higher degree (e.g. MA, Phd, PGSE, post graduate certificates and diplomas)	6
Professional qualifications (teacher, doctor, dentist, nurse, midwife, health visitor, other)	7
No qualifications	8
Other please specify	9

Q.S.6. Please could you look at this card [SHOWCARD 28] **and tell me in which category you would place your total household income from all sources before tax and other deductions?**

INTERVIEWER: PLEASE PROBE FOR AN ANSWER TO THIS QUESTION. EXPLAIN THAT THIS IS A CRUCIAL PIECE OF INFORMATION FOR DATA ANALYSIS. THEY ARE NEEDED BECAUSE IT IS IMPORTANT TO ENSURE THAT WE SURVEY PEOPLE FROM ALL WALKS OF LIFE THE ANSWERS WILL NOT BE LINKED TO THE NAME OF THE RESPONDENT AND THEY WILL NOT BE REVEALED TO ANY OTHER PARTY.

SHOWCARD 28: ONE CODE ONLY

	Per Week	Per Year	
A	Up to £86	Under £4,500	1
B	£87-£125	£4,500-£6,499	2
C	£126-£144	£6,500 - £7,499	3
D	£145-£182	£7,500 - £9,499	4
E	£183-£221	£9,500-£11,499	5
F	£222-£259	£11,500-£13,499	6
G	£260-£298	£13,500-£15,499	7
H	£299-£336	£15,500 - £17,499	8
I	£337-£480	£17,500 - £24,999	9
J	£481-£576	£25,000 - £29,999	10
K	£577-£769	£30,000 - £39,999	11
L	£770-£961	£40,000 - £49,999	12
M	£962-£1,441	£50,000 - £74,999	13
N	£1,442-£1,922	£75,000 - £99,999	14
O	£1,923 or over	£100,000 +	15

Refused

Q.S.7. Finally: overall, what did you think of this questionnaire?
MULTICODE OK

Interesting	1
Too long	2
Difficult to understand	3
Educational	4
Unrealistic/not credible	5

Other (specify)

THIS IS THE END OF THE INTERVIEW. THANK YOU FOR YOUR HELP!

QUESTION TO INTERVIEWER

Q.S.8 In your opinion, how easy or difficult did the respondent find the questionnaire?

Very easy	1
Fairly easy	2
Neither easy nor difficult	3
Fairly difficult	4
Very difficult	5
Don’t know	6

INTERVIEWER RECORD END TIME ☐☐ ☐☐
Hours Mins

Appendix 7: Supplementary resources for Field Study 2

SHOWCARD "HEALTH STATE RANKER"

Which health state has the….

Most adverse impact upon the household

Second most adverse impact upon the household

Third most adverse impact upon the household

Least adverse impact upon the household

SHOWCARDS "MONEY CARDS"

[EACH AMOUNT TO BE SHOWN ON A SEPARATE PLAYING CARD SIZED CARD]

Total amount: **£60** Monthly payment over 10 years **£0.50**	Total amount: **£90** Monthly payment over 10 years **£0.75**
Total amount: **£120** Monthly payment over 10 years **£1**	Total amount: **£300** **£120** Monthly payment over 10 years **£2.50**
Total amount: **£600** Monthly payment over 10 years **£5**	Total amount: **£1,200** Monthly payment over 10 years **£10**

£300

£2.50

£1,200

£10

Total amount:	**£3,600**
Monthly payment over 10 years	**£30**

Total amount:	**£6,000**
Monthly payment over 10 years	**£50**

£6,000

£50

Total amount:	**£9,000**
Monthly payment over 10 years	**£75**

Total amount:	**£12,000**
Monthly payment over 10 years	**£100**

£12,000

£100

Total amount:	**£18,000**
Monthly payment over 10 years	**£150**

Total amount:	**£36,000**
Monthly payment over 10 years	**£300**

£36,000

£300

Total amount:	**£60,000**	Total amount:	**£90,000**	**£90,000**
Monthly payment over 10 years	**£500**	Monthly payment over 10 years	**£750**	**£750**
Total amount:	**£120,000**	Total amount:	**£240,000**	**£240,000**
Monthly payment over 10 years	**£1,000**	Monthly payment over 10 years	**£2,000**	**£2,000**
Total amount:	**£360,000**	Total amount:	**£600,000**	**£600,000**
Monthly payment over 10 years	**£3,000**	Monthly payment over 10 years	**£5,000**	**£5,000**

Total amount	**£1,200,000**	Total amount	**£6,000,000**	**£6,000,000**
Monthly payment over 10 years	**£10,000**	Monthly payment over 10 years	**£50,000**	**£50,000**

SHOWCARD "BUDGET SORTER"

Can Afford: Easy to find money	**Can Afford:** Must make spending cutbacks (e.g. cheaper food, fewer new clothes, no pay-TV, no holiday)	**Can Afford:** Must make spending cutbacks and find money from elsewhere (e.g. cash-in savings, sell-off possessions, move to cheaper property)	**Can't Afford:** Could not make this payment

"PAYMENT SHEET"

Definitely would pay	Unsure	Definitely would not pay

G1a

TREATMENT A

FOR SURE:

You have severe stomach pains, diarrhoea and vomiting for 2-3 days every 2 weeks for **12 months**.

TREATMENT B

50% CHANCE

You avoid all effects from this illness.

50% CHANCE

You have severe stomach pains, diarrhoea and vomiting for 2-3 days every 2 weeks for **the rest of your life**

G1c

TREATMENT A

FOR SURE:

Your child has severe stomach pains, diarrhoea and vomiting for 2-3 days every 2 weeks for **12 months**.

TREATMENT B

50% CHANCE

Your child avoids all effects from this illness.

50% CHANCE

Your child has severe stomach pains, diarrhoea and vomiting for 2-3 days every 2 weeks **for the rest of your child's life.**

G2a

TREATMENT A

FOR SURE:

You have severe stomach pains, diarrhoea and vomiting for 2-3 days every 2 weeks for **the rest of your life**

TREATMENT B

50% CHANCE

You avoid all effects from this illness.

50% CHANCE

You become unconscious and subsequently die.

G2c

TREATMENT A

FOR SURE:

Your child has severe stomach pains, diarrhoea and vomiting for 2-3 days every 2 weeks **for the rest of your child's life.**

TREATMENT B

50% CHANCE

Your child avoids all effects from this illness.

50% CHANCE

Your child becomes unconscious and subsequently die.

Appendix 8: Algorithm used in Field Study 2 to update probabilities

The standard gamble algorithm starts at 50% risk of failure. As to say in the 1st question of the standard gamble we ask to compare the certain treatment with an uncertain treatment with the 50% chance of failure. Then if someone says no, reduce the risk as indicated by the higher dot in the next column. For example, this means going to 10%in the 2nd question. Alternatively, if someone says yes to a 50% risk, go down to the lower dot in the second column - this means raising the risk to 90% in the 2nd question. Following questions ask the appropriate risk value according to the previous answers.

Risk of Failure	1st Quest	2nd Quest	3rd Quest	4th Quest	5th Quest	6th Quest
1 in million						•
1 in 100,000					•	
1 in 10,000				•		
1 in 1,000					•	
1%			•			
2%						•
3%					•	
4%						•
5%				•		
6%						•
7%					•	
8%						•
10%		•				
15%					•	
20%				•		
25%					•	
30%			•			
35%					•	
40%				•		
45%					•	
50%	•					
55%					•	
60%				•		
65%					•	
70%			•			
75%					•	
80%				•		
85%					•	
90%		•				
95%			•			
99%				•		

Appendix 9: The ranking of illness scenarios in the second field study

	Perceived Severity			
Symptom	I (highest)	II	III	IV (lowest)
$Permanent_{child}$	57%	31%	10%	2%
$Permanent_{adult}$	38%	42%	16%	4%
$Temporary_{child}$	2%	18%	47%	33%
$Temporary_{adult}$	2%	10%	27%	61%

Appendix 10: Linear probability model investigating whether university education increases the probability an individual is weakly scope sensitive in the CV part of Field Study 1

a) Respondent's value for her own life

Predictor	Parameter (SE)	t value	p value
Intercept (*No university education*)	0.348 (0.042)	8.202	<0.001
University education (or higher)	0.081 (0.058)	1.389	0.166

Notes: Dependent variable = binary outcome for if WTP for a risk reduction of 1/1000 < WTP for risk reduction of 5/1000
Adjusted R-squared (OLS estimator) = 0.003; N = 279.

b) Respondent's value for her child's life

Predictor	Parameter (SE)	t value	p value
Intercept (*No university education*)	0.564 (0.042)	13.332	<0.001
University education (or higher)	0.085 (0.058)	1.467	0.144

Notes: Dependent variable = binary outcome for if WTP for a risk reduction of 1/1000 < WTP for risk reduction of 5/1000
Adjusted R-squared (OLS estimator) = 0.004; N = 282.

Appendix 11: Linear probability model investigating whether socioeconomic group affects scope sensitivity in Field Study 2

a) Respondent's value for her own life

Predictor (socio-economic group)	Parameter (SE)	t value	p value
Intercept (*AB*)	0.439 (0.037)	11.948	<0.001
C1B	-0.016 (0.048)	-0.343	0.732
C2	-0.021 (0.050)	-0.432	0.666
DE	-0.052 (0.045)	-1.154	0.249
Refused to say	0.311 (0.249)	1.249	0.212

Notes: Dependent variable = binary outcome for if WTP for a temporary condition < WTP for permanent condition
Adjusted R-squared (OLS estimator) = -0.0005; N = 994.

b) Respondent's value for her child's life

Predictor (socio-economic group)	Parameter (SE)	t value	p value
Intercept (*AB*)	0.400 (0.036)	11.119	<0.001
C1B	-0.036 (0.047)	-0.761	0.447
C2	-0.047 (0.049)	-0.963	0.336
DE	-0.043 (0.045)	-0.968	0.334
Refused to say	0.100 (0.244)	0.41	0.682

Notes: Dependent variable = binary outcome for if WTP for a temporary condition < WTP for permanent condition
Adjusted R-squared (OLS estimator) = -0.0002; N = 994.