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Measuring Intergenerational Time Preference: *Are* Future Lives Valued Less?

SHANE FREDERICK shanefre@mit.edu
Massachusetts Institute of Technology, Sloan School of Management, 38 Memorial Drive, E56-317, Cambridge, MA 02142, USA

Abstract

Prior research has estimated intergenerational time preferences by asking respondents to choose between hypothetical life saving programs. From such choices, researchers have concluded that the public heavily discounts the lives of people in future generations. However, using a multiversion survey involving 401 respondents, I show that imputed intergenerational time preferences can be dramatically affected by the specific question that is asked. Different elicitation procedures can yield widely varying results by evoking or suppressing various relevant considerations (such as uncertainty). Many formats revealed no preference for current generations over future generations.

Keywords: discounting, framing, intergenerational choice, time preference, value of life

JEL Classification: D9

Introduction

Many public policy decisions require tradeoffs between lives in this generation and lives in future generations.[1] For example, widening a mountain highway may cost the lives of construction workers now, but save lives of future motorists. Sequestering nuclear waste in a repository may reduce risks to future generations, but transporting it to the repository may increase risks for this generation. Money spent on heart transplants will have immediate benefits, whereas money spent on biomedical research may primarily benefit people who aren't yet born.

For such choices, policy makers must decide whether future lives should count less than current lives and, if so, what tradeoff rate is appropriate. Many believe that the appropriate rate ought to be based, at least in part, on public input.[2] However, there has been little descriptive research attempting to quantify the public's relative valuation of current and future lives.

One of the most widely cited studies of this type was conducted by Cropper, Aydede, and Portney (1991, 1992, 1994).[3] Using a telephone survey, they asked respondents in Washington D.C. and Maryland to choose between two hypothetical life-saving programs: one of which would save a specified number of lives now and the other of which would save a greater number in some designated future year. Johanneson and Johansson (1997) later conducted a similar study in Sweden.[4]

The results of these studies have been interpreted as showing that the public values the lives of people in future generations much less than they value the lives of people in this generation. For example, Cropper, Aydede, and Portney (1994) concluded that the typical

respondent would be willing to trade 45 lives in 100 years to save 1 life today, and the results reported by Johanneson and Johansson (1997) imply rates of substitution as high as 243 to 1 for a similar time horizon.

If the results of such surveys are to be used as an input to policy decisions, it is essential to determine their robustness. This paper describes a study which assesses intergenerational time preferences using seven different methods. 401 respondents received one of 4 versions of a questionnaire containing three choices or judgments pertaining to the relative valuation of current lives and future lives. The procedures included a matching task, a ratings task, and choice tasks with different contexts and emphases.

The alternate elicitation procedures implied dramatically different degrees of intergenerational time preferences. Some of the questions implied that saving a life now was 70 times more important than saving a life 100 years from now, whereas other methods implied that current and future lives were valued equally. The different elicitation procedures yield widely varying results because they evoke (or suppress) several distinct considerations or criteria relevant to the evaluation of such life saving programs (e.g., uncertainty, efficiency, and distributional equity), and because they produce, to different extents, experimental demand effects: cues about what a reasonable answer should be. Given the sensitivity to procedure, no single method will yield definitive results. Nevertheless, some procedures (such as a direct ratings task), are less likely to confound the assessment of pure intergenerational time preference with other considerations (such as uncertainty that the future deaths will actually occur), and these procedures provide no compelling evidence that the intergenerational discount rate is appreciably different from zero. Thus, considered collectively, these new findings challenge the validity of prior estimates of intergenerational discount rates.

The paper is divided into 4 sections. Section 1 briefly describes the overall design of the experiment, and the composition of the sample of respondents. Section 2 describes, in sequence, each of the 7 elicitation procedures, the wording of each question, and a description of the results. The end of the section summarizes the differences between the two groups of respondents used in this study: Pittsburgh residents serving jury duty at the civil courts, and a convenience sample of college undergraduates. For all seven elicitation methods, the responses of the older jury respondents implied a greater degree of discounting than the responses of the college undergraduates, though the differences across respondent groups was still small relative to the differences across methods. Section 3 summarizes the results of the various elicitation procedures, and contrasts these results with the results from prior studies of intergenerational time preferences. Section 4 offers concluding remarks.

1. Experimental design, procedures, and subjects

Four hundred and one respondents were randomly assigned one of four versions of a questionnaire. Each of the versions (A, B, C, or D) contained three questions designed to measure the relative valuation of current lives and future lives, as shown in Table 1.[5] These questions were separated by distractor tasks so that respondents would be less likely to attempt to coordinate their responses (e.g., by adjusting their responses so that each implied the same rate of substitution).[6] Two of the choice questions in the study were taken from Cropper, Aydede, and Portney (1994). The other six elicitation procedures were designed to test the

Table 1. Study design.

$n = 97$ Version A	$n = 103$ Version B	$n = 94$ Version C	$n = 107$ Version D
A_1 choice (100)	B_1 matching (100)	C_1 rating (100)	D_1 total (25)
distractor	distractor	distractor	distractor
A_2 sequence (25)	B_2 sequence (25)	C_2 equity (100)	D_2 equity (100)
distractor	distractor	distractor	distractor
A_3 total (25)	B_3 choice (25)	C_3 context+ (25)	D_3 context− (25)

robustness of the results obtained in those types of questions. All of the question formats are described below, and the results from them are presented sequentially.

The 401 respondents comprised two distinct groups. One consisted of 158 registered voters selected for jury duty at the Pittsburgh civil courts (average age = 43). The other was a convenience sample of 243 undergraduates at the University of Arizona and Carnegie Mellon University (average age = 20). For the purposes of reporting the results of the various elicitation procedures, the two groups were pooled. However, differences between the groups are reported in Section 3.8.[7]

2. Results and discussion

The following sections present and discuss the results obtained from the various elicitation procedures used in this multiversion, multiquestion study. In each case, the question that was asked is reproduced in an accompanying inset. The final section discusses differences between the two distinct samples of respondents whose results were pooled for the results reported below.

2.1. Choice

Two questions in this study were adopted verbatim from Cropper, Aydede, and Portney (1994). The first question in form A (reproduced below) asked respondents to choose between a hypothetical program that saves 100 lives this year, and a program that saves 7000 lives in 100 years. The third question in form B asked respondents to choose between a hypothetical program that saves 100 lives this year, and one that saves 200 lives in 25 years.

"CHOICE"

Each year some people in the United States may die as a result of exposure to certain kinds of pollutants. Unless there are programs to control this pollution, 100 people will die this year from pollution, and 7000 people will die 100 years from now. The government has to choose between two new programs to control this pollution. The two programs cost the same, but there is only enough money for one.

Program A will save 100 lives now.
Program B will save 7000 lives 100 years from now.

Which program would you choose? (circle one) **A** **B**

2.1.1. Results. Results were nearly identical to those obtained by Cropper, Aydede, and Portney (1991, 1992, 1994). In a direct choice, 49% (48/97) preferred the program that saves 100 lives now to the one that saves 7000 lives in 100 years (compared to 47% in Cropper, Aydede, and Portney). For the shorter horizon, 78% (80/103) preferred the program that saves 100 lives now to the one that saves 200 lives in 25 years (compared to 70% in Cropper, Aydede, and Portney).[8]

The near identity of results is noteworthy, because the sample used in this study (a mixture of Pittsburgh residents and college students) differed from theirs (a random sample of approximately 1500 households in Washington, D.C. and Maryland), as did the mode of administration (a paper and pencil questionnaire in this study compared to a phone interview in theirs). This suggests that any differences in implied intergenerational preferences between their results and the results of the elicitation procedures discussed next are not readily attributable to the differences in the composition of the sample or the administration mode.

2.2. Matching

The first question on version B was a "matching" task, in which respondents were asked to equate two hypothetical life saving programs, as shown below:

"MATCHING"

Each year some people in the United States may die as a result of exposure to certain kinds of pollutants. Unless there are programs to control this pollution, some will die this year from pollution, and some will die in the future. Consider **Program A** and **Program B** below, and then fill in the blank such that you would be indifferent between them—so that you would judge them to be equally good.

Program A will save **100** lives this year, but will save **0** lives 100 years from now.
Program B will save **0** lives this year, but will save ___ lives 100 years from now.

(Please look back at the number you wrote in the blank to make sure that you consider Policy A and Policy B to be equally good. If you change your mind, feel free to change your answer.)

2.2.1. Results. The median matching response was 324, which implies a median substitution rate of 3.2 to 1. This figure contrasts sharply with the 45 to 1 substitution rate reported by Cropper, Aydede, and Portney (1994), and with the even higher rates implied by the results of Johanneson and Johansson (1997). In fact, 43% (39/91) of respondents reported a value of 100, implying an equal weighting of current lives and future lives.[9]

The matching task may imply lower substitution rates because it presents the intertemporal comparison more neutrally than the choice tasks described above. Asking respondents to compare a program that saves a smaller number of lives now with a program that saves a greater number of lives in a future year compels the inference that there must be some reason to discount the future lives—otherwise, why would the experimenter be asking the question. The matching task has no such demand effect, because the intertemporal options are not fully specified; the respondents must generate the indifference value themselves.

Although this matching task implied much lower substitution rates than the choice tasks reported above, it was nevertheless true that some form of "discounting" prevails among many respondents. Nearly all (50/52) of the respondents who did not answer 100, reported

a greater number rather than a smaller one. However, it is unclear whether these responses ought to be interpreted as a straightforward manifestation or translation of an "intergenerational discount rate." Having lesser concern for the welfare of future people is not the only reason why respondents might specify a number larger than 100. They might do so because of some *other* relevant difference between the programs: to compensate for the fact that the future life saving program could not save *their* life, to repudiate the task's implicit assumptions (e.g., that it is possible to precisely quantify the effects of programs designed to save lives in the distant future), or even to protest the difficulty of being asked to quantify their relative degree of concern for temporally separated anonymous strangers.

2.3. Rating

The first question on version C asked respondents to directly compare a death 100 years from now with a death next year, and to rate the relative importance of those two outcomes, as shown below:

"RATING"

Carefully consider each of the two outcomes listed below:

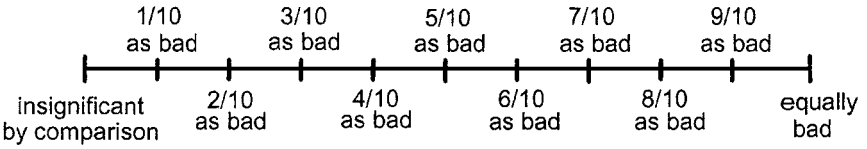
Outcome A: Next year, one person in the United States dies because of exposure to pollutants in the environment.
Outcome B: 100 years from now, one person in the United States dies because of exposure to pollutants in the environment.

Do you consider these two outcomes to be equally bad? **YES** **NO**

If **NO**, which outcome is worse? (Circle one) **A** **B**

[for those respondents who answered NO and circled A]

Compared to **Outcome A**, how bad is **Outcome B**? (Indicate on the scale below.)



2.3.1. Results. When forced to directly compare an immediate and more temporally remote death, 64% (60/92) judged them to be equally bad, 28% (26/92) judged the current death to be worse, and 8% (6/92) judged the future death to be worse. This procedure implies a substitution rate of 1 to 1, because most considered the two outcomes to be equally bad.[10] Even among those subjects who believed the current death was worse, the median relative severity judgment was 3/10—which implies a substitution rate of roughly 3 to 1. Again, these results contrast sharply with the much higher rates of substitution implied by earlier studies.[11]

2.4. *"Total"*

A fourth elicitation procedure appeared on two versions of the questionnaire (A_3 and D_1 in Table 1). It involved two programs whose effects spanned two time periods and explicitly mentioned the *total* number of lives saved over both time periods.

"TOTAL"

The government is considering two different life saving programs:

Program A will save 55 lives now and 105 more lives 25 years from now, for a total of 160 lives.
Program B will save 100 lives now and 50 more lives 25 years from now, for a total of 150 lives.

Which program would you prefer? (circle one): **A** **B**

2.4.1. Results. For this choice, respondents were almost equally divided: 46% (93/200) preferred Program A and 54% (107/200) preferred Program B. Indifference between Program A and Program B would imply a substitution rate of 1.2 (because $55k + 105 = 100k + 50$, when $k = 1.2$). Thus, on a group level, the question implies a median rate of substitution rate of approximately 1.2. In contrast, for a 25 year time horizon, Cropper, Aydede, and Portney (1994) report a substitution rate of 6 to 1 and Johanneson and Johansson (1997) found rates as high as 25 to 1.

It is noteworthy that 46% of respondents chose the future oriented program to save 7% more lives (160 vs. 150), because in the choice described earlier, which had the same time horizon, only 22% chose the future oriented program to save 100% more lives (200 vs. 100). At first glance, there is no apparent reason why the choice (100_0) vs. (200_{25}) ought to elicit any greater discounting than the choice (55_0, 105_{25}) vs. (100_0, 50_{25}). However, explicitly mentioning the total number of lives saved may have given respondents a compelling reason to choose the program that saves the greater total. Furthermore, countervailing reasons are not as salient with this format, because both programs save lives in both time periods and the differences in the temporal distribution of effects is more subtle. Consequently, when evaluating these two programs, many respondents may have found it reasonable to simply choose the program that saves more lives, in total. In contrast, when the two programs save lives in one generation *or* the other, a conversational norm of relevance discourages respondents from focusing solely on the total. As noted earlier, merely offering respondents a choice between saving 100 lives now or 200 lives in 25 years provides a very strong hint that the temporal distribution should not be ignored; that future lives *should* be discounted (because otherwise the question looks too trivial to bother asking about). The format of this question reduces the strength of these demand effects, and thereby make total lives a more compelling criterion for selecting among programs.[12]

2.5. *"Sequence"*

A fifth elicitation format, shown below, appeared on two versions of the questionnaire (A_2 and B_2 in Table 1). It asked respondents to choose between two programs that saved a total of 600 lives over the next three decades. One of the programs saved more lives in

each successive time period (100, 200, 300) whereas the other saved fewer lives in each successive time period (300, 200, 100).

"SEQUENCE"

The government is considering two different life saving programs. Both programs will be in effect for 30 years.

Program A will become *more effective* over time. It will save 100 lives this decade, 200 lives next decade, and 300 lives in the decade after that.
Program B will become *less effective* over time. It will save 300 lives this decade, 200 lives next decade, and 100 lives in the decade after that.

Which program would you prefer? (circle one): **A** **B**

2.5.1. Results. Program A (100, 200, 300) was preferred to Program B (300, 200, 100) by 71% (139/196) of respondents. Since Program A effectively delays 200 "units" of life saving from the first decade to the third decade, this result could be interpreted as implying that future lives are actually valued *more* highly than current lives. (Of course, if respondents extrapolated the sequence beyond the specified three decades, the total number of lives saved would no longer remain equal for the two programs, and the preferences would not necessarily imply that future lives are valued more highly.) This "sequence effect" is consistent with earlier research by Loewenstein and Prelec (1991, 1993), who found that intertemporal tradeoffs can be dramatically affected by explicitly embedding a consequence into a sequence (making the temporal relation among outcomes salient). This result extends that finding to an intergenerational context.

2.6. "Equity"

A sixth elicitation procedure, shown below, appeared on two versions of the questionnaire (C_2 and D_2 in Table 1). It asked respondents to choose between two programs that saved a total of 300 lives over the next three generations. Program A saved all 300 lives in this generation and no lives in future generations (300, 0, 0), whereas Program B saved 100 lives in each generation (100, 100, 100). Although discounting future lives should make Program A more attractive (because none of the life saving is delayed), equity concerns may make Program B more attractive.

"EQUITY"

The government is considering two different life saving programs:

Program A will save 300 lives in your generation, 0 lives in your children's generation and 0 lives in your grandchildren's generation.
Program B will save 100 lives in your generation; 100 lives in your children's generation, and 100 lives in your grandchildren's generation.

Which program would you prefer? (circle one): **A** **B**

2.6.1. Results. Overall, 80% (157/196) of respondents preferred Program B, which saves an equal number of lives in each generation, to Program A, which benefits only the present generation. This result shows that the desired intergenerational tradeoff depends on the perceived distribution of benefits and that intergenerational preferences cannot be simply characterized as a substitution rate (or discount rate).[13] The question formats used by Cropper, Aydede, and Portney (1991, 1992, 1994) or Johanneson and Johansson (1997) deprive respondents of the opportunity to express concerns for equity, by forcing them to choose between two inequitable programs—one that saves all lives now and none in the future or another that saves all lives in the future and none now. Thus, the substitution rates inferred from responses to those questions may not reflect concerns about equity that are clearly important.[14]

2.7. Context effects

The third question on versions C and D was included to test whether the choice between hypothetical life-saving programs is affected by the set of options considered. In each question, respondents ultimately chose between Program A, which saves 100 lives now, and Program C, which saves 200 lives 25 years from now. However, in this question, respondents did not make only this choice—they first compared Program A to a third program—Program B. In one condition (shown below), Program B was designed to be less attractive than Program C (it saved 103 lives 24 years from now, as opposed to 200 years 25 years from now). In the other condition (not shown), Program B was designed to be more attractive than Program C (it saved 7000 lives 26 years from now). If respondents infer something about the expected tradeoff rate from the choices with which they are presented, as suggested earlier, the characteristics of Program B should affect choices between Program A and Program C.[15]

"CONTEXT"

Each year some people in the United States may die as a result of exposure to certain kinds of pollutants. Unless there are programs to control this pollution, some will die this year from pollution, and some will die in the future. The government has to choose between three new programs to control this pollution. The three programs cost the same, but there is only enough money for one.

Program A will save 100 lives now.
Program B will save 103 lives 24 years from now.
Program C will save 200 lives 25 years from now.

If you had to choose between **Program A** and **Program B**, which would you choose? **A** **B**
If you had to choose between **Program A** and **Program C**, which would you choose? **A** **C**

2.7.1. Results. The characteristics of Program B substantially affected choices between Program A and Program C. When Program B was relatively superior to Program C (saving many more lives and only slightly more delayed), only 21% (22/104) preferred Program C to Program A. However, when Program B was relatively inferior to C (saving many fewer lives, and only slightly less delayed), 43% (39/91) preferred Program C to Program A. This

difference was highly significant ($\chi^2 = 10.65$; $p < 0.01$). Apparently, therefore, many respondents do not merely apply their own, predetermined time preferences to the presented options, but make inferences about the appropriate (or expected) substitution rate from the options they are provided.[16] Thus, as noted earlier, even presenting respondents with a choice between saving a smaller number of lives now or a greater number in the future may convey the message that future lives should be discounted, and when the future program saves *many* more lives, it conveys the message that future lives should be discounted a lot.

2.8. Comparing the jury respondents with the student respondents

For all the results presented thus far, the two subject groups were pooled. Table 2 reports the results of the nine elicitation procedures, disaggregated by subject group. For every elicitation format, the implicit discount rates of the jury sample exceeded those of the younger student sample and the differences were statistically significant (at the 0.05 level) for three of the procedures.

However, though the consistent differences between samples is worth exploring in future research, these differences are still small relative to the differences across procedures. For example, if the analysis is restricted to just the jury sample (which was a random sample of Pittsburgh residents), the implied rates of substitution (of lives in 100 years for lives now) still vary dramatically across procedures: from more than 70 to 1 for the dichotomous choice (64% preferred the hypothetical program that saved 100 lives now to one that saved

Table 2. A comparison of the jury sample and student sample.

Elicitation format	Stylized description	Result	Pooled sample	Jury sample	Student sample	Significance level (test)
Replication	100 lives now or 7000 lives in 100 yrs	% preferring 7000 in 100 yrs	51	36	60	$p < 0.05$ (χ^2 test)
Replication	100 lives now or 200 lives in 25 yrs	% preferring 200 in 25 yrs	22	18	25	Not sig. (χ^2 test)
Matching	100 lives now = ___ lives in 100 yrs.	Median response	324	1000	200	Not sig. (Mann-Whitney)
Rating	Is 1 future death as bad as 1 current death? Yes No	% answering "Yes"	64	63	65	Not sig. (χ^2 test)
Total	$(100_{\text{now}} + 50_{25\text{ yrs}})$ or $(55_{\text{now}} + 105_{25\text{ yrs}})$	% preferring (55 and 105) = 160	47	45	47	Not sig. (χ^2 test)
Sequence	(300, 200, 100) or (100, 200, 300)	% preferring (100, 200, 300)	71	65	75	Not sig. (χ^2 test)
Equity	(300, 0, 0) or (100, 100, 100)	% preferring (100, 100, 100)	80	72	85	$p < 0.05$ (χ^2 test)
Contrast(−)	100 lives now or 200 lives in 25 yrs	% preferring 200 in 25 yrs	43	35	48	Not sig. (χ^2 test)
Contrast(+)	100 lives now or 200 lives in 25 yrs	% preferring 200 in 25 yrs	21	8	28	$p < 0.05$ (χ^2 test)

7000 lives in 100 years) to 10 to 1 for the matching procedure (the median response was 1000), to roughly 1 to 1 for the ratings procedure (most judged the current and future death to be equally bad).

3. General discussion

Much of the empirical research on intergenerational discounting has concluded that the public values the lives of people in future generations much less than the lives of people in this generation. For example, Cropper, Aydede, and Portney (1994) concluded that the typical respondent would be willing to trade 45 lives in 100 years to save 1 life today, and the results reported by Johanneson and Johansson (1997) imply rates of substitution as high as 243 to 1 for a similar time horizon. Cropper, Aydede, and Portney (1994, p. 255 and 256) speculate that future lives are worth less because respondents "*do not feel as close a kinship with future anonymous lives as with present anonymous lives*" and that respondents' choices "*presumably reflect ethical values*." Similarly, Johanneson and Johansson (1997, p. 169) assume that the representative respondent "*values the interests of the current generation higher than he values the interests of future generations*."

This study does not support these interpretations. Although the findings of previous research were replicated when identical elicitation procedures were adopted, other elicitation procedures yielded dramatically different results. Indeed, many of the alternate elicitation procedures tested here suggest that lives in this generation and lives in future generations are valued about equally, as the implied rates of substitution are close to 1 to 1. Table 3 reports the differences in the implied substitution rate (of future lives for current lives) across studies and elicitation procedures.

The large differences in the implicit rate of substitution between elicitation formats is undoubtedly driven by the difficulty and unfamiliarity of the tasks. Respondents have no prior experience comparing the importance of lives in different generations, and will, therefore, likely be strongly influenced by any aspect of the comparison that the particular elicitation procedure (e.g., choice, matching, and rating) or format (e.g., total, sequence, equity, context) happens to make salient. If the question emphasizes total, many will choose the program with the highest total; if it emphasizes sequence, many will choose the program with an increasing sequence; if it emphasizes equity, many will choose the program that seems most equitable. The programs that best satisfy these various considerations are not necessarily those that would be chosen if respondents simply applied a given discount rate to the specified number of future lives.

The differences across procedures may also reflect variation in the degree to which the elicitation format encouraged or permitted respondents to reject the premises of the scenario. In choice tasks, respondents can readily express skepticism that the future deaths will actually occur by simply choosing the present-oriented program. However, the rating format effectively forces respondents to directly compare the prospect of a current and future death—the comparison they *must* make, if one wishes to use their responses to compute an intergenerational time preference, *per se*. Thus, while binary choice procedures are relatively easy for researchers to formulate and for respondents to answer, they may often confound diminished concern for the future outcome (a pure time preference) with

Table 3. Implied rate of substitution (of future lives for current lives).

Question format	Time horizon	No. of future lives = 1 current life: Cropper, Aydede, and Portney (1994)[a]	Johanneson and Johansson (1997)[b]	Present study[c]
Binary choice	100	45	>243	≈45
Binary choice	25	6	25	≈6
Matching	100			≈3
Rating	100			≈1
Equity	100			<1
Total	25			≈1
Sequence	25			<1

[a]The rates of substitution are those reported by Cropper, Aydede, and Portney (1994, p. 243).
[b]Johanneson and Johansson (1997) used essentially the same question formats as Cropper, Aydede, and Portney (1994). However, their long time horizon questions were 75 years, rather than 100 years, and they used two slightly different framings. When the choices were framed as [100] lives now vs. [some multiple of 100] lives in 75 years, the implied substitution rate was 243 to 1. When the choices were framed as [100] lives in 75 years vs. [some fraction of 100] lives now, the implied rate of substitution was 32 to 1. Thus, Johanneson and Johansson (1997) also found that implied intergenerational preferences were sensitive to minor changes in question format. However, their results were qualitatively comparable to Cropper, Aydede, and Portney's, as both formats implied that the lives of future generations were valued much less than lives in this generation.
[c]The median rate of substitution cannot typically be computed from a single dichotomous choice question (unless the choice proportion happens to be 50%). I assumed that the rate of substitution implied by this format was approximately the same as that found by Cropper, Aydede, and Portney (1991, 1992, 1994), because, as reported in Section 2.1, the results for the two questions were almost identical.

many other considerations, such as uncertainty about whether the deaths will really occur, or uncertainty that the program will remain in place.

For many of the elicitation procedures, there is little basis for believing that expressions of preference for present oriented programs do, in fact, reflect a diminished concern for future generations, *per se*. Indeed, when Cropper, Aydede, and Portney asked respondents who consistently preferred the present-oriented program to explain why (see Table 1 on p. 250 of their 1994 publication), the responses were coded as follows:[17]

• Technological progress provides means to save people in the future	31.3%
• One should live day by day	31.7%
• Future is uncertain	15.4%
• The life I save may be my own	6.5%
• Present-oriented program saves more lives	1.6%
• Saving lives now means more lives in the future	2.8%
• Other	7.7%
• Do not know	2.9%

Notably, there is no category labeled "I care less about future generations than this generation" or anything that suggests "ethical values" or "kinship" or a diminished concern for future people. In the study presented here, respondents were not requested to explain their answers, but were invited to comment on the questions or their answers if they wished. These comments suggest reasons similar to those listed above. Many respondents refused to believe that the future deaths would actually occur (e.g., "We'll figure out a way to save lives in the future," "Technology will change and guarantee higher survival rates," "In 100 years, a solution might be found to save the life."). Others were dubious of the long-term commitment by the government needed to ensure that the future programs would be instituted (e.g., "I don't trust long term projects in the hands of government agencies which are subject to political whims."). None of the 29 people who offered written justifications for their choice indicated that they felt less concern for, or empathy toward, or kinship with future people.

4. Conclusion

The results of this study cast doubt on previous claims that the public values future lives much less than present lives. Many of the elicitation procedures tested here indicate no substantial discounting of future lives. When coupled with the direct statements of respondents in earlier studies (see Cropper, Aydede, and Portney, 1994, p. 250), these new results suggest that the preferences for present-oriented life-saving programs found in earlier research do not reflect respondents' ethical values or "*pure* rate of social time preference."

These new results do not imply that there is no basis for having less regard for outcomes that occur in the more distant future. For example, the spill of a carcinogen one hundred years from now may be less important than a spill five years from now, because a cure for cancer is more likely to be found in the next hundred years than in the next five. However, if one is interested in assessing rates of technological progress or the probabilities that future events will actually occur, there are better ways to ask the question—not to mention better procedures for determining these figures than surveying public beliefs. If one is interested in the importance or moral significance of future people vs. current people, it seems better to simply ask about this directly. When respondents in this study directly compared the severity of current and future deaths (in the ratings format), most regarded them as equally important.

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Notes

1. A 1991 ruling by the U.S. Fifth Circuit Court of Appeals [947 F.2d (5th Cir. 1991)] overturned an asbestos regulation issued by the Environmental Protection Agency (EPA) in part because the EPA did not discount

the future lives that would be saved. On p. 1218 of that ruling, the judges commented: "... *it would skew the results to discount only costs without according similar treatment to the benefits side of the equation ... Because the EPA must discount costs to perform its evaluations properly, the EPA should also discount benefits to preserve an apples-to-apples comparison, even if this entails discounting benefits of a non-monetary nature* [the future lives that would be saved by the regulation].

2. Some reject the view that the social rate of time preference ought to be determined by surveying and aggregating the intergenerational preferences of the current members of society. Page (1977, pp. 169–170) characterizes this practice from the viewpoint of a future generation:

> "As you grow up, it is explained to you that the world is going to end very shortly because earlier generations wanted to live well ... You might well call out to the ghosts of the first generation, demanding by what right it made its decision. It would hardly be satisfying to hear the answer, "We took a vote of all those present and decided to follow our own time preferences."

3. The studies of Cropper, Aydede, and Portney (1991, 1992, 1994) have subsequently been cited in 40 different academic journals, including articles about the social costs of auto accidents (Miller et al., 1997), risk-benefit analyses of cigarette smoking (Dardis and Keane, 1995), the rationing of medical care (McKie, 1999), sustainable development (Chichilnisky, 1997), and the appropriate procedures for removing abdominal aneurysms (Enemark et al., 1998).
4. Horowitz and Carson (1990), Olsen (1993), Cairns (1994), and Poulos and Whittington (2000) also elicited discount rates over life saving interventions. They found discount rates of 5–13%, 7–23%, and 16–38%, and 11–206%, respectively. However, these studies all used intervals of twenty years or less, and are not as readily interpreted as intergenerational time preferences, which are the primary focus of this paper.
5. Four questions appeared on just one version: the choice between 100 lives now or 7000 lives in 100 years, the choice between 100 lives now or 200 lives in 25 years, the matching question, and the rating question. Four other questions appeared on two versions. The "sequence" question appeared versions A and B, the "equity" question appeared on C and D, and the "total" question appeared on A and D. Because there were 401 respondents and four versions, the sample size was roughly 100 for the questions that appeared on one version and roughly 200 for the questions that appeared on two. (The reported proportions were slightly smaller than 100 or 200, because a few respondents who received a questionnaire did not answer all three questions, or produced one or more illegible responses.)
6. One of the "distractor" tasks involved a judgment of the relative viscosity of various fluids. The other involved a judgment of the relative values of different amounts of money delivered at different times.
7. The jury respondents filled out the questionnaire while they were waiting (often for hours) to find out whether they would be selected for jury duty. The students filled out the questionnaire before class. Respondents in both groups received either a candy bar or a lottery ticket for completing the questionnaire.
8. Cropper, Aydede, and Portney do not report exactly which dichotomous questions they asked. However, figure 2 on p. 250 of their 1994 publication indicates that for a time horizon of 25 years and a substitution rate of 2 to 1, roughly 70% of respondents preferred the immediate program to the future program. (The median rate of substitution was the ratio of future lives to current lives in the choice for which half the respondents preferred the future program and half preferred the immediate program.)
9. The discrepancies between the choice and matching procedures can be viewed another way as well. While 49% of the respondents in the previous task preferred the program that saved 100 lives now to one that saved 7000 lives in 100 years, only 23% (21/91) of the respondents in this format generated a number greater than 7000.
10. It is possible that this question wording prohibited respondents from expressing their intertemporal preferences, because a respondent may care less about future people, yet still report that the two outcomes are equally "bad" in some abstract utilitarian sense. Others may have felt embarrassed to report directly that they cared less about one person than another.
11. Chapman (2001) used a choice procedure similar to that used by Cropper, Aydede, and Portney (1992, 1994) and Johanneson and Johansson (1997). However, unlike these studies, she first asked respondents whether saving lives in future generations is as important as saving lives in this generation before offering them choices between saving 100 lives now and greater numbers in future years. Notably, the respondents who thought that

future and current generations were equally important did not behave differently in a subsequent choice task, suggesting that their responses were driven by something other than time preference.

12. A follow up study involving 190 MBA students at the Massachusetts Institute of Technology further tested two of the questions used in this study, including this one. Following class, respondents randomly received one of two versions of this question, in which the 105 future lives that Program A saved were described as occurring in either 25 years (as in the original study) or in 100 years. When the 105 lives were saved in 25 years, 40% (38/94) chose Program A, but when they were saved in 100 years, only 26% (25/96) chose Program A ($\chi^2 = 4.43$; $p < 0.05$). This suggests that many respondents are attending to the quantitative details specified in such scenarios.
13. No substitution rate (or discount rate) could, by itself, explain the set of preferences (100,100,100)$\succ$(300,0,0) $\succ$ (0,0,300), which these results suggest. Such preferences could be explained by invoking diminishing marginal utility of additional lives within a generation, which would penalize unequal distribution across generations. However, it does not typically make sense to suppose that someone's life has less value (to themselves or to society) because someone else's death is prevented. Furthermore, there is no good reason for isolating the effects of this particular project when calculating the marginal value of an additional life saved. The effects of the life-saving project could just as easily be subtracted from the 4 million or so deaths that occur annually in the U.S., such that the net effect of the alternate programs are (3,999,900, 3,999,900, 3,999,900) vs. (3,999,700, 4,000,000, 4,000,000). This formulation makes the claim of diminishing marginal utility far less compelling.
14. A follow up study involving 190 MBA students at the Massachusetts Institute of Technology tested this question further. After class, respondents randomly received one of two versions of this question, in which Program A saved either 300 [or 500] lives in this generation (and none thereafter). Among these respondents, 56% (53/94) preferred Program A when it saved 300 lives while 71% (68/96) preferred Program A if it saved 500 lives ($\chi^2 = 4.29$; $p < 0.05$). This suggests three things. First, it shows that respondents are sensitive to the quantitative details of such scenarios. Second, it shows that a substantial minority prefer the more equitable Program B, even though it saves fewer lives in total. Third, relative to respondents in the original study, significantly more MBA students preferred the program in which all the life saving is concentrated in this generation (56% vs. 20%; $\chi^2 = 30.0$; $p < 0.001$).
15. Simonson and Tversky (1992) note that salespeople commonly exploit such context effects by first presenting consumers with a much higher priced, only slightly better "decoy" product before showing them the real product they intend on selling, which then looks like a bargain by comparison.
16. For a discussion of an analogous concept in the context of consumer choice, see Huber, Payne, and Puto (1982).
17. In the study for which these retrospective verbal protocols were elicited (which was conducted with 564 households in Washington D.C), Cropper, Aydede, and Portney used a "double-bounded" dichotomous choice procedure in which respondents were first given a choice between a program which saved lives now and a program which saved lives 50 years from now. If they chose the present oriented program, they were given a second choice in which the future program was made more attractive by reducing the time horizon from 50 to 25 years. The respondents who still preferred the present-oriented program were asked to state, in their own words, the reason for their choices.

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