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LIFE AFTER DEATH: AN INVESTIGATION INTO HOW MORTALITY PERCEPTIONS INFLUENCE FERTILITY PREFERENCES USING EVIDENCE FROM AN INTERNET-BASED EXPERIMENT

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Abstract. Both life history theory and demographic transition theory predict that fertility responds to changes in mortality, but there have been relatively few tests which identify links between mortality perceptions and fertility preferences at the individual level. This paper provides an individual-level investigation of the relationship between mortality and fertility, by testing whether mortality priming results in an increase in fertility preferences. Data were collected via an internet-based experiment of students at the London School of Economics (LSE), who were randomly allocated between two questionnaires. The treatment questionnaire asked a set of mortality priming questions and then collected information on fertility preferences and attitudes towards the costs and benefits of children. The control questionnaire recorded information on fertility preferences without prior mortality priming. The results suggest that mortality priming resulted in higher ideal number of children for males, but not for females. There were no significant differences in the attitudes towards the costs and benefits of children for either sex, though the raw data suggest a slight shift towards viewing children as less costly after mortality-priming, particularly for men. This paper therefore argues that the reaction of fertility to mortality may be at least partly mediated by a direct psychological link between mortality perceptions and reproductive behaviour.

Keywords: fertility preferences, life history theory, online experiment, terror management theory

LITERATURE REVIEW

There are only two events that are inevitable in the life of every human being: birth and death. Population science has from its inception made strong causal links be-

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tween fertility and mortality (NI BHROLCHAIN and DYSON 2007). The seminal ideas of Thomas Malthus, developed at the end of the 18th century, revolved around how population growth is kept in line with its resource base by any increases (or decreases) in fertility being matched with increases (or decreases) in mortality, and vice versa (KNUTSEN 2003). In the post-WWII period demographic transition theory was developed, which highlighted that declines in fertility rates are preceded by declines in mortality. Because of the time order of the changes an implicit causal argument was developed, whereby fertility decline was linked as an underlying 'demographic response' to changes in mortality (e.g. DAVIS 1963; CASTERLINE 2003; CLELAND 2001)

Both Malthusian and demographic transition theories are focused at the macro-level, and their causal claims have recently lost impact within population research, because of the scarcity of evidence demonstrating any mortality–fertility relationship at the individual level. Explaining fertility levels has now moved on to numerous other factors and models, for example: intergenerational wealth flows (CALDWELL 1982), micro-economic 'household' models (BECKER 1991), diffusion and cultural change (CLELAND and WILSON 1987), the effectiveness of family planning programmes (FREEDMAN 1997), changes in gender equality (MCDONALD 2000) and social structures (NEWSON et al. 2005), to name but a few. Few of these theories, however, incorporate evolutionary ideas into their models. Here, we argue that the incorporation of evolutionary theory is important to understanding fertility decline, and revisit the relationship between mortality perceptions and fertility preferences at the individual level, using the theoretical framework of life history theory.

A key element of human behaviour is its relative flexibility to varying environmental conditions (LALAND and BROWN 2002; SMITH and WINTERHALDER 1992; BORGERHOFF MULDER 1991), an ability which has allowed us to colonise diverse environments successfully (WELLS and STOCK 2007). Hence fertility and reproductive decision-making is expected to vary under different environmental conditions. Life history theory predicts that fertility behaviour is likely to be particularly sensitive to mortality levels and patterns, given the key importance of mortality in determining the payoffs to life history decisions such as when to stop growing and reproducing, how to allocate investment between quantity and quality of children, etc. (e.g. STEARNS 2000). High and unpredictable mortality regimes are likely to favour an early start to reproduction and high fertility, whereas low and stable mortality is predicted to lead to later and lower fertility. An early start to reproduction is necessary where the risk of dying before reproductive maturity is high, and, given the high parental investment needed in human children, high mortality will select for parents who spread their investment across many, albeit low quality, children, in order to mitigate against the risk of all children dying before they can successfully reproduce. Conversely, under more benign mortality conditions, a later start to reproduction may be favoured (allowing a longer growth period) and parents should reduce the number of offspring, to avoid diluting parental investment across

too many surviving children: such dilution of parental investment risks weakening the competitiveness of children and their ability to successfully mate and reproduce.

So, both demography and life history suggest that a shift towards lower fertility will be seen under low mortality conditions – but how might this effect be brought about? There is, of course, a direct physiological relationship between mortality and fertility. In natural fertility societies, birth intervals are considerably shorter after a stillbirth or neonatal death than after a child who survives for some time after birth: ovulation resumes much more quickly in the absence of a surviving child, because there is no inhibiting effect of lactation on ovulation (e.g. RONSMANS 1996; GUZ and HOBCRAFT 1991). But our species has a long history of manipulating the probability of conception, even in the absence of effective modern contraception. Which leaves open the possibility that our evolved psychological mechanisms may respond to changing mortality conditions, by a preference for higher fertility in high mortality conditions and lower fertility under low mortality. We therefore suggest that the processes given in *Figure 1* may link mortality to fertility at the individual level.

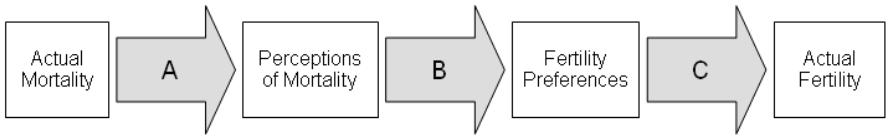

Figure 1. Causal process linking mortality to fertility

This research will focus upon establishing part B of the chain. The link between desires and preferences for children and actualised fertility in part C of the chain is likely to be complicated, certainly in the context of fertility negotiations being made between males and females (SMALLWOOD and JEFFERIES 2003; KOHLER et al. 2005; BERRINGTON 2004) but for the purposes of this paper we will simply assume that there is such a link between desired and realised fertility preferences, and concentrate on arrow B. Part A may also not be entirely straightforward. There is relatively little research on how accurately individuals perceive mortality risks, though there may be various biases which affect accuracy of mortality perceptions (MONTGOMERY 2000). In recent years, for example, media coverage of events where individuals have died, such as natural disasters and terrorist attacks, could induce perceptions of mortality in excess of the actual lives lost. There has been a popular assumption that the September 11th terrorist attacks resulted in an increase in fertility in New York and the wider United States (MSNBC 2006), though we have not found academic empirical evidence to support this claim. More convincing research into events such as Hurricane Hugo (COHAN and COLE 2002) and the Oklahoma City bombing (RODGERS et al. 2005) has shown higher fertility levels following these mortality-enhancing events. Such research supports our argument of a link between mortality perceptions and fertility, though in reality such events, devastating as they may be to the communities involved, have a negligible effect on

the mortality of a population. A recent study which demonstrates evidence of a fertility response to a mortality crisis which did have a substantial impact on national-level mortality rates, that associated with the Khmer Rouge regime in Cambodia, further supports the argument that fertility rises as a direct response to mortality in ways which cannot be entirely attributed to the physiological response of the female reproductive system to child mortality. Here fertility demonstrated a sustained (10-year) rise after the mortality crisis in the late 1970s, in which 25% of the population died (HEUVELINE and POCH 2007).

HYPOTHESIS

We predict, therefore, that mortality salience should increase fertility preferences.

METHODOLOGY

We used an internet-based questionnaire experiment to test the hypothesis that mortality priming would increase fertility preferences. Participants were randomly allocated into two conditions. The treatment condition first induced mortality salience by asking questions related to death and the process of dying, and then measured fertility preferences. The control condition reversed the two sections of the questionnaire, so that fertility preferences were elicited before mortality questions were asked. Both treatment and control conditions included a number of questions on background information at the end of the questionnaire, including age, gender, relationship status, whether they had existing children, socio-economic status, ethnicity and region of origin. Participants were all students at the London School of Economics (LSE). An email was sent to all students at the LSE inviting them to participate in the survey on 15th May 2007. The questionnaire remained open until 25th May 2007. Such internet surveys of student populations do not represent any kind of random sample of the UK population, or even of the student population at LSE, since participation is voluntary. However, such internet experiments allow experimental testing of a particular hypothesis: by random allocation, all factors are held constant between the treatment and control populations except for the mortality prime. And an advantage of using a non-random sample such as a student body is that they are a relatively homogenous group in terms of age, childbearing history, socio-economic status (SES) and educational level, as well as being easily accessible.

OPERATIONALISATION

We used a series of 11 closed questions on death and dying to act as mortality priming (see *Appendix 1*). For an internet study a series of closed questions was considered appropriate in order to minimise drop-out and to regulate the treatment. Some questions were designed to elicit information on the likely sensitivity of the respon-

dent to mortality priming, to determine whether such individuals were particularly likely to demonstrate a treatment effect (such as question 11).

Fertility preferences were measured in two ways. First, the desired number of children was assessed with the question *'if you could chose the ideal number of children that you would, have during your whole life, how many would that be?'*. The participant's confidence in this answer was determined with the question *'In reference to the above question, how likely do you think it is that you will be able to have that number of children?'* Secondly, participants were questioned on their perceptions of the costs and benefits of children. When attempting to measure change in fertility preferences it is likely that some aspects of fertility decision making will not be captured simply by questions asking for an ideal number of children. Such a response in a low-fertility country such as the UK will be largely limited to a small number of outcomes (typically zero to four), and will be discrete. It would therefore be very useful to examine the extent to which mortality salience affects the participant's attitudes towards the costs and benefits of children. These attitudes were measured via a battery of questions assessing the extent of agreement with various cost / benefit statements. For example *'children provide costs for their parents' socialising / leisure time*' (see *Appendix 1*). We also included a smaller section measuring participants' perceptions of the financial, social, employment and emotional consequences of having children.

Given the possibility of causing distress to participants, for example those whom had suffered a recent bereavement, we included a warning on both the covering email and on the first page of the survey of the potential for emotional distress and were provided with clearance from the LSE Research Ethics Committee.

PARTICIPANTS

872 participants completed the questionnaire, which is approximately 10% of the LSE's student population. The key background features of the participants, as well as those for the entire LSE student population, are given in *Table 1*. No significant differences between the treatment and control groups were found in any of the background variables, using a series of chi-square association tests (results not shown). The participants were not entirely representative of the LSE student population: women appeared to be somewhat over-represented. As expected for a student population, participants were relatively young with over 60% under the age of 25 (the modal age group for men and women being 20–24), and therefore were mostly childless and not in cohabiting relationships. The sample was also very homogenous in terms of SES, with most participants having highly educated parents from the professional/managerial social class. There was more diversity in the region of origin of participants: only about 30% originated from the UK, which approximates the proportion of UK students across the (very international) LSE student body.

Table 1. Selected background demographics of participants (except for total number the percentage figure relates to distribution within each treatment group)

		TREATMENT	CONTROL	Approximate LSE wide
Total		428 (49%)	444 (51%)	9000
Sex	Male	166 (39%)	169 (38%)	4400 (49%)
	Female	261(61%)	271 (61%)	4600 (51%)
	Missing / prefer not to say	1 (0%)	4 (1%)	
Age	Under 25	276 (65%)	266 (60%)	n/a
	25 or over	151 (35%)	174 (40%)	
	Missing / prefer not to say	1 (0%)	4 (1%)	
Any biological children	Yes	10 (2%)	29 (7%)	n/a
	No	414(97%)	410 (92%)	
	Missing / prefer not to say	4 (1%)	5 (1%)	
Ethnicity	Asian	63 (14%)	79 (15%)	2,100 (15%)
	Black	6 (1%)	10 (2%)	180 (2%)
	White	302 (71%)	306 (69%)	3,590 (40%)
	Other and mixed ethnicity	34 (8%)	39 (9%)	520 (6%)
	Missing / prefer not to say	23 (5%)	10 (2%)	2,700 (30%)
Religion	Agnostic	78 (18%)	96 (22%)	n/a
	Atheist	143 (33%)	114 (26%)	
	Christian	138 (32%)	151 (34%)	
	Other	52 (12%)	70 (16%)	
	Missing / Prefer not to say	17 (4%)	18 (3%)	
Region of origin MEDCS	Europe	143 (33%)	130 (29%)	1,810 (21%)
	UK	128 (30%)	118 (27%)	2,960 (34%)
	N America / Australia	75 (18%)	85 (19%)	1,180 (14%)
Region of origin LEDCS	East Asia	17 (4%)	28 (6%)	1,420 (16%)
	S America / Caribbean	26 (6%)	28 (6%)	280 (3%)
	South & SE Asia	22 (5%)	24 (5%)	690 (8%)
	West Asia and Africa	11 (2%)	17 (2%)	300 (4%)
	Missing / Prefer not to say	6 (1%)	14 (4%)	15 (0%)
Parental Education	0–14 years	83 (19%)	96 (20%)	n/a
	14+ years	344 (80%)	343 (77%)	
	Missing / Prefer not to say	1 (0%)	5 (1%)	
Parental Occupation	Unemployed	4 (1%)	5 (1%)	n/a
	Semi or unskilled manual	13 (3%)	14 (3%)	
	Skilled manual	16 (4%)	24 (5%)	
	Clerical / Administrative	30 (7%)	42 (10%)	
	Professional / Managerial	346 (81%)	347 (78%)	
	Missing / Prefer not to say	19 (4%)	12 (3%)	
Partnership Status	Married	25 (6%)	44 (10%)	n/a
	Cohabiting with partner	63 (15%)	68 (15%)	
	In a long term non-cohabiting relationship	107 (25%)	100 (23%)	
	Divorced	4 (1%)	2 (1%)	
	Single	221 (52%)	216 (49%)	
	Widowed	2 (1%)	0 (0%)	
	Missing / Prefer not to say	6 (2%)	14 (4%)	

STATISTICAL ANALYSIS

Ideal Number of Children

We first used t-tests to determine whether there was a treatment effect of mortality priming on ideal number of children. We analysed each sex separately, and we also performed analysis on two different sets of participants for each sex: one including all respondents, and one excluding respondents who stated they wished to remain childless. Questions which collect information on ideal number of children are collecting information on two facets of childbearing: whether a respondent wishes to have children at all and, for those who do, how many children they would like to have. Combining these two facets into a single average family size for each group may distort the results somewhat, so we re-ran the analysis only on respondents who stated a desire for children (the sample size of respondents who wished to remain childless was too small to determine whether there was a treatment effect on this facet of childbearing). We have already determined that there are no significant differences between the treatment and control groups in any of our control variables, so are confident that the results of our univariate t-tests are not confounded by differences in the background characteristics of our two groups. We checked for the possibility of a reverse causation occurring, i.e. that the control groups' answers to mortality questions were 'primed' by the fertility questions they had answered beforehand. Chi-square tests showed no significant association between the treatment and control groups for all of the mortality priming questions (results not shown).

Costs and Benefits of Children

All questions referring to the costs and benefits of children (see *Appendix 1*) were coded with a 5-point Likert scale. For question 1, beneficial views of children were coded positively and costly views of children negatively. Slight agreement with each cost or benefit question was coded ±1 and strong agreement ±2. Missing and neutral values were coded as 0. In exploratory analysis, a principle component analysis was run on these attitudinal items to determine whether the 15 sub-questions reduced down to a small number of components. This was examined for the whole sample, and then split by treatment, sex and then by both treatment and sex. In all cases the analysis produced at least four factors with eigen values in excess of 1 but none of the factors explained more than 22% of variance. We therefore decided it was appropriate to load all items onto a single aggregate score that would reflect an average cost and benefit attitude per participant, calculated as the sum of all items divided by the number of items for each participant. For ease of interpretation the scores were standardised around a mean of zero.

As with the ideal number of children variable, we ran t-tests to determine whether the mean score differed in the treatment and control groups for each sex. Finally, we calculated an average cost/benefit score for each sub-question of the

second cost/benefit question and ran t-tests to determine whether there were significant differences between the treatment and control groups when financial, career-related, social and emotional costs/benefits of children are considered separately.

RESULTS

Ideal Number of Children

Across all participants the mean ideal number of children was 2.40 for men and 2.48 for women. Approx 8% of participants wished to remain childless (9.0% of men and 7.7% of women). *Figure 2* illustrates the effect of the treatment condition on ideal number of children for both men and women, by showing the distribution of the ideal number of children under treatment and control conditions. This suggests a slight treatment effect for men, whose ideal number of children increased from 2.29 in the control group to 2.52 with mortality priming, but not for women, whose ideal number of children was 2.47 for controls and 2.50 under the treatment condition. The difference between the mean value treatment effect for men was significant at the 10% level (t = 1.71, df = 320, p = 0.088), but not significant for women (t = 0.254, df = 518, p = 0.8). When only the set of respondents who stated a desire for children is considered the treatment effect increases for men, from 2.49 desired children in the control group to 2.79 in the treatment group, and becomes significant at the 1% level (t = 2.753 df = 291, p = 0.006). For women, the treatment

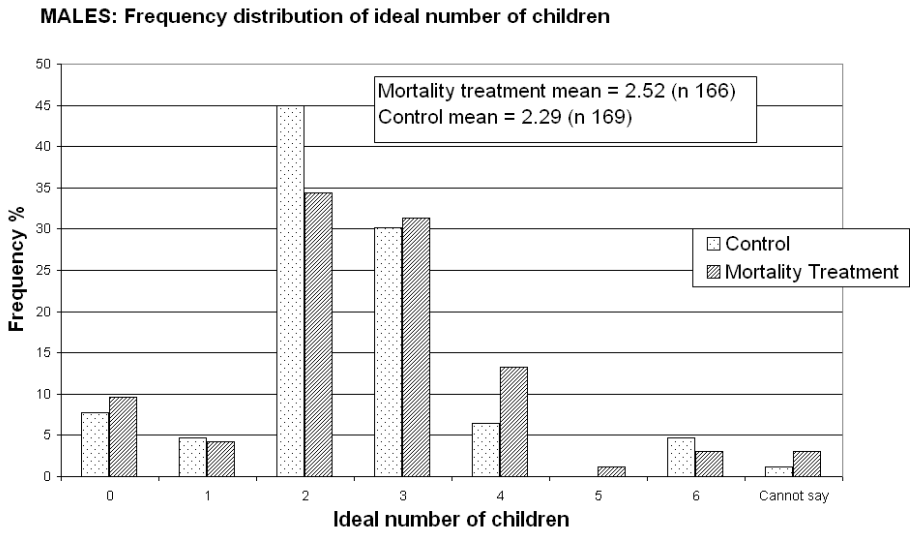

Figure 2a. Distribution of ideal number of children by treatment/control group for males

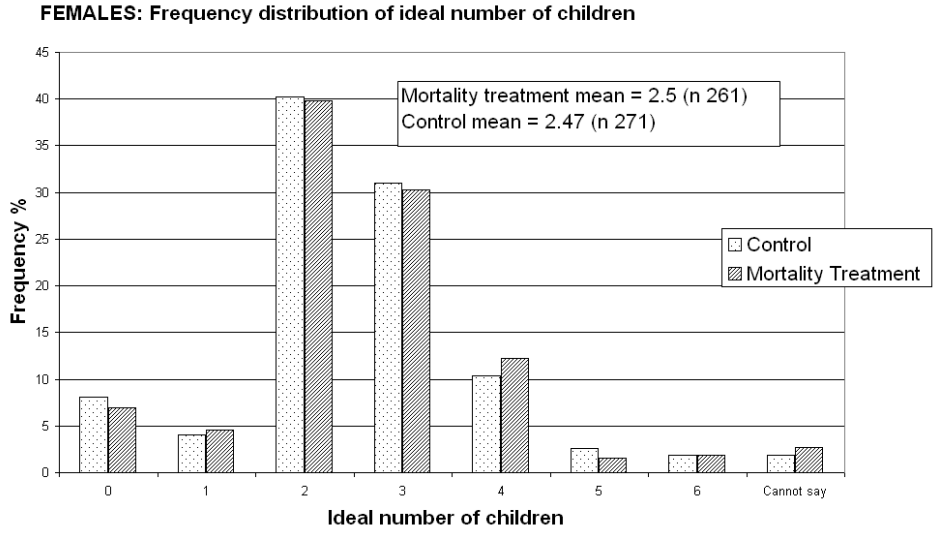

Figure 2b. Distribution of ideal number of children by treatment/control group for females

effect remains negligible (ideal number of children is 2.70 in the control and 2.69 in the treatment group) and non-significant ($t = 0.68$, $df = 481$, $p = 0.946$).

Costs and Benefits of Children

Overall women took a more negative view of the benefits of children relative to men with a mean aggregate cost/benefit score of –.0252 (SD 0.4038) compared to a score of .0427 (SD 0.3895) for men (as these scores are standardised around 0, a negative score indicates that those participants viewed children as more costly than average; a positive score indicates viewing children as more beneficial than average). Mortality-primed males viewed children as less costly and more beneficial than control males: when all participants are considered, the score for treatment males was 0.675 (SD 0.409), the score for control males 0.018 (SD 0.368). This difference was not, however, statistically significant ($t = 1.15$, $df = 333$, $p = 0.249$). For women, the difference between treatment and control groups was negligible and not significant: treatment women had a mean score of –0.040 (SD 0.4194) and control women a mean of –0.011 (SD 0.388: $t = –0.808$, $df = 530$, $p = 0.420$). When only those participants who stated a desire for children were considered, the results were similar: treatment males had a mean score of 0.097 (SD 0.395), control males 0.039 (SD 0.349); treatment females mean score was –0.027 (SD 0.416), control females 0.012 (SD 0.378). Neither difference was statistically significant (males: $t = –1.363$, $df = 304$, $p = 0.174$; females: $t = 1.006$, $df = 490$, $p = 0.278$).

Table 2. Percentage distribution of responses to the consequences of having children questions by treatment group and sex

		Males		Females	
		Treatment	Control	Treatment	Control
Financial	Very costly	44.6	46.2	50.6	50.2
	Slightly costly	36.7	34.9	34.9	36.2
	Neutral	9.0	10.7	12.3	10.0
	Slightly beneficial	6.0	5.3	1.1	2.6
	Very beneficial	1.8	0.6	0.8	0.4
	Cannot say	1.8	1.8	0.4	0.7
	Missing	0.0	0.6	0.0	0.0
Employment	Very costly	9.0	4.7	14.2	19.2
	Slightly costly	42.2	49.1	48.3	50.6
	Neutral	34.9	35.5	31.8	24.0
	Slightly beneficial	9.0	6.5	4.6	4.1
	Very beneficial	2.4	1.2	0.4	0.7
	Cannot say	2.4	2.4	0.8	1.5
	Missing	0.0	0.6	0.0	0.0
Social	Very costly	3.6	3.0	3.8	3.3
	Slightly costly	20.5	14.8	15.7	21.4
	Neutral	19.3	24.9	24.9	26.6
	Slightly beneficial	30.1	37.3	32.2	27.3
	Very beneficial	26.5	17.2	22.2	19.9
	Cannot say	0.0	1.8	1.1	1.5
	Missing	0.0	1.2	0.0	0.0
Emotional	Very costly	1.8	1.2	0.8	1.8
	Slightly costly	1.8	1.2	3.1	5.5
	Neutral	5.4	5.3	8.0	6.3
	Slightly beneficial	25.9	30.8	22.2	24.4
	Very beneficial	64.5	58.6	65.5	59.8
	Cannot say	0.6	2.4	0.4	2.2
	Missing	0.0	0.6	0.0	100.0

Table 2 highlights the effect of mortality priming on the distribution of responses to the four attitudinal items that asked respondents to rate the extent to which children would have beneficial or costly consequences in financial, employment, social and emotional terms. *Table 3* indicates the mean cost/benefit score for each question by treatment condition and sex. Both tables suggest that treatment results in both males and females viewing children as less costly and more beneficial. However t-tests indicate that none of these differences between the mean scores are significant, as set out in *Table 3* (when using a Bonferonni correction for multiple tests).

Table 3. Mean cost/benefit score by treatment group and sex (the lower the value, the more costly children are considered to be); number of participants in parentheses

Consequences of children:	All males					All females				
	Treatment	Control	DF	t	p	Treatment	Control	DF	t	p
Financial	−1.163 (166)	−1.207 (169)	333	0.434	0.664	−1.333 (261)	−1.332 (271)	530	−0.018	0.986
Employment	−.464 (166)	−.497 (169)	333	0.376	0.707	−.713 (261)	−.834 (271)	530	1.765	0.78
Social	.554 (166)	.510 (169)	333	0.372	0.710	.533 (261)	.391 (271)	530	1.455	0.146
Emotional	1.494 (166)	1.444 (169)	333	0.564	0.573	1.487 (261)	1.347 (271)	530	1.771	0.77
Consequences of children:	**Males who wanted to have at least one child**					**Females who wanted to have at least one child**				
	Treatment	Control	DF	t	p	Control	Treatment	DF	t	p
Financial	−1.107 (150)	−1.205 (156)	304	0.914	0.361	−1.346 (243)	−1.28 (249)	490	−0.892	0.373
Employment	−0.433 (150)	−0.468 (156)	304	0.379	0.704	−0.708 (243)	−0.8 (249)	490	1.232	0.218
Social	0.66 (150)	0.526 (156)	304	1.08	0.278	0.572 (243)	0.47 (249)	490	1.034	0.301
Emotional	1.62 (150)	1.481 (156)	304	1.698	0.09	1.556 (243)	1.462 (249)	490	1.278	0.2

DISCUSSION

The results provide two key findings:

1) There is some evidence to support the hypothesis that mortality priming increases fertility preferences.

2) This effect was largely seen in men, as women showed little evidence of a change in fertility preferences.

Mortality primed men, but not women, showed an increase in their ideal number of children, particularly if those men who wished to remain childless were excluded from the analysis. Analysis of attitudes towards the costs and benefits of children was less conclusive. Though these attitudes shifted in the predicted direction (for all measures of the costs/benefits of children, mortality primed men tended to view children as less costly than control men), these differences were not statistically significant. This provides support for the argument that fertility will increase in response to a mortality increase, and that this response may be at least partly driven by a change in fertility preferences in response to a change in mortality perceptions.

The research reported here chimes with two studies which have emerged from the social psychology literature on Terror Management Theory (TMT: SOLOMON et al. 1991). This theory argues that humans are conscious of the inevitability of their mortality, but have developed coping strategies to exclude this fear since a permanent conscious fear of death would destroy an individual's capacity to function (BECKER 1973). Evolutionary researchers tend to be sceptical about the theory behind this research (NAVARRETE and FESSLER 2005; but see LANDAU et al. 2007), but psychologists working within this paradigm have generated a considerable body of empirical evidence demonstrating that individuals do react to mortality priming in predictable ways (PYSZCZYNSKI et al. 1997). TMT suggests that humans react to mortality salience by spreading the notion of self to a wider cultural group and hence mortality salience produces 'immortality through society'. Most of the empirical research has looked at how mortality salience acts to prompt individuals to strengthen their attachment, solidarity and defence of their social in-group and its traditional social norms. Despite the fact that children present a clear and compelling way an individual's identity and that of his/her social group can be preserved (because the parental environment will also shape the cultural identity of the child), there has been relatively little research from a TMT perspective on how mortality salience affects fertility intentions. As far as we are aware, there have been only two attempts to do so (WISMAN and GOLDENBERG 2005; FRITSCHE 2007).

WISMAN and GOLDENBERG's (2005) study, on Dutch undergraduates, found similar results to those reported here: mortality salience increased ideal number of children for men but not for women. The authors interpreted their results as the result of differential effects of having children on social and career success, which is an alternative route to mitigating one's inevitable mortality, i.e. children are more damaging to women's careers than men's. This means that the additional costs of

having children for women in terms of harming their social success may reduce any potential mortality salience effects on their ideal number of children. We suggest that the differential in the costs of children for each sex more broadly may partly explain the apparently more flexible nature of men's fertility preferences than women's: the costs of bearing children are much greater for women than for men, physiologically as well as socially, so that women may show less flexibility in their reproductive preferences, and perhaps preferences for smaller family size, than men. In high fertility societies at least, where there is a difference between the sexes in ideal number of children, men tend to prefer larger families than women (e.g. RATCLIFFE et al. 2000). Since they suffer fewer costs of bearing and raising children, men have potentially much to gain and little to lose from additional births. Females must spend nine months from conception to gestating whereas a male could die shortly after conception and the child would still have a probability of surviving and providing reproductive success. After birth women also bear the brunt of parental investment and in numerous populations child survival has shown to be more dependent upon maternal survival than paternal survival (MACE and SEAR 2005). Such differential costs, benefits and risks may lead women to be more circumspect and less flexible in their ideal number of children. The study by FRITSCHE et al. (2007) on German undergraduates perhaps supports this hypothesis, since their results showed that mortality salience increased the fertility preferences of both sexes. However, fertility preferences were operationalised here as a desire for any children, rather than desire for a particular number of children: and both sexes need to have at least some children in order to achieve reproductive success.

CONCLUSION AND NEXT STEPS

Such research using an undergraduate population raises the question of the generalisability of these findings. We did not attempt to generate a random sample of any wider population (not even the LSE student population, as our experiment only included those who actively chose to participate). Instead, we chose to experiment on a relatively homogenous population, in terms of educational level and SES, and also childbearing experience. Our data was collected very largely from individuals who have not yet had children: fertility preferences may well change once a child has been born. Nevertheless using a randomised experimental design helps support internal validity. We found no evidence for systematic differences between the groups other than the mortality priming – suggesting our results do indicate a genuine effect of mortality priming on the fertility preferences of men, rather than the effects of confounding characteristics on fertility preferences. Next steps in this research would be to conduct similar experiments but across a wider range of participants to determine whether such an effect is seen beyond a self-selected population from one particular UK higher education institution. Another expansion of this work should also look at how mortality salience reactions are influenced by perceptions

of those who are at risk of death. It is not just the overall mortality level which affects life history traits, but the age-specific pattern of mortality. Life history decisions (those affecting relative effort devoted to growth and reproduction, for example) are likely to have different payoffs in populations which have relatively high juvenile mortality than those which have relatively high adult mortality. A further experiment will test whether priming participants to think about death in childhood or infancy has a different effect to priming participants to think about their own, or other adult, deaths.

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APPENDIX 1

Key questions used in questionnaire

Question
Mortality priming section

1. Please rank in order what you believe to be the most significant causes of death in the UK
    a. Accidents / Injuries
    b. Cancers
    c. Cardio-vascular diseases (e.g. heart attacks)
    d. Diseases of the digestive system
    e. Infectious diseases (Influenza, HIV/AIDS, TB)
    f. Others – please specify
2. Please can you estimate the mean (average) age that people die at in the UK?
3. At any point in your life have you ever believed that you were in immediate risk of dying?
4. In the last 3 years have you experienced the death of any close friends or family members?
5. If yes… how old in years was that individual(s) at the time of their death?
6. Relative to your friends and family, how easily do you become upset at images of death in non-fictional media (newspapers, TV news programmes)?
7. Relative to your friends and family, how easily do you become upset at images of death as portrayed in fictional media (films, TV, books)?
8. What age do you expect to be when you die?
9. Many people expect to die either in a hospital or at home. Do you have any expectations about the location where you will die?
10. Some people worry at the prospect of their own death. Does the prospect of your own death ever cause you concern?
11. Do you personally believe in 'life after death'?

Cost and benefits of children section

1. Respondents were asked how much they agreed/disagreed with the following statements:
    a. Children provide emotional support to their parents
    b. Children's education causes substantial financial costs for their parents
    c. Children provide domestic help benefits
    d. Children's subsistence (food and clothing) causes substantial financial costs for their parents

   e. Children's entertainment causes substantial financial cost for their parents
   f. Having children provides a help to their parents' occupation
   g. Children provide an insurance against risk i.e. will help in the event of unemployment/ incapacity
   h. Having children harms their parents' physical appearance
   i. Children cause emotional stress for their parents
   j. Children provide a fulfilment for a desire to nurture
   k. Having children harms their parents' occupation
   l. Children provide support in old age
   m. Children provide costs for their parents' socialising / leisure time
   n. Having children is an economic risk
   o. Children provide a benefit through access to social networks
2. Respondents were asked how beneficial/costly they believed the consequence of having children were in the following fields?
   a. Financially
   b. Employment opportunities
   c. Socially
   d. Emotional wellbeing

REFERENCES

BECKER, E. (1973): *The Denial of Death.* New York: The Free Press: Macmillan.

BECKER, G. S. (1991): *A Treatise on the Family.* Cambridge, Massachusetts: Harvard University Press.

BERRINGTON, A. (2004): Perpetual postponers? Women's, men's and couple's fertility intentions and subsequent fertility behaviour. *Population Trends,* 117**,** 9–19.

BORGERHOFF MULDER, M. (1991): Human behavioural ecology. In: KREBS, J., DAVIES, N. *(eds): Behavioural Ecology.* Oxford: Blackwell, pp. 69–98.

CALDWELL, J.C. (1982): *Theory of Fertility Decline.* New York: Academic Press.

CASTERLINE, J. (2003): Demographic transition. In: DEMENY, P., G. MCNICOLL (eds): *Encyclopedia of Population* ,New York: Macmillan Reference, pp. 210–216.

CLELAND, J. (2001): The effects of improved survival on fertility: A reassessment. *Population and Development Review,* 27**,** 60–92.

CLELAND, J. & WILSON, C. (1987): Demand theories of the fertility transition: An iconoclastic view. *Population Studies,* 41**,** 5–30.

COHAN, C. L. & COLE, S. W. (2002): Life course transitions and natural disaster: Marriage, birth & divorce following Hurricane Hugo. *Journal of Family Psychology,* 16**,** 14–25.

DAVIS, K. (1963): The theory of change and response in modern demographic history. *Population Index,* 29**,** 345–366.

FREEDMAN, R. (1997): Do family planning programs affect fertility preferences? A literature review. *Studies in Family Planning,* 28**,** 1–13.

FRITSCHE, I., JONAS, E., FISCHER, P., KORANYI, N., BERGER, N. & FLEISCHMANN, B. (2007): Mortality salience and the desire for offspring. *Journal of Experimental Social Psychology,* 43**,** 753–762.

GUZ, D. & HOBCRAFT, J. (1991): Breastfeeding and fertility: a comparative analysis. *Population Studies,* 45**,** 91–108.

HEUVELINE, P. & B. POCH (2007): The phoenix population: Demographic crisis and rebound in Cambodia. *Demography,* 44**,** 405–426.

KNUTSEN, T. (2003): Why is Mathus' essay a classic? In: JENSEN, A., KNUTSEN, T.L., SKONHOFT, A. (eds): *Visiting Malthus: The Man, his Times, the Issues.* Oslo: Abstrakt forlag, pp. 21–43

KOHLER, H. P., BEHRMAN, J.R. & SKYTTHE, A. (2005): Partner plus children = happiness? The effects of partnerships and fertility on well–being. *Population and Development Review,* 31**,** 407–446.

LALAND, K. N. & BROWN, G.R. (2002): *Sense and Nonsense: Evolutionary Perspectives on Human Behaviour*. Oxford: Oxford University Press.

LANDAU, M. J., SHELDON, S., PYSZCZYNSKI, T. & GREENBERG, J. (2007): On the compatibility of Terror Management Theory and Perspectives on Human Evolution. *Evolutionary Psychology,* 5**,** 476–519.

MACE, R. & SEAR, R. (2005): Are humans cooperative breeders? In: VOLAND, E., CHASIOTIS, E. A., SCHIENFENHOEVEL, A. (eds): *Grandmotherhood – the Evolutionary Significance of the Second Half of Female Life.* Piscataway: Rutgers University Press, pp. 143–159.

MCDONALD, P. (2000): Gender equity in theories of fertility transition. *Population and Development Review,* 26**,** 427–439.

MONTGOMERY, M.R. (2000): Perceiving mortality decline. *Population and Development Review,* 26**,** 795–819.

MSNBC (2006): Relationships and family reevaluated after 9/11. We asked readers tell how their lives were changed by Sept. 11 and its aftermath. Here, in their own words, are some of their stories. http://www.msnbc.msn.com/id/14587960/, accessed 01/04/2007.

NAVARRETE, D.C. & FESSLER, D.M.T. (2005): Normative bias and adaptive challenges: A relational approach to coalitional psychology and a critique of terror management theory. *Evolutionary Psychology,* 5**,** 297–325.

NEWSON, L., POSTMES, T., LEA, S.E.G. & WEBLEY, P. (2005): Why are modern families small? Toward an evolutionary and cultural explanation for the demographic transition. *Personality and Social Psychology Review,* 9**,** 360–375.

NI BHROLCHAIN, M. & DYSON, T. (2007): On causation in demography: Issues and illustrations. *Population and Development Review,* 33**,** 1–36.

PYSZCZYNSKI, T., GREENBERG, J. & SOLOMON, S. (1997): Why do we need what we need? A terror management perspective on the roots of human social motivation. *Psychological Inquiry,* 8**,** 1–20.

RATCLIFFE, A.A., HILL, A.G. & WALRAVEN, G. (2000): Separate lives, different interests: Male and female reproduction in the Gambia. *Bulletin of the World Health Organization,* 78**,** 570–579.

RODGERS, J.L., CRAIG, A.S.J. & COLEMAN, R. (2005): Did fertility go up after the Oklahoma city bombing? An analysis of births in metropolitan counties in Oklahoma 1990–1999. *Demography,* 42**,** 675–692.

RONSMANS, C. (1996): Birth spacing and child survival in rural Senegal. *International Journal of Epidemiology,* 25**,** 989–997.

SMALLWOOD, S. & JEFFERIES, J. (2003): Family building intentions in England and Wales: Trends, outcomes and interpretations. *Population Trends,* 112**,** 15–28.

SMITH, E.A. & WINTERHALDER, B. (1992): *Evolutionary Ecology and Human Behaviour*. New York: Aldine de Gruyter.

SOLOMON, S., GREENBERG, J. & PYSZCZYNSKI, T. (1991): A terror management theory of social behaviour: The psychological functions of self-esteem and cultural worldviews. *Advances in Experimental Social Psychology,* 24**,** 93–159.

STEARNS, S.C. (2000): Life history evolution: Successes, limitations & prospects. *Naturwissenschaften,* 87, 476–486.

WELLS, J.C.K. & STOCK, J.T. (2007): The biology of the colonizing ape. *American Journal of Physical Anthropology,* 134, 191–222.

WISMAN, A. & GOLDENBERG, J. (2005): From grave to the cradle: Evidence that mortality salience engenders a desire for offspring. *Journal of Personality and Social Psychology,* 89**,** 46–61.