

## Environmental concern and fertility intentions among Canadian university students

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**Abstract** Little is known about how environmental concern in young adulthood may shape childbearing attitudes and intentions. Here, we examine the relationship between individual environmental concern, fertility intentions, and attitudes toward reproduction in a sample of Canadian university students,  $N = 139$ . General environmental concern and pollution-related health concerns both predicted a less positive attitude toward having children. Further, attitude toward having children mediated the negative relationship between pollution-related health concerns and personal fertility intentions. This study offers an important early step in empirical examination of the association between environmental concern and fertility.

**Keywords** Fertility · Environmental concern · Family planning · New ecological paradigm (NEP) · Reproduction

If green parenting web sites, organic applesauce, and reusable diapers are any indication, eco mommies are on the rise. But so are women who say that even baby feet leave a major carbon footprint. And they are opting not to have children as a result (Zelveloff 2010, p. 1).

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## Introduction

Popular press articles abound with cases of individuals who state that the detrimental environmental consequences of child-rearing are a major impetus for their decision not to reproduce (e.g., Courtney-Smith and Turner 2007; Engber 2007; Zeveloff 2010). Courtney-Smith and Turner (2007), for instance, noted that some couples have responded to their environmental concerns by electing to pursue sterilization procedures. These articles suggest that some individuals believe they can make a positive contribution to the environment by remaining childless. Alternatively, some may believe that poor environmental quality may threaten the well-being of potential offspring. Indeed, global population growth has consequences for all life around the world and has been cited as a major contributor to the deteriorating state of many natural ecosystems (Kazdin 2009; Koger and Scott 2007; Oskamp 2000). Even if global per capita greenhouse gas emissions were held constant, projections suggest population growth over the next half-century would raise total global emissions by approximately half (Swim et al. 2009).

Of course, fertility intentions are determined by myriad, complex social, and individual-level factors (Iacovou and Tavares 2011), yet there is little work that aims to disentangle subjective environmental concerns from these other influences. In this study, we examine whether different types of environmental concern are related to attitudes toward having children, and the intention to have children, among young adults in Thunder Bay, ON, Canada. We consider two different types of environmental concern. The first involves concerns about humanity's role in affecting the natural environment and the importance of environmental protection (e.g., Dunlap et al. 2000). The second considers concerns with health risks due to pollution (e.g., Homburg and Stolberg 2006). Beyond the influence of demographic variables related to fertility intentions (e.g., age, sex, and religiosity), attitudes toward reproduction are considered fundamental to the fertility decision-making process (see Langridge et al. 2005) and should logically be related to individual fertility intentions (i.e., the desire to have versus not to have children or the desire for a specific number of children across the lifespan; Miller and Pasta 1988; Miller 1992), though there are sometimes mismatches (Coombs and Chang 1981; Kar 1978; Voas 2003).

## Conceptual links between environmental concern and fertility intention

Supposing that parents are, at some level, responsible for their children's environmental impact, evidence suggests that remaining childless can be more environmentally beneficial than other pro-environmental behaviors such as recycling or driving a low emissions vehicle. Murtaugh and Schlax (2009) estimated that in the United States, each child contributes approximately 9,441 metric tons of carbon dioxide to the carbon heritage of their mother. By comparison, recycling throughout one's lifetime is estimated to save approximately 17 tons of carbon dioxide and replacing incandescent light bulbs with energy-efficient bulbs can save about 36 tons. Thus, having fewer children may be considered an effective means of reducing one's carbon footprint.

Environmental concern is defined herein as “a general attitude, which centers on the cognitive and affective evaluation of the object environmental protection” (Bamberg 2003: 21). Although local environmental problems such as water quality and air pollution continue to be of great concern, the world is currently seeing the proliferation of broader forms of concern for the human–environment relationship (Dunlap et al. 2000). Along with growing concern among natural scientists (e.g., Fourth Assessment Report of the Intergovernmental Panel on Climate Change [IPCC] 2007), public concerns regarding environmental quality and sustainability are becoming increasingly prevalent (Curry et al. 2005; Kempton et al. 1995; Leiserowitz 2005) and have been hypothesized as important to active engagement in pro-environmental behavior (e.g., Arnocky and Stroink 2011a, b; Arnocky et al. 2007).

Environmental concerns are often measured using the New Ecological Paradigm (NEP; Dunlap et al. 2000). The NEP considers beliefs about the human relationship with nature, whereby endorsement is indicative of concern for environmental quality (Dunlap et al. 2000) and a belief that human survival is dependent on environmental quality (Stern et al. 1995). Numerous studies have found that NEP endorsement is related to various types of environmental behaviors and behavioral intentions (Blake et al. 1997; Schultz and Oskamp 1996; Stern et al. 1995; Schultz and Zelezny 1998). Endorsement of the NEP also involves a view that human interference with nature has the potential to be disastrous. That is, nature should be preserved and protected from overuse by humans (Milfont and Duckitt 2004). Such beliefs are in line with concerns about the Earth’s capacity to support a growing human population.

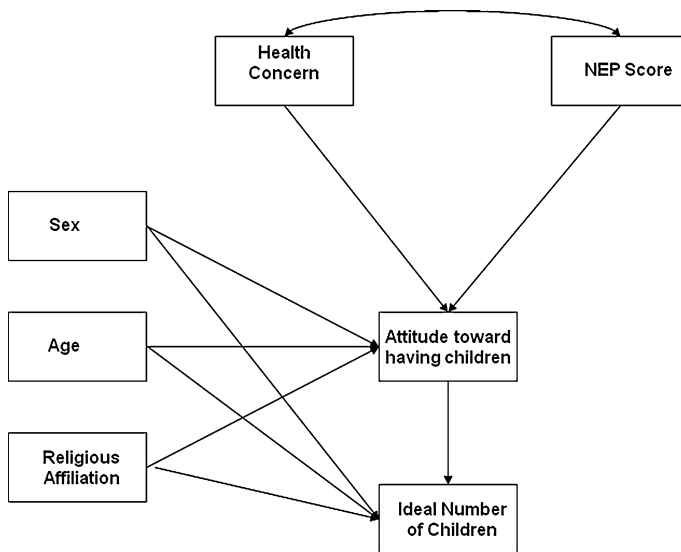
Recent findings demonstrate a link between more specific local environmental concerns and reduced fertility behaviors. Ghimire and Mohai (2006) examined the relationship between three specific environmental concerns (agricultural productivity, water quality, and status of the groundwater table) and contraceptive use in Chitwan Valley, Nepal. They considered local environmental concerns of direct relevance to the community. After controlling for relevant demographic variables, concern over crop production was positively associated with contraceptive use. Ghimire and Mohai reasoned that (1) when ecological conditions are perceived as being unfavorable to childbearing, individuals may view raising a large number of children as too difficult and (2) that more children will be unfavorable because of the negative effects of population growth on the local environment. Ghimire and Mohai argued that although environmental concerns may be rapidly increasing in industrialized nations, the impact of such shifts in concern on fertility behavior may be more prevalent in societies where locally used resources may be scarce.

In addition, those who believe that environment quality poses a considerable threat to the self or offspring—due to pollution or climate change, for example—might be less likely to reproduce (Ghimire and Mohai 2006). In Canada, perceptions of health risk have been associated with industrial pollution and chemical products, and many consider the land, air, and water to be more contaminated than ever before (Krewski et al. 1995). Moreover, there is a clear link between perceived exposure to pollution and decreases in perceived health and quality of life (Williams and Bird 2003; Day 2006). Pollution-related health concerns have also been found to relate to various forms of pro-environmental behavior (Homburg and Stolberg 2006); however, empirical links to fertility intentions have not yet been made.

Commonly discussed means of addressing broad environmental concerns have tended to focus on relatively minor consumption practices (Gardner and Stern 2008) rather than on more consequential decisions such as those regarding reproduction. Indeed, public discourse has tended to avoid the politically and ethically difficult realm of concerns over high fertility rates (Swim et al. 2009), thus individuals may not associate reproductive tendencies with environmental problems. Further, fertility decisions are highly complex—as they are shaped by myriad individual, community, and cultural factors, disentangling environment-specific influences is a formidable empirical challenge. Still, the above literature suggests preliminary evidence that environmental concerns can affect family planning decisions (e.g., Ghimire and Mohai 2006).

### The present study

Based upon the above literature, we designed and tested two path models to examine whether environmental concerns directly or indirectly (via attitude toward having children) predict fertility intentions among young adult university students in Canada. All hypotheses pertain to Model 1 (our theoretical model; Fig. 1). Model 1 tested whether expressed “ideal number of children” is associated with environmental concerns (NEP and pollution-related health concern) indirectly via attitude toward having children. The demographic factors of age, sex, and religiosity were controlled. Age tends to be negatively related to fertility intentions (e.g., Tickamyer 1979), and religiosity tends to be positively related to fertility intentions in Western



**Fig. 1** Path model outlining the proposed relationship between pro-environmental orientation (NEP score) and pollution-related health concern predicting attitude toward having children, which subsequently predicts ideal number of children. Endogenous error terms not depicted

samples (Philipov and Berghammer 2007). Additionally, sex differences are occasionally found regarding the value placed on having children (Thompson 1980) and environmental concern (Zelezny et al. 2000). In model 1, the following hypotheses were tested:

**Hypothesis 1** Pollution-related health concern (hypothesis 1a) and NEP (hypothesis 1b) will negatively predict attitude toward having children.

**Hypothesis 2** Attitude toward having children will positively predict desired number of children.

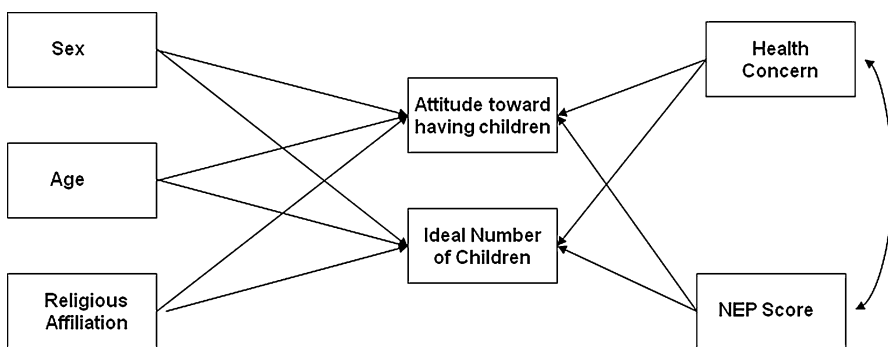
**Hypothesis 3** Attitude toward having children will mediate negative relationships between pollution-related health concern and desired number of children (hypothesis 3a) and between NEP and desired number of children (hypothesis 3b).

Model 2 (Fig. 2), our comparison model, was tested to examine whether model fit is improved by considering only the direct relationships between environmental concerns (NEP and pollution-related health concern) and both attitude toward having children and ideal number of children. We expected model 1, our theoretical model, to better fit the data.

## Methodology

### Data collection and sample characteristics

We explored links between environmental concern and fertility intentions in a convenience sample of Canadian University students. In Canada, as of 2004, the national average fertility rate was 1.53 children per female aged 15–49 (Statistics Canada 2004). One hundred and forty-four undergraduate students from a mid-sized Canadian university participated and were compensated with partial course credit. The questionnaire's introduction explained that the study concerned reproductive and environmental attitudes. The sample consisted of males and females below the



**Fig. 2** Path model for our comparison direct effects model hypothesizing a relationship between pro-environmental orientation (NEP score) and pollution-related health concern in directly predicting both attitude toward having children and ideal number of children

maximum likely reproductive age range for females, which has been suggested as 44 years of age (Easterlin 1971; Ogilvie et al. 2007; Tickamyer 1979). The sample thus comprised 90 females and 49 males ranging from 17 to 44 years of age ( $M = 20.26$ ,  $SD = 3.59$ ). Participants were predominantly white (83.4%), and religious affiliation was non-religious (31.9%), Roman Catholic (29.0%), and Protestant (23.2%). Sikh, Muslim, and non-denominational spiritual affiliation accounted for a combined 15.9% of sample.

Unless otherwise specified, respondents answered items using a 5-point Likert-type scale (strongly disagree to strongly agree). A missing values analysis showed that no variables contained missing cases greater than 5%.

## Instruments

### *Pollution-related health concern*

Items developed by Homburg and Stolberg (2006) for assessing the extent to which individuals feel that pollution has harmed their physical health, threatened their health, or caused poor mental health (e.g., depression) were used to create a scale assessing perceived effects of pollution on personal health. We termed this measure *pollution-related health concern*. The measure comprised six items, internally consistent at  $\alpha = .78$ . The scale items are as follows: “I feel my health is threatened by pollution in everyday life”; “The thought of this pollution makes me uneasy”; “My health has become worse by the pollution in everyday life”; “So far, pollution in everyday life has not harmed me (reverse coded)”; “I am not worried about the health consequences of pollution (reverse coded)”; and “When I talk about pollution I feel depressed.” As these items had not previously been combined to form an overall measure of pollution-related health concern, we employed principal component analysis (PCA). PCA confirmed that all items contributed to a single factor that accounted for 52.4% of total item variance with factor loadings ranging between .611 and .821.

### *The new ecological paradigm (NEP)*

The NEP consists of items measuring beliefs about limits to growth, the balance of nature, human domination over nature, the potential for ecological crisis, and the idea that humans are not exempt from the rules of nature (Dunlap et al. 2000). Empirical evidence suggests that it is most reasonable to treat the NEP as an overarching measure of environmental concern. In the present study, the NEP was internally consistent,  $\alpha = .81$ . For further review of the NEP’s criterion, construct, and content validity, see Dunlap et al. (2000).

### *Reproductive information*

Two kinds of reproductive information were obtained. To measure fertility intention, we employed a single item assessing the ideal number of children a participant would like to have over their lifetime. To measure reproductive attitude,

we developed a scale to assess positive and negative attitudes associated with having biological children. We termed this measure the *Reproductive Attitude Scale* (RAS; see Table 1). We developed the RAS by creating a broad pool of positive and negative items measuring one's attitude toward having children. Internal consistency was assessed via principal components analysis. Orthogonal dimensions were created using varimax rotation. A two-factor model, accounting for 53.94% of total variance, was supported. Factors were identified as assessing pro-reproductive and anti-reproductive attitudes (Table 1). Six items loaded on the first factor (factor loadings ranged from .593 to .707) accounting for 22.10% of the total variance among items. Four items loaded on the second factor (from .525 to .725) accounting for 31.84% of variance. Factor 1, pro-reproductive attitude, measures positive attitude toward personal and familial aspects of having children,  $\alpha = .70$ . Factor 2, anti-reproductive attitude, concerns negative personal, familial, and ecological effects of having children,  $\alpha = .75$ . An attitude toward reproduction score was calculated by subtracting anti-reproductive attitude from the pro-reproductive attitude subscale.

### Analytic approach

We tested our theoretical model (model 1) and a comparison model (model 2) using observed variable path analysis. This allowed for the examination of the hypothesized relationship between environmental concerns and attitude toward having children, and the link between attitude and reported ideal number of children simultaneously. For each model, assessment of overall model fit was conducted

**Table 1** Varimax rotated component matrix for factor analysis of the reproductive attitudes scale

Item	Factor	
	Pro-reproductive	Anti-reproductive
1. Carrying on my genes is important to me	.707	
2. My having children is important for my entire family	.698	
3. I'd be doing my duty to my family by reproducing	.666	
4. It is important that my children carry on my family name	.622	
5. Part of why I want children is because my parents would enjoy having grandchildren	.594	
6. Having children is the greatest personal accomplishment one can hope for	.593	
7. I would consider having fewer children if it meant less stress for family members		.725
8. If I had fewer children, it would save me a great deal of time and money		.525
9. I would feel the same way toward an adopted child as to my own biological child		.725
10. What I am made up of carries on regardless of whether I personally reproduce		.702

Derived subscales: Pro-reproductive attitudes: 1, 2, 3, 4, 5, 6

Anti-reproductive attitudes: 7, 8, 9, 10

using the following fit indices: the chi-square test of significance ( $\chi^2$ ); comparative fit index (CFI); and root mean square error of approximation (RMSEA; Kline 2005). The model chi-square is not significant for models that fit the data well. However, this statistic tends to be compromised by sample size—it is only useful for smaller sample sizes (75–200 cases)—therefore, we employed the model chi-square in conjunction with other fit indices. An RMSEA below .07 and a CFI above .90 are generally accepted as indicating good fit. We compared differences in fit between our models using a chi-square difference test and report Akaike information criterion (AIC) scores whereby lower values reflect a better fit.

## Results

### Descriptive statistics

Descriptive statistics for measures of NEP, health concern, reproductive attitude, and ideal number of children are presented in Table 2. Men and women reported similar levels of ideal number of children. The average number of desired children ( $M = 2.4$ ) was above the national average fertility rate of 1.53 children per female aged 15–49 (Statistics Canada 2004). Pearson  $r$  coefficients between the aforementioned variables and relevant demographic variables were computed (see Table 2). As expected, NEP and pollution-related health concern scores positively correlated with anti-reproductive attitude and negatively correlated with pro-reproductive

**Table 2** Intercorrelations and descriptive statistics for observed variables

	1	2	3	4	5	6	7
1. Age $M = 20$ $SD = 3.59$	1						
2. Sex $M = NA$ $SD = NA$	.06	1					
3. Religious affiliation $M = NA$ $SD = NA$	-.01	-.03	1				
4. Health concern $M = 3.19$ $SD = .67$	.07	-.25**	-.15	1			
5. NEP $M = 3.63$ $SD = .52$	.05	-.18*	-.16	.50**	1		
6. Pro-reproductive attitudes $M = 3.16$ $SD = .73$	.01	.21*	.10	-.25**	-.34**	1	
7. Anti-reproductive attitudes $M = 3.27$ $SD = .74$	-.28**	.05	-.16	.37**	.18*	-.33**	1
8. Ideal number of children $M = 2.43$ $SD = 1.14$	.01	-.12	.20*	-.18*	-.09	.27**	-.39**

\*  $p < .05$  (two-tailed) \*\*  $p < .01$  (two-tailed)



attitude. Pollution-related health concerns also correlated negatively with fertility intention. Reproductive attitudes correlated with fertility intention in the expected directions.

### Model fit and comparisons

We tested an observed variable path model (model 1), where age, sex (*male* = 0, *female* = 1), and religiosity (*not religious* = 0, *religious* = 1) were entered as controls. NEP and pollution-related health concerns were then entered into the model as exogenous indicators (allowed to covary) directly predicting attitude toward having children. Ideal number of children (fertility intention) was included as an endogenous outcome of attitude toward having children. With both forms of concern as direct predictors of attitude toward having children, and attitude predicting ideal number of children, fit indices suggested good overall model fit,  $\chi^2 = 18.35$  ( $df = 11$ ,  $p = .07$ ), RMSEA = .06 (95% CI = .00–.20), CFI = .93, AIC = 66.36 (Table 3). There were no significant regression estimates for the control variables of age, religious affiliation, or sex on attitude toward having children. Only sex predicted total number of children desired,  $\beta = -.158$ ,  $p < .05$ . In support of H1, attitude toward having children was negatively predicted by pollution-related health concern,  $\beta = -.306$ ,  $p < .001$ , and NEP,  $\beta = -.192$ ,  $p < .05$  (Fig. 3). In support of H2, attitude toward having children predicted ideal number of children,  $\beta = .373$ ,  $p < .001$ .

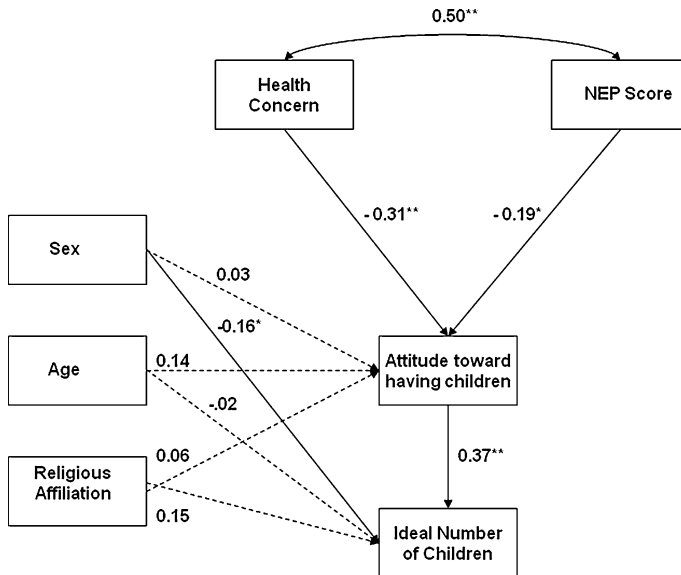
Following the procedure outlined by Baron and Kenny (1986), a Sobel test confirmed that individuals' attitudes toward having children mediated the relationship between health concerns and ideal number of children,  $Z = -2.89$ ,  $p < .001$ . This finding supported H3(a). That is, the negative relationship between pollution-related health concern and fertility intention was accounted for by the negative relationship between health concern and attitude and the positive relationship between attitude and ideal number of children. Our model also supported the hypothesis that reproductive attitudes may act as an intermediate variable between environmental concerns and the ultimate number of children desired (hypothesis 3b).

We next tested a comparison model (model 2) where NEP and health concern were entered as exogenous variables and were again allowed to covary. Attitude toward having children and ideal number of children were entered as endogenous outcomes of these variables. Age, sex, and religiosity were included as control

**Table 3** Tests of the latent path structure model fit

Nested model step	$\chi^2$ ( $df$ )	CFI	RMSEA	CI 95% RMSEA	AIC
Model 1: theoretical model	18.36 (11)	.93	.06	.00–.12	66.36
Model 2: direct outcome model	34.46 (10)	.74	.13	.08–.18	84.46
Model 3: revised theoretical model	19.19 (14)	.95	.05	.00–.10	61.19

CFI comparative fit index, RMSEA root mean square error of approximation, AIC Akaike information criterion;  $N = 139$



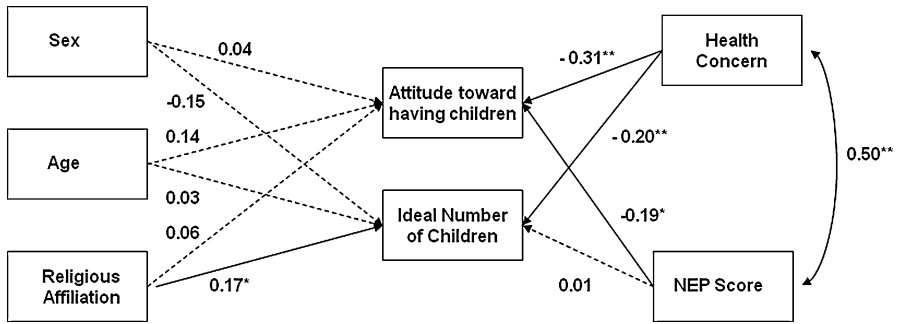
**Fig. 3** Observed variable path analysis for our model showing the relationship between pro-environmental orientation (NEP score), pollution-related health concern, attitude toward having children, and ideal number of children. Values are standardized regression coefficients ( $\beta$ ). *Solid lines* indicate significant paths, and *broken lines* indicate non-significant paths. Endogenous error terms not depicted

variables in order to test the relative contributions of NEP and pollution-related health concern in predicting attitude toward having children and ideal number of children.

Results indicated that attitude toward having children predicted both NEP scores,  $\beta = -.192$ ,  $p < .05$ , and pollution-related health concern,  $\beta = -.306$ ,  $p < .001$ . Ideal number of children did not predict NEP, but was predictive of both religious affiliation,  $\beta = -.059$ ,  $p < .05$ , and health concerns,  $\beta = -.201$ ,  $p < .05$  (Fig. 4). However, model 2 was a poor fit to the data,  $\chi^2 = 34.46$  ( $df = 10$ ,  $p < .001$ ), RMSEA = .130 (95% CI = .08–.18), CFI = .74, AIC = 84.46.

As the lack of relatedness between our control variables and endogenous variables may have limited the overall fit of the hypothesized model, we tested a third model nested within model 1, with non-significant control variable paths removed. Removing these paths from model 1 improved model fit,  $\chi^2 = 19.19$  ( $df = 14$ ,  $p = ns$ ), RMSEA = .51 (95% CI = .00–.10), CFI = .95, AIC = 61.19.

We used  $\chi^2$  difference tests to compare the significance of the elimination of parameters from model 2 through nested theoretical models 1 and 3. Model 2 (direct effects model) was first compared to model 1 (theoretical model) score. This analysis yielded a significant difference,  $\chi^2 = -16.1$  ( $df = 1$ ,  $p < .01$ ). Thus, model 1 provided a better fit to the data than model 2. Model 1 was then compared to nested model 3 where all non-significant parameters were eliminated. Model 3 was not a significantly better fit compared to model 1 (original hypothesized model),  $\chi^2 = .83$  ( $df = 3$ ,  $p > .05$ ). However, model 3 was more parsimonious.



**Fig. 4** Observed variable path analysis for our comparison direct effects model showing the relationship between pro-environmental orientation (NEP score) and pollution-related health concern predicting both attitude toward having children and ideal number of children. Values are standardized regression coefficients ( $\beta$ ). *Solid lines* indicate significant paths, and *broken lines* indicate non-significant paths. Endogenous error terms not depicted

### Conclusions

There has been little empirical investigation into the relationship between environmental concerns and fertility intention, and this study offers important early steps. Our model revealed that pollution-related health concern was related to lower fertility intention. This relationship was mediated by attitude toward reproduction. Environmental concern, as measured by NEP scores, also related to a less positive attitude toward reproduction; however, we did not see the expected direct relationship between NEP and fertility intention.

As indicated previously, individuals’ general concerns for the environment may lack the strength of more local and personally felt environmental problems such as those considered in previous studies (e.g., Ghimire and Mohai 2006; see also Shreffer and Ni-Amoo Dodoo 2009). For example, the link between regional population growth and specific local environmental concerns, such as decreases in agricultural productivity, should be well appreciated by those who depend on the land. In contrast, concerns regarding the environment more generally may not be perceived as directly relevant to daily provision for children.

As this represents preliminary exploration of the relationship between environmental concern and fertility intentions, there were limitations to our design. A number of future research directions are suggested. First, the cross-sectional nature of the data does not allow for inference of causation—it is possible that negative attitudes toward reproduction actually shape environmental concern. As a post hoc test of this possibility, we ran a model in which reproductive attitude and intentions were entered as independent variables predicting environmental concerns. As would be expected based upon our hypotheses, the model fit the data poorly,  $\chi^2 = 34.44$  ( $df = 10, p < .001$ ), RMSEA = .13 (95% CI = .09–.18), CFI = .72, AIC = 84.12.

Second, we considered only one intervening variable—reproductive attitude. Fertility decisions are highly complex and involve many factors not been examined here. It is likely that other factors such as perceived behavioral control and perceived norms (see Theory of Planned Behavior; Ajzen 1991) affect the

relationship between environmental concern and fertility intention. Of notable interest is the complex interplay between the desires of both partners in the reproductive process. Furthermore, as prevalent approaches to addressing environmental problems focus on changing small and repeated behaviors such as recycling and energy consumption rather than on larger life decisions (Gardner and Stern 2008), individuals may not perceive reduced fertility as a normative means of addressing environmental problems.

Lastly, researchers might seek to further distinguish between limiting one's reproduction out of environmental concern for the world at large (e.g., there are too many people on the Earth already, so I won't bring another one into the world) as compared with more self-oriented environmental concerns (e.g., I would not want take on the difficult task of raising a child in a world that could not support that child). It would also be of interest to consider whether environmental concerns shape perception of the reproduction of others. This desire would likely be less contingent on personal concerns and be, therefore, more affected by information linking population pressures to environmental issues.

This said, the results of the present study suggested that young adults in Thunder Bay, Canada, who are concerned about the natural environment and who believe that pollution has affected their physical and mental health, tend to have a less positive attitude toward having children and desire to have fewer children in their lifetime. Attitude toward having children appears to be a key mediating factor in the relationship between pollution-related health concern and fertility intentions. It is hoped that this study will contribute to further research on, and discussion of, the relationship between environmental concerns and fertility—an important issue that has not received a great deal of attention in the literature nor in public discourse (Swim et al. 2009).

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