Research Note:

What kind of individual-level effects of childbearing would we ideally be interested in learning about? The important distinction between expected, unexpected, varying and general effects.

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Abstract

Some consequences of childbearing for the parents and children are partly expected by the parents, while others to a larger extent are unexpected. Also, some are rather general while others vary greatly between individuals. In principle, it would obviously be valuable for individual fertility decision-makers to learn about consequences of childbearing that they are currently not aware of. This can be achieved by disseminating existing expert knowledge about effects that are likely to be poorly known to the public, and by doing further research on effects of childbearing. Knowledge about effects that are rather general, such as those involving physiological mechanisms, would be particularly valuable. Other effects, which may be described as social-behavioural, are to a larger extent expected and varying, and are therefore both harder to estimate and less important for individual decision-makers to learn about. For politicians and planners, knowledge about all types of consequences may be helpful, and perhaps especially those that are rather general.

Introduction

The potential macro-level consequences of below-replacement or very high fertility have attracted much scholarly attention and given rise to serious concerns. Besides, there has been considerable interest in how a woman's or man's reproduction may influence her or his life, for example with respect to work, health, or overall subjective wellbeing (Myrskylä and Margolis, 2014), and how children's wellbeing may be affected by the number and age of siblings (Kravdal et al., 2013) and the parents' age (Barclay and Myrskylä, 2016). The aim of this research note is to explain what kind of individual- or family-level consequences of childbearing it is most important to learn about. The discussion builds on a distinction between consequences that to a large extent are expected to the decision-makers and those that are largely unexpected. This distinction reflects the quite obvious idea that people's welfare would be improved if they knew more about the possible implications of the different options they are faced with. Furthermore, a key issue in the discussion is that some consequences of childbearing are rather general while others vary greatly between individuals. The first step is to briefly explain and exemplify these distinctions. Then, the value of research on these various types of childbearing – and the difficulties involved - are discussed.

Note that, while the focus (with a few exceptions) is on the effects of the number of children throughout the paper, similar arguments are relevant for the effects of other aspects of the reproductive and family behaviour, such as parents' age at first or later births, birth interval lengths, and relationship disruptions. They are also relevant in a variety of settings, although they are formulated here with rich low-fertility societies in mind.

Expected and unexpected individual- and family-level consequences of fertility

Expectations: varying but with some commonalities

Most parents probably expect that childbearing will have some implications that add positively to their wellbeing. For example, children may help the parents feel that life has a purpose; parents may enjoy engaging in various activities with children; and it may be rewarding to see children develop (Nelson et al. 2012; White and Dolan 2009). Furthermore, many parents may have an idea that children may provide practical and emotional assistance in old age (Brandt et al. 2009; Wenger et al. 2007). On the more negative side, parents typically have poorer work opportunities over many years (Boushey 2008, Dommermuth and Kitterød 2009); they may have a more strained economic situation than they otherwise would have (Aassve et al. 2007); they may worry about the children's wellbeing; and they have less time for adult leisure activities (Bittman and Wajkman 2000).

Obviously, there are different views about exactly how *much* the various positive aspects of childbearing and -rearing add to life quality, and how strong the negative consequences will be. Some parents may, for example, have particularly strong expectations about deriving pleasure from interactions with children, and some may not care so much about the loss of leisure time. In the most extreme case, what some parents see as positive consequences may be seen as negative by others. For example, some parents may consider the intense supervision of very young children as highly rewarding (apart from the possibly adverse implications for the family income), while others may consider it a burden (Poortman and van der Lippe 2009). Therefore, some parents will conclude that they, on the whole, will be better off by having a(nother) child than by not having that child, while others will reach the opposite conclusion.

It is important to note that, even if the population is divided into a number of subgroups defined according to observed characteristics, such as education or income, there will be variation in these expected consequences of childbearing within each subgroup, and one typically aims to estimate an average effect. This issue is relevant for some of the discussion below and returned to there.

Reality versus expectations: varying and general differences

It is possible that people foresee quite well, for example, the rewards from interacting with a child and from seeing him or her grow up, as this touches on deeply held values about what is important in life and may be quite persistent. However, even these particular types of consequences will never be exactly as expected, and other types of consequences may be much more different from the expectations. For example, there are probably many parents who experience much larger reductions in leisure time or work opportunities because of childrearing than they expected, one possible reason being that grandparents were less able to provide help than they thought. On the other hand, a child may turn out to be a considerably more important source of old age support than the parents expected. A possible perspective on this is to consider the actual consequences (themselves hard to identify both for the individual and any outside observer) as something that is expected plus something that modifies or adds to these. The latter is the unexpected contribution, which can be small or large.

These consequences just used as examples are of a type that people probably are conscious about, although they cannot know exactly how they will be. Additionally, there are some consequences that many people perhaps not even consider, so that they are definitely unexpected to them, although that is admittedly speculative; empirical evidence about what kind of consequences people are conscious about is lacking. One possible example of consequences that people may tend not to have in mind is that parents, according to some evidence, tend to take generally fewer risks (Wang et al. 2009) than the childless. Besides, parents are typically subjected to stronger social control (Joutseneemi et al., 2007; Kendig et al., 2007), and they may be better socially integrated into the community (Knoster and Eggebeen 2006; Nomaguchi and Milkie 2004). It is not obvious whether these consequences themselves would be deemed positive or negative. Anyway, they likely contribute positively to parents' health by affecting their lifestyle and for other reasons (Grundy and Kravdal 2010).

These types of outcomes may be called "social-behavioural". While there has been research on how childbearing may affect these outcomes – both those of them that people may have some expectations about (although they are typically never exactly met) and those they perhaps have less expectations about – we do not know anything about the gap between the actual consequences and the expected. This gap – the unexpected contribution - is certainly highly varying. For example, among a group of people who expect that their feeling of loneliness in old age will be lower if they have a(nother) child, some may experience an effect that is larger than expected and others the opposite.

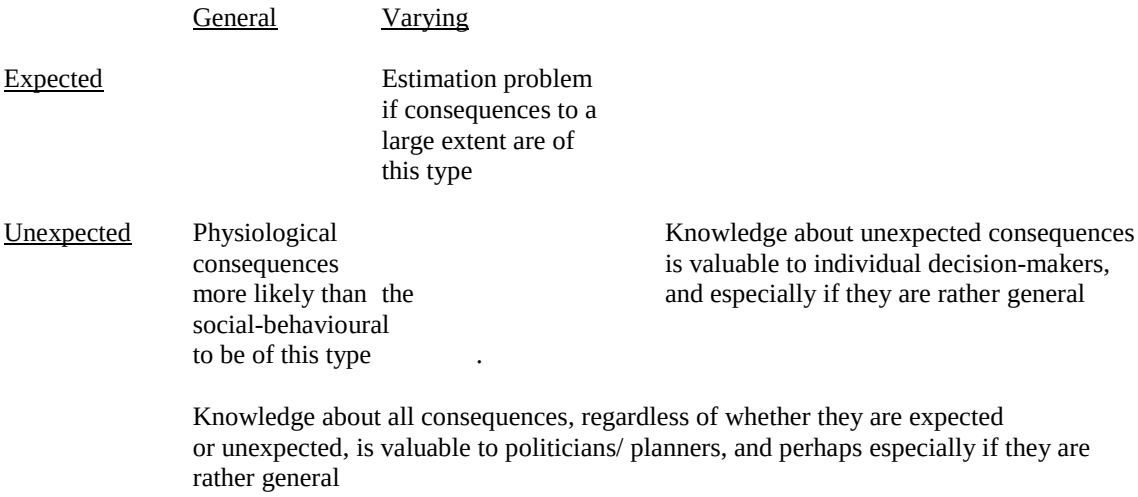
Additionally, there are physiological consequences. For example, there is a literature suggesting that the number of pregnancies and the age at which the first occurs affect the mother's chance of developing certain types of cancer (Salehi et al. 2008; Russo and Russo 2007) or other diseases (Naver et a. 2011; Skilton et al. 2009) through various physiological mechanisms. This expert knowledge is perhaps not widely shared by the public – so that these consequences are broadly "unexpected" – but little is actually known about this. Anyway, it seems reasonable to consider these changes in the disease risk as occurring in all women, and that they are also persistent, in the sense that they will also exist in the future. In other words, they are "general". If we assume, for example, that low fertility has an adverse health impact through such mechanisms, the implication would be that having few children has more

negative consequences than expected by the parents (although only a minority actually develop these diseases and other factors may play a much larger role in the disease etiology).

Finally, there may be "general surprises". For example, perhaps a government suddenly decides – without having indicated any plans about it - to increase the child allowances, thus reducing the adverse economic consequences of childbearing for everyone. It is hard to imagine research that would enable predictions of something that comes out of the blue like that. It is a type of (change in the) consequence of childbearing that is truly unexpected by everyone, even experts, and will remain so. Therefore, it is also of little interest from the perspective of this research note and will receive no attention in the discussion below.

To summarize, the consequences of childbearing for the (potential) parents may be almost as expected, or they may be rather different, in which case we may consider something unexpected as modifying or coming in addition to the expected. The consequences may even be entirely unexpected. Some of these consequences that are unexpected to the decision-makers may be known to experts; others are not even know to the latter, but may be revealed in future research. Additionally, some of the almost expected consequences vary little between individuals, and can therefore be referred to as quite general, while others vary greatly. The same can be said about the consequences that are unexpected, or the unexpected contribution. While the social-behavioral consequences can be both quite expected and largely unexpected, and can be rather general as well as highly varying, physiological consequences are probably to a larger extent unexpected (to fertility decision-makers or even experts) and general. These distinctions are illustrated in Figure 1, which also includes some conclusions from the discussion below.

Figure 1. Illustration of the main ideas about various types of consequences of childbearing.



Note that some of the consequences of childbearing that have been mentioned are quite immediate and short-lasting, while others are relevant only at a high age or are felt over a large part of the remaining life, although perhaps more in some years than in others. To give one example of the latter, it is possible that some aspects of the emotional rewards from childbearing diminish as the parents, so to speak, get used to their life with children (which

would be in line with the so-called set-point theory [Kahneman, 1999] and may be one reason for the decline in subjective wellbeing some years after birth observed by Myrskylä and Margolis [2014]). Also, various life circumstances of importance for the value and burden of parenthood may change. Such changes over time in the consequences of childbearing are largely ignored in the discussion below, as they are not important for the main arguments that are made.

Effects of number of siblings on children's wellbeing

Turning very briefly to the offspring perspective, the number of children in a family may also affect the *children's* wellbeing. For example, several (but not all) studies have shown that children with siblings tend to have particularly well developed social skills (Downey and Condron 2004). However, there are also potentially adverse effects of having (many) siblings because of more competition for economic resources and parental attention. This could perhaps lead to poorer educational progression, although recent studies have shed some doubt on this idea (Black et al. 2005; Angrist et al., 2010). Additionally, studies have suggested physiological effects of the number of older siblings in particular, i.e. the child's birth order (von Behren et al. 2011). The same categorization is relevant for these consequences of the parental reproductive behaviour for the children's wellbeing: Some are probably to a large extent expected by the parents (and taken into account in their fertility decision-making), while others are more unexpected; furthermore, some are more general than others.

What politicians and planners need

One possible perspective on social policy is that it is a public responsibility to help people who experience certain problems, regardless of the chain of decisions or events that have led them into this situation. To keep within the focus of the present discussion, consider the possibility that having few or no children increases the chance of lacking practical support (during illness as well as in everyday life) or feeling lonely in old age. It would be reasonable to try to help everyone with these disadvantages, but if it at least is known that low fertility is among the determinants, on may, for example, instruct health personnel to keep a special eye on patients in this family situation (as it can be considered an indicator of possible lack of support), and home helpers could be asked to spend more time during their visits (to mitigate the potential feeling of loneliness). Also, because those lacking support may be more in need of the type of care that can only be provided in nursing homes, it would be helpful for politicians and planners with responsibility for allocation of resources to such institutions to know about this particular implication of having no or few children, as well as the proportion of people with no or few children in various parts of the country - currently and in the future (according to population projections).

From this public-support perspective, the distinction between expected and unexpected consequences of childbearing may not be important. Many people would probably consider it reasonable to reach out a hand to people with low fertility to mitigate any problems related to lack of support or loneliness even if these disadvantages are expected consequences of the childbearing decisions these individuals have made (and supposed to be outweighed by advantages), so that they in some sense can be blamed themselves for their situation. In fact, it may be reasonable to be concerned about their lack of support or loneliness even if their life otherwise is rather good, for example because these particular adverse implications of the childbearing decisions actually *have* been outbalanced by beneficial impacts, or because they have other types of advantages.

Note that even from this perspective one would ideally want information about causal effects rather than just relationships that to a considerable extent can be a result of selection. To spell this out in more general terms, if it is not X (in this case low fertility) that causes certain problems Y (in this case lack of support and loneliness), but a determinant Z of X, it may make more sense to target people with the characteristic Z (if practically possible) and with another kind of intervention. The latter will be particularly relevant if the goal is not to, so to speak, compensate for Y (as in the mentioned example) but mitigate the effects on Y. Also, when Z is an important confounder it will be less reasonable to conclude, for example, that an increase in the proportion of people with the characteristic X will lead to an increase in the proportion with characteristic or problem Y. Such a conclusion would only hold if the increase in X involves changes in Z that correspond to the link between these two factors in the period for which the relationship between X and Y has been estimated, and if the effect of Z on Y is stable.

It would be important for politicians and planners to have knowledge about effects of childbearing regardless of whether they are varying or general, but one may argue that knowledge about the latter would be particularly valuable. To see that, assume, for example, that effects of low fertility vary much between two unidentified subgroups that are equally large in a certain population from which an estimates (of the average effect) has come; the implications of low fertility for the access to practical support are very strong in one group and very weak in another. In a specific local population it is possible, in principle, that almost everyone are in one of these two groups – which could make policies or interventions based on an estimated average effect non-optimal - but only if the population is very small. More importantly, by using knowledge about an average effect, one may provide too little help to some people and waste resources on others (who do not feel much lack of support even if they have no or few children), while the interventions would have been more efficient if there were less heterogeneity in the consequences or low fertility.

Methodological challenges

Establishing causality is always difficult, if not impossible, but special problems arise in the extreme (and hypothetical) case where a consequence of childbearing is entirely expected, taken into account in the fertility decisions (likely to be the case if the issue is very important for individual or family wellbeing) and also varies between individuals. In this situation, those expecting and experiencing the most positive effect of childbearing on the important outcome under consideration are relatively likely to actually have a child; those expecting less positive or even negative effects would be far less interested in having a child. Using the treatment effect vocabulary, one can say that there is a "treatment effect heterogeneity" that is linked to the "treatment take-up" (childbearing being the "treatment").

The estimation problem resulting from this situation was illustrated by Kravdal (2014), using a very simple hypothetical example about fertility effects on subjective wellbeing. He also showed that even the most advanced methods that have been used so far in studies of fertility and happiness do not deal adequately with it. Also Deaton and Stone (2014) have pointed to this methodological problem in the fertility-happiness research. As should be clear from the argumentation above, an effect of fertility is rarely entirely expected; it is to a smaller or larger extent expected. The larger the "expected component" is, the more variation between individuals there is in this component, and the more important the outcome is for people (so that it really matters in their fertility decision), the larger is the estimation problem.

Note that these concerns are also relevant when analysing effects of other demographic events, such as the effects of divorce on children's wellbeing (which typically matters for the parents): Parents who expect that a child will benefit much from a disruption,

rather than being harmed, and who may well be right in that judgement, may be particularly likely to end an unsatisfactory relationship. Yet, this "treatment effect heterogeneity problem" has not attracted much attention among demographers or sociologists. One exception is Xie (2012), who presented an approach to diagnose it. Economists, however, have been more concerned about the problem and suggested ways to deal with it (see for example, Brinch et al. 2016).

To end this in a more positive tone, even though one ideally would want to learn about causal effects, it would also be helpful from a public-support perspective just to be aware of statistical associations between the number of children and various specific problems, regardless of causality. Furthermore, from such a perspective the rather general effects may as mentioned be particularly interesting, and if the attention is focused on effects that are believed to be of this type – and this is a correct assessment - there will be no estimation problem such as just discussed.

Research on unexpected effects of childbearing

For individual fertility decision-makers, knowledge about unexpected effects would obviously be most valuable: In principle, families' wellbeing might have been be higher if adults making fertility decisions knew about and took into account the consequences that they are currently not aware of. They might then have had fewer children than they actually have had - or more children - and would have been better off on the whole as a family (assuming rational decisions that in a reasonable way take into account the implications for both adults and children, which may be quite difficult). An elaboration on the value of research on unexpected consequences of childbearing follows below.

Social-behavioural effects

A number of studies have tried to shed light on how childrearing affects various aspects of people's life and lifestyle - such as work activity, health behaviour or the inclination to take risks. However, no attempt has been made to separate out the unexpected component – the part that one may consider as coming in addition to what people expect (relevant for some outcomes, while there may be little consciousness, and thus few expectations, about others). In principle, one could analyse that component explicitly through surveys that allow people to make comparison between how they *thought* a child would affect their life and lifestyle and what they *judged* to be the *actual* consequences (at different stages of life) of having or not having that child. Such assessments are obviously very difficult to make, but it is possible, for example, that some relatively old people would conclude that they regret they did not have more children. One reason could be that they underestimated the benefits with respect to old age support when they made their fertility decisions. Some would surely reach the opposite conclusion, but if people on average have been too pessimistic or too optimistic about the consequences of having children, information about that might be disseminated in an attempt to help the younger generation take "better" fertility decisions and attain a higher level of wellbeing.

One limitation of this argument – in addition to the obvious difficulties involved in forming opinions about consequences of hypothetical behaviour - is that the consequences that have been unexpected for the currently quite old may not be relevant for those who are now about to make their decisions. Besides, one may wonder how valuable it would actually be to know the average when there is much variation. If statistical analysis shows, for example, that having few children *tends* to have had even more adverse impact on old age

loneliness than expected, while there is much variation and even many who have experienced a weaker impact than expected, how could this information be used by decision-makers? It may not be easy for them to know whether they belong in the "high-effect" or "low-effect" category.

As an alternative to exploring unexpected consequences of childbearing explicitly, one might consider studying effects of fertility on life and lifestyle without trying to separate out the unexpected – based on an idea that it cannot be a large problem for people to learn something they already know or expect. As mentioned, however, a methodological problem arises when we consider consequences that to some extent are expected, if there is individual variation in these expectations.

Physiological effects

As mentioned above, expert knowledge about physiological effects is perhaps not widely shared by the public. Presumably, these effects are rather persistent and general, in contrast to the social-behavioural effects, so it would be particularly helpful for people to learn about them.

Admittedly, there are apparently not huge changes in the disease risk as a result of childbearing. For example, having three children rather than one has been found to reduce the chance of a relatively common disease such as breast cancer by one-seventh (Collaborative Group on Hormonal Factors in Breast Cancer 2002). However, it is possible that some people would take such risks into account in their decision-making if they knew about them. Besides, physiological effects of first-birth timing may in some cases be stronger (Grundy and Kravdal 2010), and there may be other and still unidentified effects that are even more worthy of consideration. Thus, further research should ideally be carried out and findings from this spread to the public. Such research adds, of course, also to the pool of knowledge about human physiology, which has a much broader value.

That said, there are challenges and limitations: One problem is that many people probably have a poor understanding of probabilities and risks. Furthermore, there are several physiological consequences of childbearing, which go in different directions, and it may therefore be hard for people to "summarize" them in order to form a conclusion about how various reproductive "strategies" would affect their health through such mechanisms. In a next step, they would have to take into account what they know about the social-behavioural effects, operating on their health or otherwise, and weigh these types of advantages and disadvantages against how their health may be affected through physiological pathways, and how important good health is to them compared to other life goals.

Another challenge is that there is uncertainty about the physiological consequences; estimation is difficult, just as with the social-behavioural consequences. One issue is that existing studies typically have been based on observational designs. Besides, although the estimated effects may make good sense in light of what we know about physiological mechanisms from laboratory investigations, they may also capture social effects, such as the changes in lifestyle that often take place because of responsibility for children. For example, the mentioned consequences of childbearing for breast cancer could be partly a result of lower alcohol intake among women with many children (Bagnardi et al. 2015), rather than reflecting a purely physiological process. This is particularly problematic because the social-behavioural component may to some extent be expected and varying, and taken into account in decisions, which (again) means that the broader effect will be hard to estimate. To summarize this point, a woman may, for example, hear that her risk of developing a certain type of cancer may be reduced by a certain amount if she has two more children (itself perhaps difficult to digest),

but that there is much uncertainty, and that this effect may also be much weaker or much stronger. Such a message is not easy to make good use of.

Summary and conclusions

For politicians and planners, knowledge about the consequences of the number of children would be potentially valuable regardless of whether they are expected or unexpected (by individuals). . However, there is likely to be variation in effects of childbearing across settings, and ideally one should base policies and interventions in a certain population on knowledge about effects estimated in a population that is as similar as possible with respect to observed characteristics. As argued above, knowledge about effects of childbearing that do not vary much between individuals within such a sub-population is perhaps particularly helpful for politicians and planners. Among the effects that to a large extent are expected, the rather general are also less difficult to estimate.

For individuals, it is obviously particularly important to learn more about the fertility consequences that are unexpected to them, and especially those of them that are quite general. To be more specific, population welfare gains might be made through "better" individual decision-making by taking four steps. First, authorities, organizations or individuals with a special interest in the issue may take initiative to spread (for example through media articles or discussions, or by writing easily accessible books) existing expert knowledge about physiological consequences of childbearing that are probably largely unknown to the public, although there is uncertainty about them. This information should include some general guidance about how to interpret risks.

Second, it would be valuable to carry out research to see if there are additional such consequences and disseminate results from that research. A challenge in such research is to tease out a causal effect from the observational designs that are typically used and wipe away any social-behavioural contributions (which are more varying and less interesting to learn about).

Third, researchers may try to find out whether there are unexpected social-behavioural consequences (possibly varying over time across the parents' lives) that tend to go in a certain direction, which is far from easy. Such investigations would have to be based on people's memory of earlier expectations about these consequences, as well as insight into what the consequences actually were, which would also be hard to establish without drawing on the involved persons' own ideas.

Fourth, one may spread information about what is believed (through research) to be unexpected social-behavioural consequences, although it is not obvious how useful such knowledge would actually be for the decision-makers because of the lack of stability as well as the variation across individuals. To be more specific about the latter, the consequences may vary between countries and between identifiable groups (for example defined according to education and income) within a country. This variation should ideally be explored. However, as should be clear by now, the key problem is that there is also variation in effects within such groups defined by certain observed characteristics. Thus, even if the averages for the various identifiable groups are known (which as mentioned is a true challenge), it may not be very informative because, for some individuals in a group, the effects are considerably weaker than indicated by the group average, while it is opposite for others.

As briefly mentioned above, one can make similar arguments about other aspects of the reproductive and family behaviour. For example, a couple may decide to divorce although there are certain expected social-behavioural disadvantages for the children, because they think this on the whole is better for the child, or for the whole family, than the alternative.

(Physiological effects are not relevant from this family stability perspective.) These disadvantages for the children may not be as large as expected, or they may be worse, and knowledge about how these unexpected consequences have been in the past may have some value for those currently making decisions about dissolving their partnership. Furthermore, attempts to minimize the adverse implications for the children (and parents) may be seen as a public responsibility, which requires knowledge about how disruptions tend to affect the individuals involved. The same methodological problems are relevant when estimating the impact of family disruption as when assessing the consequences of childbearing.

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Conflict of interest: The author declares that there is no conflict of interest.

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