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Full title:

Support for new mothers and fertility in the United Kingdom: not all support is equal in the decision to have a second child

Short title:

Support and 2nd births in the UK

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Abstract

Unexpectedly low fertility across Europe highlights the need to better understand reproductive decisions in high-income countries. Availability of support may be one factor influencing reproductive decisions though availability varies between environments within high-income countries, including socioeconomic environments. We test whether receiving higher levels of different sources (informal and formal) and types (practical and emotional) of support positively correlates with second births in the United Kingdom's Millennium Cohort Study, and whether relationships differ by socioeconomic position. Our hypothesis is only partially supported: receiving emotional support correlates with higher likelihood of birth, but the opposite is true for practical support. Availability of different types of support varies across SEP, but relationships between support and fertility are similar with one exception: kin-provided childcare increases the likelihood of birth only among women of lower-SEP. Our results highlight that not all support is equal in the decision to have a second child.

Keywords:

Allomaternal Support; Cooperative Breeding; Paternal Investment; Intergenerational Support; United Kingdom; Fertility; Socioeconomic status

Introduction

Fertility rates across Europe are regularly below replacement level. Such populations are characterised by the underachievement of reproductive goals (Westoff & Ryder, 1977; Berrington, 2004; Lutz, 2007; Ní Bhrolcháin, Beaujouan, & Berrington, 2010; Harknett & Hartnett, 2014), suggesting an unmet need for children (Philipov, 2009). A better understanding of the costs and benefits of reproduction might allow them to be altered such that women and men can more easily fulfil their reproductive intentions. Receiving support for raising children is a key factor that can alter the costs and benefits of continued reproduction, while easing conflicts with competing activities. We consider support to encompass any action or presence, from any source, that causes a real *or perceived* reduction of costs to childrearing for mothers. This could include emotional support (e.g. time with friends, counselling, etc.), financial support, or practical support (e.g. childcare) from informal sources (e.g. partners, friends, family; Kaptijn et al. 2010; Park, Cho, and Choi 2010; Fiori 2011; Waynforth 2012; Mathews and Sear 2013a) or formal sources (e.g paid or professional, childcare workers, teachers, counsellors, doctors, etc; Del Boca 2002; Andersson, Duvander, and Hank 2004).

Several studies that have correlated availability of support with fertility, but results are varied and sometimes contradictory. This is particularly true in Europe, where support is often positively correlated with fertility (Del Boca, 2002; Hank & Kreyenfeld, 2003; Kaptijn, Thomese, van Tilburg, & Liefbroer, 2010; Waynforth, 2012; Mathews & Sear, 2013a, 2013b; Thomese & Liefbroer, 2013; Tanskanen, Jokela, Danielsbacka, & Rotkirch, 2014), sometimes not associated with fertility (Kertzer, White, Bernardi, & Gabrielli, 2009; Aassve, Meroni, & Pronzato, 2012; Thomese & Liefbroer, 2013) and occasionally even negatively associated with fertility (Balbo & Mills, 2011; Waynforth, 2012; Schaffnit & Sear, 2014; Tanskanen et al., 2014). Part of the reason for this variation may be that different studies use different measures of support and fertility leading to problems of comparability across studies. Support is variously measured through proxies like parental survival (Del Boca, 2002; Kertzer et al., 2009; Schaffnit & Sear, 2014) or proximity to family (Hank & Kreyenfeld, 2003; Kaptijn et al., 2010; Thomese & Liefbroer, 2013; Schaffnit & Sear, 2014), and more direct measures like childcare and financial support (Waynforth, 2012; Mathews & Sear, 2013b). Sources of support also vary: studies include support from parents (Kaptijn et al., 2010; Mathews & Sear, 2013a; Schaffnit & Sear, 2014), parents-in-law (Thomese & Liefbroer, 2013; Tanskanen et al., 2014), and more formal sources like day-care (Del Boca, 2002; Andersson et al., 2004). Additionally, relationships between partner support and fertility are becoming a particular area of interest (Park, Cho, & Choi, 2010; Rijken & Thomson, 2011; Esping-Andersen & Billari, 2015). The aim of this paper is to provide an unusually detailed analysis of how receiving different types and sources of support provided to first-

time mothers correlate to the likelihood of second births in the UK, closely examining type and source of support, and taking the heterogeneity of the study population into account, in order to tame some of the existing confusion in the literature.

The role of support in reproductive decisions: the cooperative breeding framework

Several disciplines have independently shown an interest in testing whether the availability of support is important for reproductive decision making. Economic and social scientists hypothesise that support alters the costs and benefits of beginning and continuing reproduction (Del Boca, 2002). Specifically, support is expected to alleviate tensions between competing activities in women's lives, such as employment and higher education, which became more common with societal and cultural changes of the past half century (Del Boca, 2002; Andersson et al., 2004; McDonald, 2006; Fiori, 2011). Our interest in this topic, however, stems from evolutionary theory, which also predicts that support received by women which reduces the costs of childbearing will increase fertility (an approach, we emphasise, which is complementary to, not mutually exclusive with, other social science theories: Sear 2015). In particular, we use the cooperative breeding hypothesis as our framework. This framework highlights two important points about the role of support in women's reproductive decision-making: firstly, that support is necessary for reproduction; and secondly that mothers are flexible in who they seek and accept help from, depending upon their environment. The latter point is returned to in the following section. The hypothesis that support from other individuals, called allomothers, is *necessary* for mothers to raise children successfully (Hrdy 2009; Mace and Sear 2005) is grounded in the premise that support has been necessary for successful reproduction throughout human history (Hrdy 2009) (and perhaps for our more distant human ancestors; DeSilva 2011). Unlike most mammalian species, human mothers simply cannot raise children alone because of the high costs of rearing children: our long period of childhood development means that mothers simultaneously care for multiple dependent children at different developmental stages. The assertion that support is necessary for reproduction is not strictly testable as, we would argue, there are no cases or societies where women receive *no* support with childrearing. Typically, mothers are embedded in social networks where they may receive varying amounts and types of support from partners, family, friends or other social group members; a range of institutions provide additional support on top of these personal networks, such as healthcare and education in welfare states.

This hypothesis that support is necessary for reproduction, though not directly testable, has stimulated a considerable amount of research designed to test the corollary hypothesis that variation in levels of support received will correlate with variation in reproductive outcomes. More

precisely, mothers who receive plentiful support will be more likely to raise children 'successfully', and may have more children than those who receive less support (note: in the evolutionary field, 'successfully' is not a qualitative assessment of parenting skills, but refers to producing children who survive to adulthood and who are then expected to have their own children). In high-fertility populations, availability of allomaternal support for raising children improves reproductive outcomes for women, in terms of child survival and sometimes increased fertility, supporting the cooperative breeding hypothesis (reviewed in: Sear and Coall 2011; Sear and Mace 2008). In low-fertility, high-income countries the relationships between allomaternal support and reproduction is more equivocal, particularly within the European continent (Del Boca & Sauer, 2009; Balbo & Mills, 2011; Waynforth, 2012; Schaffnit & Sear, 2014; Tanskanen et al., 2014). In such contexts, we no longer optimise reproductive output as would be expected based on the simplest hypotheses derived from evolutionary theory (Goodman, Koupil, & Lawson, 2012). Nevertheless, the cooperative breeding framework suggests our evolved physiology and psychology has been shaped to be sensitive to the availability of support when making reproductive decisions (Sear, 2015), so that we still respond to cues of support.

Flexibility in use of reproductive support: the role of socioeconomic position

A second feature of the cooperative breeding framework is that it emphasises flexibility: mothers may receive support for childrearing from a number of sources, but exactly who provides support may differ between populations (Hrdy 2005). Literature using the cooperative breeding perspective has traditionally focused on provisioning and care support from family members (e.g. grandmothers, father, siblings) in small-scale, high-fertility societies (Sear, Mace, & Mcgregor, 2000; Sear, Mace, & McGregor, 2003; Sear & Mace, 2008). This is because related individuals make up a large proportion of women's social networks in such societies, making them convenient allomothers, and they also have a vested interest in the wellbeing of related children (Hamilton, 1964). Within such settings support from family members is often inversely correlated, highlighting the flexibility of allomaternal support (Meehan 2005; Meehan et al. 2014; and in modern societies: Botcheva and Feldman 2004; Meyers and Jordan 2006; Powell 2002; Thomese and Liefbroer 2013). In contrast, in low-fertility countries, women's networks are large and often include both kin and non-kin who can provide childrearing support. This, along with an expansion in the types of potential support which can be provided in such societies (beyond help with subsistence tasks, which has the focus of study in small-scale societies), means that the analysis of how support influences fertility is much more complex in high-income societies, and requires careful operationalisation. Such societies are also large and heterogeneous, so it is important to consider whether such heterogeneity influences

either the availability of support, or relationships between support and fertility (Stulp, Sear, & Barrett, 2016).

Socioeconomic position is a key factor that patterns women's access to and use of many different types of support in high-income contexts. The United Kingdom, like other high-income countries, has high socioeconomic inequality (OECD, 2013). Socioeconomic status correlates with the availability and use of support surrounding reproduction. In general, women with a low socioeconomic position (SEP) have smaller, but more kin-dense social networks than women with higher SEP (Ajrouch, Blandon, & Antonucci, 2005). These women are also less likely to seek formal support (such as that from GPs preceding or following a birth) than higher-SEP women even when such support is provided freely through social-welfare programs (Séguin, Bouchard, Michèle, Jacinthe, & Potvin, 1995; Sword, 2003; Sword & Watt, 2005). Paid sources of support such as formal childcare are often inaccessible to low-SEP women due to the costs and inflexibility of the support (Powell, 2002; Meyers & Jordan, 2006). Low-SEP women are also less likely to have partners (Séguin et al., 1995; Duncan & Magnuson, 2005) and when present partners may provide less help in raising children than higher-SEP men (Harris, Furstenberg, & Marmer, 1998; Mclanahan, 2004; Nettle, 2008, 2010). We therefore include support from partners in our analysis since they are an important source of support for women, but also a significant source of variation in support.

This research addresses two key assertions of the cooperative breeding framework: we test the hypothesis that more support predicts higher fertility all else equal; and explore whether women flexibly rely on different types of support depending upon their environment, measured through socioeconomic position. While we are primarily interested in testing the hypothesis that greater support will be associated with higher fertility, there are exploratory aspects to this research, in that we make no clear a priori predictions about which types of support may be more important; nor exactly how patterns of support will differ by socioeconomic position. More precisely, we will:

1) Establish patterns of support across SEP groups in our UK sample and explore the substitutability of support from partners. We predict that as preferred supporters, families will play a particularly large role in filling-in for absent partners for all women and, for lower-SEP women, due to the inaccessibility of costlier support.
2) Test whether indicators of receiving support correlate with the likelihood of having a second birth in the UK, while exploring potential variation due to SEP. Broadly, we expect that the presence of support will positively predict having a second birth.

Probability of a second birth is our primary outcome so that we can explore how different types of support, including support in caring for the first child, associates with further childrearing. After the

birth of a first child is a time when new mothers are in particular need of support, so this may play an important role in the decision to progress to a second child or not. Further, progression to the second child is one important determinant of overall fertility in low-fertility societies, where relatively few individuals progress to third or higher order births.

Methods

Data

We address these objectives using the Millennium Cohort Study, a UK-wide longitudinal survey following over 18,000 children born between the years 2000 and 2001 (in Northern Ireland and Scotland sample collection continued until 11 January 2002) (Hansen, 2012b). The first wave of data was collected about nine months after the birth of cohort members (CM) and subsequent waves were collected about every two years. In this analysis we will use waves one through four, covering an eight-year period after the birth of the CM. The outcome indicates whether participants had a second child in the eight years following their first birth. As such, the sample is limited to women for whom the CM was their first child and those in which the CM's genetic mother was the main respondent. The median interval between first and second births in the UK in 2012 was 36 months (Office for National Statistics, 2014). In our own sample, no second births occurred after 71 months (out of 101 months available) and we included only women who were interviewed both in waves one and four of data collection (82.5% of our first-time mother sample). We excluded women whose first birth was a multiple birth (twins and triplets), as the decision to have another birth may be different for those women compared to mothers of singletons. Due to our model averaging method (described below), it was essential that all models have the same sample (Symonds & Moussalli, 2011). The dataset has relatively little missing data: ten variables of interest for this study had missing values at a maximum of 2%. We conducted all analyses below with complete cases; the final sample included 3,893 women.

Operationalising support

Support refers to a broad range of "currencies" – that is, actions or presences which can alter the real and/or perceived costs and benefits of having children. Twelve support variables - the main independent variables - were chosen based on availability in the dataset to represent many types and sources of support available to new mothers in the UK. Variables included three types of support from families, three from partners, and four from unrelated individuals. All support was measured in wave one. To maximise information, data from wave two were incorporated when relevant, available and when a second birth had not already occurred.

Support from families. Support from families included information on childcare, financial help, and contact. *Childcare* measured whether women received childcare from their parents, parents-in-law, both or neither for the first child. Separately for women's parents and parents-in-law, two variables measured the number of forms of *financial support* provided to new mothers including: buying essentials for the baby, lending money, buying gifts, paying for household costs, helping with childcare costs, and other financial support. *Contact frequency* with women's parents and parents-in-law was also measured. Contact could be a proxy of more practical support (Pollet, Nelissen, & Nettle, 2009; Tanskanen et al., 2014), but may be indicative of either emotional closeness between parents(-in-law) and adult children or support given to the older generation. In this study contact frequency included five categories: never sees parents(-in-law) or parents(-in-law) are both dead; less than yearly contact; contact at least yearly; contact at least weekly; or co-resident. Finally, a control dummy variable for whether at least one parent was alive was also included, as support is obviously not available if both parents are dead. Only 50 women had neither a living mother nor father. No partnered women in our sample had both a dead mother-in-law and father-in-law, so that a control for having at least one living parent-in-law was not necessary.

Support from partners. Support from partners included both practical support and emotional support. A *Paternal investment* score measured the number of tasks which women's partners did equally or more often than the woman including: cooking meals, cleaning, doing laundry, managing the household money, home repairs, looking after child when ill, looking after child regularly, feeding the child, changing the child's nappy, and getting up in the night for the child. A *paternity leave* variable indicated whether the partner took leave from work following the birth of the CM. Finally, women's self-assessed *relationship quality* represented the more abstract components of support from partners that comes from feeling secure and stable in a relationship; women responded on a 7-point scale from low (1) to high (7) relationship quality. Women's partnership status was included as a categorical variable: single throughout; single at wave one, partnered before birth of second child or final wave; partnered at wave one, single before birth of second child or final wave; partnered throughout.

Support from unrelated individuals. Support from unrelated individuals also included practical and emotional types of support. *Contract frequency with friends* indicated whether women saw friends more than three times a week, one to two times a week, or never/had no friends. This is not a direct form of practical support, but friends do provide important emotional support to new mothers (with noted health benefits: Poortinga 2006). *Formal support* measured how many sources of support women sought after the birth of the CM from GPs, health advisors, religious groups, drop-in centres for families, or telephone advice lines. *Paid childcare* indicated whether mothers received

support with childcare from paid sources. Finally, a general measure of feeling supported (which can help increase feelings of security should one need help in the future; Seltzer and Bianchi 2013) indicated whether women disagreed, neither agreed nor disagreed, agreed, or were not sure whether they agreed or disagreed with the statement "There are other parents I can talk to about my experiences."

Socioeconomic position and other variables. Socioeconomic status is a broad concept which can be operationalised using prestige-based or resource-based measures (Diemer, Mistry, Wadsworth, López, & Reimers, 2013). For the purposes of this research, we use the latter conceptualisation; household income equivalised for household composition (e.g. number of adults) and size is our primary measure of SEP (Hansen, 2012a), split into terciles. In contrast to prestige-based measures of SEP, equivalised household income is a clear indicator of individual-level hardship or environmental harshness and has direct implications for the accessibility of certain types of support – particularly those that cost money – unlike prestige-based measures (Diemer et al., 2013).

Models also included variables to account for key areas confounding in the association between support and fertility: women's employment status (employed, unemployed, or self-employed), age at first birth, partnership status, and parental survival. Employment status is key in both determining the need for support and women's reproductive schedules, while for biological reasons mothers' age at first birth is predictive of having further children, but also can influence the support sought or needed by new mothers. Education was not included in final models: it is not strongly linked to the likelihood of second birth in the UK (Berrington, Stone, & Beaujouan, 2015), and made no difference to substantive results when included in models.

Analysis

Patterns of support across SEP groups. To document patterns of support by SEP, we created a descriptive table containing the proportions of women receiving support and mean amounts of support by income. Statistics related to paternal investment and support from women's in-laws are only for women with partners. Family support data refer only to those women with at least one living parent.

Substitutability of partner support. We used logistic and poisson regressions (depending on the outcome variable) to test whether the absence of partner support predicts receiving other forms of support: childcare from parents, amount of financial support from parents, weekly contact with parents (excluding co-resident women), co-residence with parents, paid childcare support, amount of formal support, frequent contact with friends (more than 3 times a week), and agreement with

the statement "There are other parents I can talk to about my experiences". We focused particularly on whether the absence of a partner affects the receipt of other support because partners are an important source of support in high-income populations where the nuclear family is idealised (Sear, 2016); we expect women without such support to seek support elsewhere. For each outcome, a first model included partner status and wealth and a second model included an interaction between the two predictors. All models included women's employment status and age at first birth. Wave one data were used for these analyses.

Correlations between support and having a second birth To determine whether support correlated with the probability of second birth, we used natural model averaging. In contrast to traditional null hypothesis testing, model averaging takes into account information from a number of models representing probable associations between predictors and outcome; resultant parameter and error estimates represent weighted averages of many models, thus reducing model selection uncertainty and producing robust parameter estimates (Johnson & Omland, 2004). This method allows us to determine not just which support variables are correlated with the probability of second birth, but also which variables are most important to this decision.

Model averaging includes four main steps. Firstly, logistic regression models for the probability of second birth were generated and run with every combination of the 12 measures of support (4,095 models generated using the tuples command in Stata 13; controls included in all models). Comparing large numbers of models comes with some risk of identifying spurious effects (Johnson & Omland, 2004), but all models compared represent plausible associations and were thus not excluded. Further, adjusted odds ratios for the associations between support types and births produced from non-averaged logistic regression models suggest that model averaged parameter estimates reflect genuine associations. This first step was repeated for the full sample (n=3,893) and, in order to compare correlations between SEP groups qualitatively, for each SEP tercile sample: low (n=1,286), middle (n=1,286) and high (n=1,321). Secondly, for each sample AIC weights (wAIC) were generated for each model. A model's wAIC represents the probability that that model is the best model given the data and other available models (Wagenmakers & Farrell, 2004). For a given set of models, the sum of wAICs will be one. Thirdly, models from each set were ranked by wAIC from highest to lowest. Parameters from models accounting for the top 95% of the aggregate wAIC (21 models from the full sample; 156 for the lowest wealth tercile; 126 from the middle wealth tercile; and 85 from the top wealth tercile) were used to conduct model averaging in R using the AICmodavg package.

Finally, the complete set of models (models accounting for 100% of wAIC) were used to estimate *variable importance* for each support measure for each sample. Variable importance is the cumulative wAIC of models containing each variable (Symonds & Moussalli, 2011) and represents the probability that the predictor (type of support) is in a "best" model for the data; variables with an importance close to one are more probably in a best model than variables with an importance nearer to zero. (For a fuller discussion of AIC model averaging and examples see: Alvergne et al. 2011; Alvergne et al. 2013; Borgerhoff Mulder and Beheim 2011; K. P. Burnham 2004; Burnham and Anderson 2002; Burnham et al. 2010; Richards 2005; Richards et al. 2010; Symonds and Moussalli 2011).

Results

Patterns of support across SEP groups

We firstly established patterns of support for new mothers by SEP in our UK sample. Broadly, lower income mothers receive lower levels of support than wealthier women, though some variation is evident (Table 1). Partners are both more often present and provide more support to mothers in higher income groups. Fewer women in the lowest tercile of income are partnered throughout the study period, and those that are have partners less likely to take paternity leave, with lower paternal investment scores, and lower relationship quality than higher income terciles. Similarly, paid and formal support are most common in the highest income group: higher proportions of wealthy mothers receive paid childcare and make use of more sources of formal support than poorer women. Frequent contact with friends is most common for women in the lowest income tercile, but the same group has the largest proportion of respondents reporting no friends or never seeing them and feeling that they do have other parents to speak to. Some support from families are most common in the poorest sample: women in the lowest income tercile receive more types of financial support and more commonly receive childcare from their parents than do those with higher wealth. Family contact and childcare relate to SEP non-linearly.

Table 1: Descriptive statistics for support variables and fertility information by socioeconomic position

		Equivalized household income			
		Low	**Mid**	**High**	**Full sample**
	n	1286	1286	1321	3893
	Had 2nd Birth (%)	46.97	61.20	68.05	58.82
	Age at First Birth (mean)	22.78	27.30	30.53	26.90
Family	Frequency of contact with parents (%)				
	Never	2.18	1.63	2.35	2.05
	Less than yearly	2.72	1.48	1.51	1.90
	At least yearly	11.66	18.82	33.46	21.42
	At least weekly	62.29	73.87	61.70	65.91
	Coresident	21.15	4.20	0.98	8.71
	Frequency of contact with parents-in-law (%)				
	Never	3.92	1.16	0.77	1.54
	Less than yearly	8.97	2.83	1.31	3.40
	At least yearly	24.80	26.12	47.19	34.66
	At least weekly	57.42	68.30	49.27	58.22
	Coresident	4.89	1.58	1.46	2.18
	Childcare from family (%)				
	None	60.34	45.65	54.73	53.58
	From parents only	31.49	28.54	24.00	27.97
	From parents-in-law only	4.12	11.04	8.78	7.99
	From both parents and parents-in-law	4.04	14.77	12.49	10.45
	Amount of Financial Support from Parents (mean)	2.09	1.68	1.34	1.70
	Amount of Financial Support from In-laws (mean)	1.47	1.42	1.24	1.35
Partner	Partner Status (%)				
	Single	42.85	5.29	1.51	16.41
	Single -> Partnered	9.49	1.24	0.00	3.54
	Partnered -> Single	4.51	4.04	2.50	3.67
	Partnered	43.16	89.42	95.99	76.37
	Paternity Leave Taken (%)	57.59	81.03	87.09	78.95
	Amount of Partner Support (mean)	3.91	4.18	4.46	4.24
	Relationship Quality (mean)	5.65	5.74	5.88	5.78
Other	Amount of Formal Support (mean)	0.92	1.14	1.34	1.14
	Receives paid childcare (%)	20.37	41.68	62.45	41.69
	Has Other Parents to Speak to (%)				
	Can't say	2.26	1.24	0.68	1.39
	Agree/strongly agree	73.87	82.66	88.95	81.89
	Neither agree nor disagree	11.04	6.61	3.71	7.09
	Disagree/strongly disagree	12.83	9.49	6.66	9.63
	Frequency of Contact with Friends (%)				
	More than 3 times a week	21.00	15.55	19.83	18.80
	1-2 times a week	46.03	50.47	52.54	49.70
	Never/no friends	32.97	33.98	27.63	31.49

Substitutability of partner support

Secondly, we tested if the absence of partners is associated with the substitution of support from families and unrelated individuals. In the absence of partners, women have a higher probability of receiving a variety of other types of support (Figure 1), particularly in regards to support from families and for poorer women who are most likely to be unpartnered. Women without partners in the lowest income tercile have higher predicted probabilities of receiving childcare from parents and paid sources, have higher expected levels of financial support from families, are more likely to live with their parents, and to see their friends frequently than women with partners. Financial support and the probability of co-residing with parents is also higher for unpartnered women in the middle income tercile, but the differences disappear for the highest income tercile. Despite overall evidence of substitution of support, women without partners in the top two income terciles are less likely to feel that they have other parents to speak to and unpartnered women in the bottom two income terciles receive fewer types of formal support than women with partners and similar incomes.

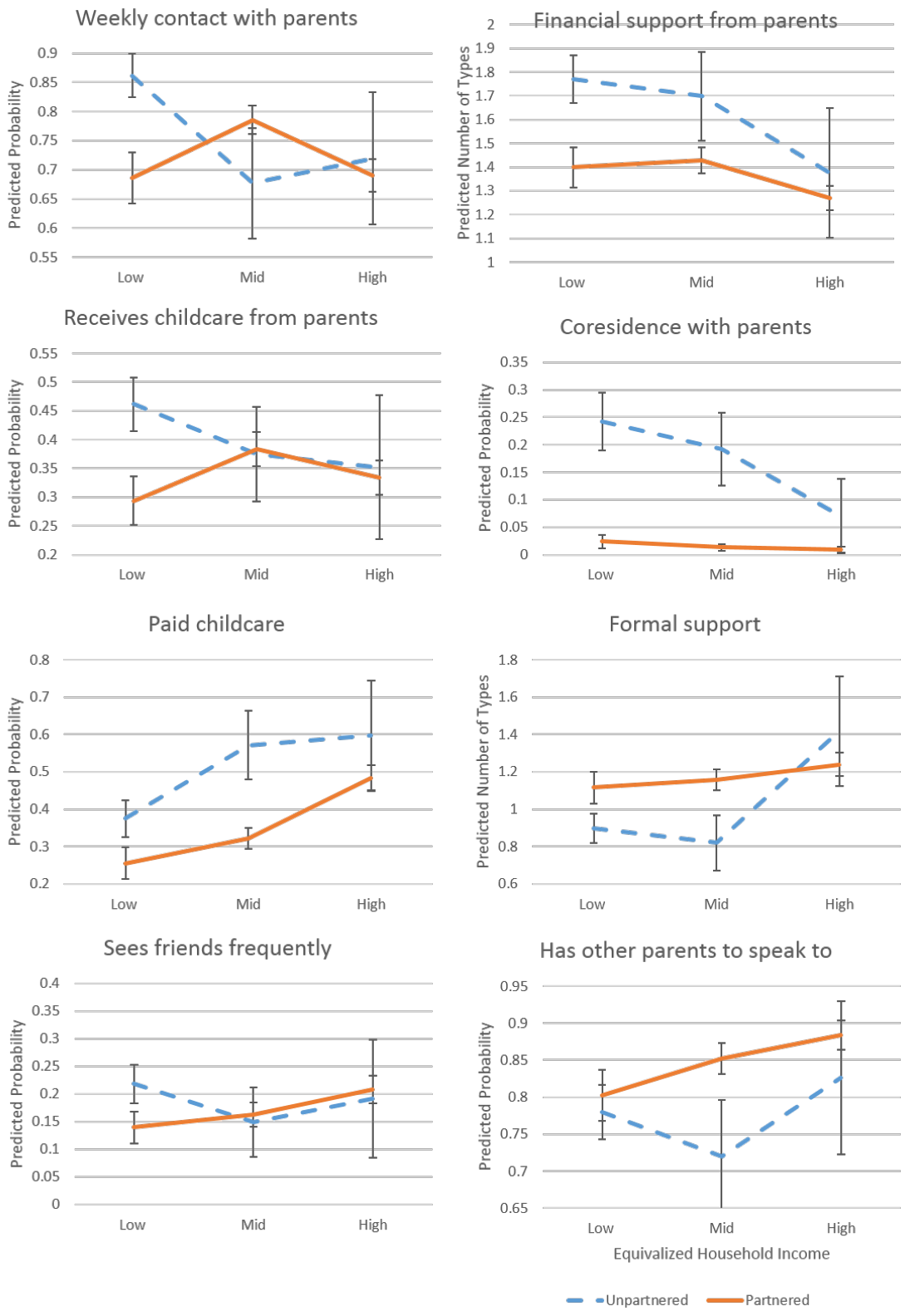

Figure 1: Predicted probabilities of receiving and predicted values of support with 95% confidence intervals for women with (solid line) and without (dashed line) a partner by socioeconomic position

Correlations between support and having a second birth

Finally, we tested whether receiving support is correlated with the likelihood of having a second birth in the UK, both in the full sample and within each SEP tercile (Table 2); the results presented represent the magnitude and direction of association between each type of support and the probability of second birth. Variable importance measures represents the probability that a given type of support is in the "best" model given the data and candidate models (Table 3).

Overall, practical and emotional support have different associations with second births (Table 2). Receiving practical support after the birth of a first child associates with lower odds of having another child: women receiving more financial support from families have 15-29% (depending upon SEP group) lower odds of having a second birth than those with less financial support; and those receiving paid childcare have 45-52% lower odds of having a second birth than those not using paid childcare. In contrast, receiving non-practical or emotional support predicts higher odds of having a second child. Such support includes frequent contact with friends, high relationship quality, having other parents to speak to, and support from GPs, counsellors etc. Women who ranked their relationship quality more highly have 10-15% higher odds of birth and receiving more formal sources of support related to 7-19% higher odds of birth. Contact with families has a non-linear relationship with the probability of second birth. Moderate levels of contact with parents and parents-in-law sometimes associates with higher odds of having a second birth compared with having more frequent contact. In the middle income tercile, a strong positive association between never seeing parents and having a second birth is noted, but very few women with a living parent fell into this category so little weight should be attached to this finding.

Comparing results qualitatively between SEP terciles, the general negative association between practical support and second births and positive associations between non-practical support and births are largely consistent with a few exceptions. There is evidence that women in the lowest income tercile have 89% higher odds of having a second birth when receiving childcare from both parents and parents-in-law compared to women receiving no childcare from families. Odds ratios suggest if anything, the opposite for women in the middle and highest income groups, although p-values are greater than 0.1 for these relationships. Paternal investment negatively predicts having a second birth, but this result is only statistically significant ($p<0.05$) for women in the middle income tercile; the odds ratios in other income groups look similar, however.

Parameter importance estimates (Table 3) suggest that some forms of support are important predictors of second birth regardless of income tercile, while others are more important to particular income groups. Financial support from parents, paid childcare, relationship quality, and

the frequency of seeing friends have high probabilities of being important (0.73-1.00) in all three income groups: the former two variables – financial support and paid childcare – are negatively associated with the probability of birth, while the latter – relationship quality and seeing friends - positively predict births. Paternal investments (anti-natal associations), having other parents to speak to and formal support (both pro-natal associations) have greater importance in the higher income terciles, while financial support from parents-in-law (anti-natal associations) ranks more highly in the bottom two income terciles.

Table 2: Model averaged odds ratios, 95% confidence intervals, and p-values for logistic regressions on having a second child by socioeconomic position

	Equivalised Household Income											
	Low Wealth			Mid Wealth			High Wealth			Total Sample		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
Childcare from family (ref: none)												
From parents only	0.91	(0.68-1.21)	0.50	1.10	(0.79-1.54)	0.56	0.98	(0.71-1.37)	0.93	1.01	(0.85-1.21)	0.92
From parents-in-law only	1.50	(0.75-3.02)	0.25	0.92	(0.6-1.41)	0.71	0.92	(0.56-1.51)	0.73	1.07	(0.8-1.43)	0.63
Both	*1.89*	*(0.93-3.8)*	*0.08*	0.87	(0.58-1.3)	0.49	0.71	(0.46-1.11)	0.13	0.96	(0.74-1.25)	0.75
Financial support from parents	*0.80*	*(0.72-0.89)*	*<0.001*	*0.85*	*(0.75-0.96)*	*0.01*	*0.71*	*(0.61-0.82)*	*<0.001*	*0.78*	*(0.73-0.84)*	*<0.001*
Financial support from parents-in-law	*0.81*	*(0.68-0.96)*	*0.02*	*0.87*	*(0.76-1)*	*0.04*	0.96	(0.82-1.13)	0.64	*0.91*	*(0.83-0.99)*	*0.03*
Contact with parents (ref: weekly)												
Never	0.85	(0.29-2.47)	0.77	*12.28*	*(0.79-191.2)*	*0.07*	*0.22*	*(0.04-1.28)*	*0.09*	0.77	(0.33-1.81)	0.56
Less than yearly	1.45	(0.62-3.36)	0.39	0.76	(0.27-2.12)	0.60	1.40	(0.42-4.66)	0.58	1.13	(0.63-2.02)	0.68
At least yearly	*1.50*	*(0.99-2.29)*	*0.06*	1.33	(0.94-1.86)	0.10	1.07	(0.79-1.44)	0.65	*1.22*	*(1-1.49)*	*0.05*
Co-resident	0.86	(0.61-1.2)	0.37	1.67	(0.76-3.65)	0.20	2.34	(0.47-11.63)	0.30	0.95	(0.71-1.28)	0.76
Contact with parents-in-law (ref: weekly)												
Never	2.12	(0.7-6.41)	0.19	1.73	(0.47-6.35)	0.41	0.37	(0.09-1.51)	0.17	1.27	(0.63-2.57)	0.51
Less than yearly	*2.03*	*(0.96-4.29)*	*0.06*	1.57	(0.67-3.68)	0.30	0.37	(0.09-1.51)	0.17	1.51	(0.92-2.47)	0.10
At least yearly	1.26	(0.78-2.03)	0.34	1.23	(0.9-1.68)	0.19	*1.69*	*(1.28-2.23)*	*<0.001*	*1.40*	*(1.16-1.69)*	*<0.001*
Co-resident	0.66	(0.28-1.56)	0.34	0.78	(0.29-2.11)	0.62	1.13	(0.37-3.49)	0.83	0.78	(0.46-1.35)	0.38
Paternal investments	0.97	(0.9-1.05)	0.45	*0.95*	*(0.9-1)*	*0.05*	0.96	(0.9-1.01)	0.13	*0.95*	*(0.92-0.99)*	*0.01*
Paternity leave	*1.41*	*(0.98-2.03)*	*0.07*	0.93	(0.67-1.3)	0.68	0.92	(0.62-1.36)	0.67	1.11	(0.9-1.36)	0.33
Relationship quality	*1.15*	*(1.02-1.3)*	*0.02*	*1.13*	*(1.03-1.24)*	*0.01*	*1.10*	*(1-1.21)*	*0.05*	*1.13*	*(1.06-1.19)*	*<0.001*
Paid childcare support	*0.55*	*(0.4-0.77)*	*<0.001*	*0.49*	*(0.38-0.64)*	*<0.001*	*0.48*	*(0.35-0.65)*	*<0.001*	*0.50*	*(0.42-0.59)*	*<0.001*
Formal support	1.07	(0.94-1.22)	0.31	1.09	(0.96-1.25)	0.18	*1.19*	*(1.05-1.35)*	*0.01*	*1.13*	*(1.05-1.21)*	*<0.001*
Sees friends (ref: never/no friends)												

More than 3 times a week	*1.94*	*(1.38-2.74)*	*<0.001*	*2.70*	*(1.78-4.09)*	*<0.001*	*2.37*	*(1.56-3.58)*	*<0.001*	*2.23*	*(1.78-2.78)*	*<0.001*
1-2 times a week	1.05	(0.8-1.39)	0.72	*1.56*	*(1.19-2.04)*	*<0.001*	1.18	(0.88-1.57)	0.27	*1.22*	*(1.04-1.44)*	*0.01*
Has other parents to speak to (ref: agree)												
Don't know	1.23	(0.53-2.86)	0.63	1.06	(0.34-3.37)	0.92	0.58	(0.13-2.52)	0.46	0.97	(0.52-1.81)	0.93
Neither agree nor disagree	1.07	(0.72-1.58)	0.75	0.70	(0.43-1.15)	0.16	*0.56*	*(0.29-1.05)*	*0.07*	0.83	(0.63-1.09)	0.19
Disagree	*0.72*	*(0.49-1.05)*	*0.08*	0.70	(0.45-1.07)	0.10	*0.54*	*(0.34-0.88)*	*0.01*	*0.67*	*(0.52-0.85)*	*<0.001*

All models control for woman's age at first birth, employment status, partner status, and survival status of parents

Table 3: Variable importance (numbers) and direction of association (+/-) between variable and second birth by socioeconomic position

		Low wealth		Middle wealth		High wealth		Total sample	
		Imp.	**Effect**	**Imp.**	**Effect**	**Imp.**	**Effect**	**Imp.**	**Effect**
Kin	Kin provided childcare	0.17	+	0.04	+/-	0.07	-	0.02	+/-
	Financial support from parents	***1.00***	**-**	***0.91***	**-**	***1.00***	**-**	***1.00***	**-**
	Financial support from parents-in-law	***0.88***	**-**	***0.74***	**-**	0.29	-	***0.80***	**-**
	Frequency of contact with parents	0.08	+/-	0.22	+/-	0.07	+/-	0.08	+/-
	Frequency of contact with parents-in-law	0.10	+/-	0.04	+/-	***0.96***	***+/-***	***0.94***	***+/-***
Partners	Paternal investment	0.33	-	***0.70***	**-**	***0.54***	**-**	***0.94***	**-**
	Paternity leave	0.41	+	0.13	-	0.13	-	0.18	+
	Relationship quality	***0.85***	***+***	***0.93***	***+***	***0.73***	***+***	***1.00***	***+***
Others	Frequency sees friends	***1.00***	***+***	***1.00***	***+***	***1.00***	***+***	***1.00***	***+***
	Paid childcare	***0.99***	**-**	***1.00***	**-**	***1.00***	**-**	***1.00***	**-**
	Feeling: other parents to talk to	0.10	+	0.13	+	***0.62***	***+***	***0.85***	***+***
	Formal support	0.38	**+**	0.47	**+**	***0.94***	***+***	***0.98***	***+***

Importance shown in bold when value is greater than 0.5
+ = pro-natal association; - = anti-natal association; +/- = non-linear association

Discussion

The cooperative breeding hypothesis, derived from evolutionary theory, predicts that higher levels of support will correlate with higher fertility, though highlights that there is flexibility in how support is provided and used depending on the environment. Our analysis demonstrated variability in access to, and use of, certain support types based on socioeconomic position, one aspect of the environment: poorer women in the UK receive less support from partners and formal sources, but this is partially compensated for by greater support from family. Those types of support which women are more likely to receive have greater importance in predicting their likelihood of second birth. The hypothesis that higher levels of support would correlate with higher probabilities of second birth was only partially supported, however. Across SEP groups, practical support broadly negatively correlates with second births, with the exception that, for lower income women, childcare from families is associated with higher probability of second birth. Less tangible, emotional support, on the other hand, does positively correlate with second births. This may suggest the primacy of perceptions of support over actual support in such modern, post-industrial societies where most women have access to enough resources to raise children, including the buffer provided by formal institutions.

Patterns of Support by SEP

With the exception of support from families, mothers in the lowest income tercile received generally lower levels of support from partners and other sources. There are undoubtedly numerous reasons behind these patterns. Drawing on evolutionary life history theory, and providing an explanation at an "ultimate" level (in terms of evolutionary function) environmental harshness – approximated by SEP – is predicted to influence reproductive strategies, including strategies related to parental investments in children (Stearns, 1992; Mace, 2014). Living in harsh environments – such as those associated with low-SEP – has been hypothesised to be associated with lower levels of parental investment (Stearns, 1992). In such contexts, there are fewer opportunities for children to capitalise on intensive parental investment to increase their SEP, so that parents may gain fewer benefits from investing heavily in the child "quality" (Kaplan, Lancaster, & Anderson, 1998; Nettle, 2008; Dotson, Kitner-Triolo, Evans, & Zonderman, 2009). This framework could account for fathers' low involvement with childrearing and low-SEP mothers experiencing less support from formal sources surrounding reproduction. Higher levels of support from high-SEP fathers could reflect (1) high perceived costs of raising high-SEP children (and thus the need for extensive bi-parental care) (Lawson & Mace, 2010), (2) higher expected returns to investment in these children in terms of their future SEP, as well as (3) the greater ability of high-income fathers to invest in children than those with fewer resources. On a proximate level, poorer mothers may also be less likely to seek long term or high-investing partners because they are reluctant to pay the costs of partnership if partners are unreliable sources of support due to low employment/wages or high rates of incarceration (Geronimus, 1987; Carbone & Cahn, 2014). Further, fear of being judged and negative experiences with professional supporters (such as GPs and counsellors) among poor women may deter women from seeking support – particularly formal sources (Sword & Watt, 2005).

Substitution of Support from Partners

Although support is not equally used/available to all women, the cooperative breeding framework highlights the flexibility of allomaternal support during reproduction. It is perhaps unsurprising that, in line with this understanding, families are important sources of compensatory support when women's partners are absent, particularly for women in the lower income terciles – i.e. those women most likely to be unpartnered. Grandparents' (women's parents) support can improve their grandchildren's health and educational outcomes (Aquilino, 1996; Dunifon & Kowaleski-Jones, 2007; Sear & Coall, 2011), as predicted by kin selection theory, where states that individuals can increase their (genetic) fitness by investing in kin (Hamilton, 1964). Previous studies have similarly suggested that grandparental support may be targeted at those most in need (Meyers & Jordan, 2006; Snopkowski & Sear, 2015). Non-familial support is also correlated with the absence

of partners, though not always as a substitute. Women without partners were more likely to use paid childcare, but made less use of other formal sources of support, particularly in the lower income terciles. The latter likely reflects the aforementioned fear of judgment and previous negative experiences that act as barriers to formal support for poorer women (Sword & Watt, 2005) and in some cases due to financial barriers.

Influence of Support on Second Birth Outcomes

The primary prediction of cooperative breeding that receiving support will increase the likelihood of a second birth is partially supported in that some forms of support positively correlate with the likelihood of a second birth but other forms of support are negatively associated with second births. Source of support did not matter in terms of identifying patterns of associations (perhaps surprisingly: Leonetti, Nath, and Hemam 2007; Borgerhoff Mulder 2009; Tanskanen et al. 2014; Sheppard et al. 2014). Rather, (1) receiving practical support negatively relates to having a second child and (2) receiving emotional (or less tangible) support positively predicts having a second birth. Correlations were broadly consistent across SEP groups.

The division between practical and non-practical support in predicting second births suggests that different types of support can have different meanings for reproductive decision making. The presence of non-practical and emotionally-oriented support may signal the availability of untapped practical support *should it be needed* (Low, Simon, & Anderson, 2002; Waynforth, 2012; Seltzer & Bianchi, 2013; Tanskanen & Rotkirch, 2014), and may be more relevant in promoting higher fertility than the actual receipt of practical support. In contrast, receiving practical support can indicate greater need on the part of mothers who seek out such support (Seltzer & Bianchi, 2013; Snopkowski & Sear, 2015) and thus deter further reproduction; though alternatively it could present opportunities to invest in non-reproductive goals such as careers. To illustrate, high paternal investments may suggest that partners are unemployed and that the mother is the primary family earner thus reducing the probability of future reproduction. Paid childcare represents a financial loss and may indicate that women are focusing on employment rather than further childrearing. Financial support may be an indicator of greater financial need, or present an opportunity to invest in the quality of a first child at cost to having more children. It is therefore possible that residual confounding due to unmeasured needs could drive observed correlations. This could be a fruitful line of enquiry for future research on the subject, though need could be a difficult thing to measure as they may be perceived rather than "real".

Childcare from families, a practical form of support, breaks this general pattern; it positively predicts second births for women in the poorest groups but negatively (though not statistically significantly) predicts births for those in the highest income tercile. Childcare from families may

represent different contexts and opportunities depending upon SEP: high-SEP women may use the time-freeing support to invest in a career, while lower-SEP women are less likely to be employed and may focus the time saved into further reproduction. Contact with parents and parents-in-law also inconsistently (and non-linearly) relates to probability of second births across income terciles. When correlated to births, moderate levels of contact predict higher odds of birth compared to more frequent contact. This may be because the various meanings of frequent contact with parents(-in-law) between and within income groups dilute associations; frequent contact may be an indicator of a large amount of support received from *or given to* the older generation, or may simply be a marker of family-orientation and emotional closeness.

Finally, even with general consistency in the *direction* of associations between support and fertility, the *importance* of certain types of support in their decision to have a second child sometimes differs by SEP. This variation in parameter importance seems to reflect differences by SEP in availability/use of support amongst first time mothers. For example, formal support has successively higher importance scores as SEP goes up, which may reflect the positive correlation between SEP and use of formal support. Further, paternal investments have higher importance, and negatively correlate with fertility, for middle and high SEP women. These women are more likely than low-SEP women to: (1) have a partner, (2) be employed, particularly if their partner is unemployed and investing more heavily in childcare and household tasks, and thus (3) not be in a position to have another child. The role of partner support in childbearing decisions in high-income populations is of interest (Duvander & Andersson, 2006; Rijken & Liefbroer, 2009; Yoon, 2017). Here again, our results differ somewhat from previous studies, at least some of which find positive relationships between indicators of partner support (such as partner's childcare involvement and taking of paternal leave) and fertility. Our analysis suggests the role of partners needs to be examined very carefully, both to take into account differences across different groups of women, but also differences in the types of support that partners provide. While indicators of practical support from partners negatively associated with second births in our study, better relationship quality with one's partners associated with a higher likelihood of birth.

Issues in operationalising support

Like all studies of support and fertility, we made choices about how to operationalise support and, while benefiting from a rich dataset were constrained by the available data. Comparing our results to other UK studies on family support and second births highlights that variation in the operationalisation of support can lead to quite different conclusions. Also using MCS data, Tanskanen et al. (2014) conclude that contact with women's parents-in-law associates positively with timing of second births (i.e. greater contact shortened the birth interval to second birth). The

authors interpreted their result as evidence that support encourages further reproduction because a previous study on the MCS had found that greater contact is correlated with receiving greater support (Pollet et al., 2009). Here, we find that *moderate*, but *not frequent* contact from women's parents-in-law correlates with a higher likelihood of having an additional child in models which controlling for direct measures of support. When controlling for direct support from families, frequent contact could represent the provisioning of support to aging family members and may explain some differences in associations between contact and fertility in this study and that of Tanskanen et al. (2014). In other UK-based studies, Mathews and Sear (2013b) note that receiving childcare from relatives and formal sources relates *positively* to having a second birth using British Household Panel Survey (BHPS) data, while Waynforth (2012) finds that childcare from families *negatively* associates with having additional births using British Cohort Survey 70 data (BCS70). These studies are based on births occurring in roughly similar periods (1990s-2000s), but each survey collected information on the availability of support and childcare in different ways: the BHPS only recorded childcare while working for employed women, while the BCS70 measured any childcare received from one's parents since finishing education. These contrasting associations between childcare and probability of birth in different studies could therefore reflect the way in which support is measured. Such contrasting associations highlight that researchers need to clearly specify how support is measured, to facilitate comparisons with similar studies (see Stulp et al. 2016 for further discussion of this).

Stepping back to compare our results to the literature on support and fertility outside of the UK highlights the important role of context. For example, in contrast to our results, practical support from families in the Netherlands is positively associated with women's fertility (Kaptijn et al., 2010; Thomese & Liefbroer, 2013). This variation could be due to structural or cultural differences. Shifting attention to low-fertility Asian countries, there is consistency across studies: practical support from parents-in-law, but not parents, correlates positively with fertility (Thornton, Freedman, Sun, & Chang, 1986; Chi & Hsin, 1996; Tsay & Chu, 2005; Fukukawa, 2013). Such consistency may be explained by structural or cultural factors, but may also be a result of the consistent operationalization of support as co-residence with parents(-in-law).

Conclusion

We tested the hypothesis that support for childbearing, which is predicted to reduce the costs or perceived costs of childbearing, associates with a higher probability of having a second child in the UK. Our results only partially supported this hypothesis. While measures of emotional support

were positively associated with the likelihood of second birth, surprisingly, practical measures of support were *negatively* associated with having another birth.

We further explored patterns of support by SEP, and found substantial differences across SEP in sources of support: women in the lowest SEP tercile were less likely to have a partner and use formal sources of support and so, though they compensated for this with higher levels of family support, they seem to receive less overall support than women in the highest tercile. Despite this, relationships between support and likelihood of second birth appeared broadly similar across SEP groups, though, as might be expected, the importance of different types of support for fertility appeared to reflect the availability of that type of support. The sole exception was childcare provided by families, which increased the likelihood of second birth among lower income, but not higher income, women.

To identify barriers to achieving reproductive intentions, understanding how support is associated with fertility and how individual factors as well as cultural, economic and institutional context influences these associations is crucial. Our results both serve as a caution against using any form of support as a proxy for another in studies of support and fertility, and also open the doors to further research into the more specific circumstances which inform and alter women's reproductive choices in low-fertility contexts. We conclude that not all allomaternal support is equal when it comes to the second birth decision in the UK.

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References

Aassve, A., Meroni, E., & Pronzato, C. (2012). Grandparenting and childbearing in the extended family. *European Journal of Population*, *28*(4), 499–518. https://doi.org/10.1007/s10680-012-9273-2

Ajrouch, K. J., Blandon, A. Y., & Antonucci, T. C. (2005). Social networks among men and women: the effects of age and socioeconomic status. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *60*(6), S311–S317. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/16260713

Alvergne, A., Gibson, M. A., Gurmu, E., & Mace, R. (2011). Social transmission and the spread of modern contraception in rural Ethiopia. *Plos One*, *6*(7), e22515. https://doi.org/10.1371/journal.pone.0022515

Alvergne, A., Lawson, D. W., Clarke, P. M. R., Gurmu, E., & Mace, R. (2013). Fertility, parental investment, and the early adoption of modern contraception in rural Ethiopia. *American Journal of Human Biology*, *25*(1), 107–115. https://doi.org/10.1002/ajhb.22348

Andersson, G., Duvander, A.-Z., & Hank, K. (2004). Do child-care characteristics influence continued child bearing in Sweden? An investigation of the quantity, quality, and price dimension. *Journal of European Social Policy*, *14*(4), 407–418. https://doi.org/10.1177/0958928704046881

Aquilino, W. S. (1996). The Life Course of Children Born to Unmarried Mothers: Childhood Living Arrangements and Young Adult Outcomes. *Journal of Marriage and Family*, *58*(2), 293–310. https://doi.org/10.2307/353496

Balbo, N., & Mills, M. (2011). The influence of the family network on the realisation of fertility intentions. *Vienna Yearbook of Population Research*, *9*, 179–206.

Berrington, A. (2004). Perpetual postponers? Women's, men's and couple's fertility intentions and subsequent fertility behaviour. *Population Trends*, *117*, 9–19. Retrieved from http://eprints.soton.ac.uk/34148/1/BerringtonPopTrends2004.pdf

Berrington, A., Stone, J., & Beaujouan, E. (2015). Educational differences in timing and quantum of childbearing in Britain. *Demographic Research*, *33*(October), 733–764. https://doi.org/10.4054/DemRes.2015.33.26

Borgerhoff Mulder, M. (2009). Tradeoffs and Sexual Conflict over Women's Fertility Preferences in Mpimbwe. *American Journal of Human Biology*, *21*(4), 478–487. https://doi.org/10.1002/ajhb.20885

Borgerhoff Mulder, M., & Beheim, B. (2011). Understanding the nature of wealth and its effects on human fitness. *Philosophical Transactions of the Royal Society B-Biological Sciences*, *366*(1563), 344–56. https://doi.org/10.1098/rstb.2010.0231

Botcheva, L. B., & Shirley Feldman, S. (2004). Grandparents as family stabilizers during economic hardship in Bulgaria. *International Journal of Psychology*, *39*(3), 157–168. https://doi.org/10.1080/00207590344000321

Burnham, K. P. (2004). Multimodel Inference: Understanding AIC and BIC in Model Selection. *Sociological Methods & Research*, *33*, 261–304. https://doi.org/10.1177/0049124104268644

Burnham, K. P., & Anderson, D. R. (2002). *Model Selection and Multimodel Inference* (Second Edi). New York: Springer.

Burnham, K. P., Anderson, D. R., & Huyvaert, K. P. (2010). AIC model selection and multimodel inference in behavioral ecology: some background, observations, and comparisons. *Behavioral Ecology and Sociobiology*, *65*(1), 23–35. https://doi.org/10.1007/s00265-010-1029-6

Carbone, J., & Cahn, N. (2014). *Marriage markets: how inequality is remaking the American family*. Oxford: Oxford University Press.

Chi, P. S. K., & Hsin, P.-L. (1996). Family structure and and fertility behavior in Taiwan. *Population Research and Policy Review*, *15*(4), 327–339. https://doi.org/10.1007/BF00128428

Del Boca, D. (2002). The effect of child care and part time opportunities on participation and fertility decisions in Italy. *Journal of Population Economics*, *15*(3), 549–573. https://doi.org/10.1007/s001480100089

Del Boca, D., & Sauer, R. M. (2009). Life cycle employment and fertility across institutional environments. *European Economic Review*, *53*(3), 274–292. https://doi.org/10.1016/j.euroecorev.2008.06.001

DeSilva, J. M. (2011). A shift toward birthing relatively large infants early in human evolution. *Proceedings of the National Academy of Sciences of the United States of America*, *108*(3), 1022–1027. https://doi.org/10.1073/pnas.1003865108

Diemer, M. A., Mistry, R. S., Wadsworth, M. E., López, I., & Reimers, F. (2013). Best Practices in Conceptualizing and Measuring Social Class in Psychological Research. *Analyses of Social Issues and Public Policy*, *13*(1), 77–113. https://doi.org/10.1111/asap.12001

Dotson, V. M., Kitner-Triolo, M. H., Evans, M. K., & Zonderman, A. B. (2009). Effects of race and

socioeconomic status on the relative influence of education and literacy on cognitive functioning. *Journal of the International Neuropsychological Society : JINS*, *15*(4), 580–589. https://doi.org/10.1017/S1355617709090821

Duncan, G. J., & Magnuson, K. A. (2005). Can family socioeconomic resources account for racial and ethnic test score gaps? *The Future of Children*, *15*(1), 35–54. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/16130540

Dunifon, R., & Kowaleski-Jones, L. (2007). The Influence of Grandparents in Single-Mother Families. *Journal of Marriage and Family*, *69*(2), 465–481.

Duvander, A.-Z., & Andersson, G. (2006). Gender Equality and Fertility in Sweden. *Marriage & Family Review*, *39*(1–2), 121–142. https://doi.org/10.1300/J002v39n01_07

Esping-Andersen, G., & Billari, F. C. (2015). Re-theorizing Family Demographics. *Population and Development Review*, *41*(1), 1–31. https://doi.org/10.1111/j.1728-4457.2015.00024.x

Fiori, F. (2011). Do childcare arrangements make the difference? a multilevel approach to the intention of having a second child in Italy. *Population, Space and Place*, *17*(5), 579–596. https://doi.org/10.1002/psp.567

Fukukawa, Y. (2013). Grandparental investment and reproductive success in modern Japanese society. *Journal of Evolutionary Psychology*, *11*(1), 35–48. https://doi.org/10.1556/JEP.11.2013.1.4

Geronimus, A. T. (1987). On teenage childbearing and neonatal mortality in the United States. *Population and Development Review*, *13*(2), 245–279. https://doi.org/10.2307/1973193

Goodman, A., Koupil, I., & Lawson, D. W. (2012). Low fertility increases descendant socioeconomic position but reduces long-term fitness in a modern post-industrial society. *Proceedings of the Royal Society B Biological Sciences*, *279*(1746), 4342–4351. https://doi.org/10.1098/rspb.2012.1415

Hamilton, W. D. (1964). The genetical evolution of social behaviour I-II. *Journal of Theoretical Biology*, *7*(1), 1–52. https://doi.org/10.1016/0022-5193(64)90038-4

Hank, K., & Kreyenfeld, M. (2003). A multilevel analysis of child care and women's fertility decisions in Western Germany. *Journal of Marriage and Family*, *65*(3), 584–596. https://doi.org/10.1111/j.1741-3737.2003.00584.x

Hansen, K. (2012a). *Millennium Cohort Study: A Guide to the Datasets (Seventh Edition)*. London.

Hansen, K. (Ed.). (2012b). *Millennium Cohort Study First, Second, Third and Fourth Surveys: A Guide to the Datasets* (Seventh Ed). London: Centre for Longitudinal Studies.

Harknett, K., & Hartnett, C. S. (2014). The gap between births intended and births achieved in 22 European countries, 2004-07. *Population Studies*, *68*(3), 265–82. https://doi.org/10.1080/00324728.2014.899612

Harris, K. M., Furstenberg, F. F., & Marmer, J. K. (1998). Paternal involvement with adolescents in intact families: the influence of fathers over the life course. *Demography*, *35*(2), 201–216. https://doi.org/10.2307/3004052

Hrdy, S. B. (2005). Cooperative breeders with an ace in the hole. In E. Voland, A. Chasiotis, & W. Schiefenhovel (Eds.), *Grandmotherhood: The evolutionary significance of the second half of female life* (pp. 295–318). New Brunswick: Rutgers University Press.

Hrdy, S. B. (2009). *Mothers and others: the evolutionary origins of mutual understanding*. Cambridge, Mass.: Belknap Press of Harvard University Press. Retrieved from http://www.loc.gov/catdir/toc/fy0905/2008052936.html

Johnson, J. B., & Omland, K. S. (2004). Model selection in ecology and evolution. *Trends in Ecology & Evolution*, *19*(2), 101–108. https://doi.org/10.1016/j.tree.2003.10.013

Kaplan, H. S., Lancaster, J. B., & Anderson, K. G. (1998). Human parental investment and fertility: the life histories of men in Albuquerque. In A. Booth & A. Crouter (Eds.), *Men in Families: When do they get iIvolved? What Difference Does it Make?* (pp. 55–109). Mahwah: Lawrence Erlbaum Associates, Publishers.

Kaptijn, R., Thomese, F., van Tilburg, T. G., & Liefbroer, A. C. (2010). How grandparents matter support for the cooperative breeding hypothesis in a contemporary Dutch population. *Human Nature*, *21*(4), 393–405. https://doi.org/DOI 10.1007/s12110-010-9098-9

Kertzer, D. I., White, M. J., Bernardi, L., & Gabrielli, G. (2009). Italy's path to very low fertility: the adequacy of economic and second demographic transition theories. *European Journal of Population*, *25*(1), 89–115. https://doi.org/10.1007/s10680-008-9159-5

Lawson, D. W., & Mace, R. (2010). Optimizing modern family size. *Human Nature*, *21*(1), 39–61. https://doi.org/10.1007/s12110-010-9080-6

Leonetti, D. L., Nath, D. C., & Hemam, N. S. (2007). In-law conflict. *Current Anthropology*, *48*(6), 861–890. https://doi.org/10.1086/520976

Low, B. S., Simon, C. P., & Anderson, K. G. (2002). An evolutionary ecological perspective on demographic transitions: modeling multiple currencies. *American Journal of Human Biology : The Official Journal of the Human Biology Council*, *14*(2), 149–167. https://doi.org/10.1002/ajhb.10043

Lutz, W. (2007). Adaptation versus mitigation policies on demographic change in Europe. *Vienna Yearbook of Population Research*, 19–25. https://doi.org/10.1553/populationyearbook2007s19

Mace, R. (2014). When not to have another baby: An evolutionary approach to low fertility. *Demographic Research*, *30*(April), 1074–1096. https://doi.org/10.4054/DemRes.2014.30.37

Mathews, P., & Sear, R. (2013a). Does the kin orientation of a British woman's social network influence her entry into motherhood? *Demographic Research*, *28*, 313–340. Retrieved from http://www.demographic-research.org/volumes/vol28/11/default.htm

Mathews, P., & Sear, R. (2013b). Family and fertility: kin influence on the progression to a second birth in the British Household Panel Study. *PloS One*, *8*(3), e56941. https://doi.org/10.1371/journal.pone.0056941

McDonald, P. (2006). Low Fertility and the State: The Efficacy of Policy. *Population and Development Review*, *32*(September), 485–510. https://doi.org/10.1111/j.1728-4457.2006.00134.x

Mclanahan, S. (2004). Diverging Destinies : How Children Are Faring Under the Second Demographic Transition *. *Demography*, *41*(4), 607–627.

Meehan, C. L. (2005). The effects of residential locality on parental and alloparental investment among the Aka foragers of the central African Republic. *Human Nature*, *16*(1), 58–80. https://doi.org/10.1007/s12110-005-1007-2

Meehan, C. L., Helfrecht, C., & Quinlan, R. J. (2014). Cooperative breeding and Aka children's nutritional status: is flexibility key? *American Journal of Physical Anthropology*, *153*(4), 513–525. https://doi.org/10.1002/ajpa.22415

Meyers, M. K., & Jordan, L. P. (2006). Choice and accommodation in parental child care decisions. *Community Development*, *37*(2), 53–70. https://doi.org/10.1080/15575330609490207

Nettle, D. (2008). Why do some dads get more involved than others? Evidence from a large British cohort. *Evolution and Human Behavior*, *29*(6), 416–423. https://doi.org/Doi 10.1016/J.Evolhumbehav.2008.06.002

Nettle, D. (2010). Dying young and living fast: variation in life history across English neighborhoods.

Behavioral Ecology, *21*(2), 387–395. https://doi.org/DOI 10.1093/beheco/arp202

Ní Bhrolcháin, M., Beaujouan, E., & Berrington, A. (2010). Stability and change in fertility intentions in Britain, 1991-2007. *Population Trends*, *141*, 10–32. https://doi.org/10.1057/pt.2010.19

OECD. (2013). *OECD Economic Surveys UNITED KINGDOM*.

Office for National Statistics. (2014). *Birth Statistics : Metadata*.

Park, S. M., Cho, S. I., & Choi, M. K. (2010). The effect of paternal investment on female fertility intention in South Korea. *Evolution and Human Behavior*, *31*(6), 447–452. https://doi.org/Doi 10.1016/J.Evolhumbehav.2010.07.001

Philipov, D. (2009). Fertility Intentions and Outcomes: The Role of Policies to Close the Gap. *European Journal of Population / Revue Européenne de Démographie*, *25*(4), 355–361. https://doi.org/10.1007/s10680-009-9202-1

Pollet, T. V., Nelissen, M., & Nettle, D. (2009). Lineage Based Differences in Grandparental Investment: Evidence from a Large British Cohort Study. *Journal of Biosocial Science*, *41*(3), 355–379. https://doi.org/Doi 10.1017/S0021932009003307

Poortinga, W. (2006). Do health behaviors mediate the association between social capital and health? *Preventive Medicine*, *43*(6), 488–93. https://doi.org/10.1016/j.ypmed.2006.06.004

Powell, L. M. (2002). Joint Labor Supply and Childcare Choice Decisions of Married Mothers. *The Journal of Human Resources*, *37*(May), 106–128. https://doi.org/10.2307/3069605

Richards, S. A. (2005). Testing ecological theory using the information-theoretic approach: examples and cautionary results. *Ecology*, *86*(10), 2805–2814. https://doi.org/10.1890/05-0074

Richards, S. A., Whittingham, M. J., & Stephens, P. A. (2010). Model selection and model averaging in behavioural ecology: the utility of the IT-AIC framework. *Behavioral Ecology and Sociobiology*, *65*(1), 77–89. https://doi.org/10.1007/s00265-010-1035-8

Rijken, A. J., & Liefbroer, A. C. (2009). The Influence of Partner Relationship Quality on Fertility. *European Journal of Population / Revue Européenne de Démographie*, *25*(1), 27–44. https://doi.org/10.1007/s10680-008-9156-8

Rijken, A. J., & Thomson, E. (2011). Partners' relationship quality and childbearing. *Social Science Research*, *40*(2), 485–497. https://doi.org/10.1016/j.ssresearch.2010.10.001

Schaffnit, S. B., & Sear, R. (2014). Wealth modifies relationships between kin and women's fertility in

high-income countries. *Behavioral Ecology*, *25*(4), 834–842. https://doi.org/10.1093/beheco/aru059

Sear, R. (2015). Evolutionary contributions to the study of human fertility. *Population Studies*, *69*(sup1), S39–S55. https://doi.org/10.1080/00324728.2014.982905

Sear, R. (2016). Beyond the nuclear family: An evolutionary perspective on parenting. *Current Opinion in Psychology*, *7*(September), 98–103. https://doi.org/10.1016/j.copsyc.2015.08.013

Sear, R., & Coall, D. A. (2011). How much does family matter? Cooperative breeding and the demographic transition. *Population and Development Review*, *37*(Suppl 1), 81–112.

Sear, R., & Mace, R. (2008). Who keeps children alive? A review of the effects of kin on child survival. *Evolution and Human Behavior*, *29*(1), 1–18. https://doi.org/DOI 10.1016/j.evolhumbehav.2007.10.001

Sear, R., Mace, R., & Mcgregor, I. A. (2000). Maternal grandmothers improve nutritional status and survival of children in rural Gambia. *Proceedings of the Royal Society B Biological Sciences*, *267*(1453), 1641–1647. https://doi.org/10.1098/rspb.2000.1190

Sear, R., Mace, R., & McGregor, I. A. (2003). The effects of kin on female fertility in rural Gambia. *Evolution and Human Behavior*, *24*(1), 25–42.

Séguin, L., Bouchard, C., Michèle, S.-D., Jacinthe, L., & Potvin, L. (1995). Évolution du réseau de soutien social lors d'une première naissance : comparaison entre des mères défavorisées et des mères de classe moyenne. *Revue Canadienne de Sante'e Publique*, *86*(6), 392–396.

Seltzer, J. A., & Bianchi, S. M. (2013). Demographic Change and Parent-Child Relationships in Adulthood. *Annual Review of Sociology*, *39*(1), 275–290. https://doi.org/10.1146/annurev-soc-071312-145602

Sheppard, P., Schaffnit, S. B., Garcia, J. R., & Sear, R. (2014). Fostering relations: first sex and marital timings for children raised by kin and non-kin carers. *Evolution and Human Behavior*, *35*(3), 161–168. https://doi.org/10.1016/j.evolhumbehav.2013.12.002

Snopkowski, K., & Sear, R. (2015). Grandparental help in Indonesia is directed preferentially towards needier descendants: A potential confounder when exploring grandparental influences on child health. *Social Science & Medicine*, *128*, 105–114. https://doi.org/10.1016/j.socscimed.2015.01.012

Stearns, S. C. (1992). *The evolution of life histories*. Oxford: Oxford University Press.

Stulp, G., Sear, R., & Barrett, L. (2016). The Reproductive Ecology of Industrial Societies, Part I. *Human Nature*, 1–23. https://doi.org/10.1007/s12110-016-9269-4

Sword, W. (2003). Prenatal care use among women of low income: a matter of 'taking care of self'. *Qualitative Health Research*, *13*(3), 319–332. https://doi.org/10.1177/0095399702250128

Sword, W., & Watt, S. (2005). Learning needs of postpartum women: does socioeconomic status matter? *Birth (Berkeley, Calif.)*, *32*(2), 86–92. https://doi.org/10.1111/j.0730-7659.2005.00350.x

Symonds, M. R. E., & Moussalli, A. (2011). A brief guide to model selection, multimodel inference and model averaging in behavioural ecology using Akaike's information criterion. *Behavioral Ecology and Sociobiology*, *65*(1), 13–21. https://doi.org/10.1007/s00265-010-1037-6

Tanskanen, A., Jokela, M., Danielsbacka, M., & Rotkirch, A. (2014). Grandparental effects on fertility vary by lineage in the United Kingdom. *Human Nature*, *25*(2), 269–284. https://doi.org/10.1007/s12110-014-9200-9

Tanskanen, A., & Rotkirch, A. (2014). The impact of grandparental investment on mothers' fertility intentions in four European countries. *Demographic Research*, *31*(July 2014), 1–26. https://doi.org/10.4054/DemRes.2014.31.1

Thomese, F., & Liefbroer, A. C. (2013). Child care and child births: the role of grandparents in the Netherlands. *Journal of Marriage and Family*, *75*(2), 403–421. https://doi.org/10.1111/jomf.12005

Thornton, A., Freedman, R., Sun, T.-H., & Chang, M.-C. (1986). Intergenerational relations and reproductive behavior in Taiwan. *Demography*, *23*(2), 185–197. https://doi.org/10.2307/2061615

Tsay, W.-J., & Chu, C. Y. C. (2005). The pattern of birth spacing during Taiwan's demographic transition. *Journal of Population Economics*, *18*(2), 323–336. https://doi.org/10.1007/s00148-004-0200-7

Wagenmakers, E.-J., & Farrell, S. (2004). AIC model selection using Akaike weights. *Psychonomic Bulletin & Review*, *11*(1), 192–196. https://doi.org/10.3758/BF03206482

Waynforth, D. (2012). Grandparental investment and reproductive decisions in the longitudinal 1970 British cohort study. *Proceedings of the Royal Society B: Biological Sciences*, *279*(1731), 1155–1160. https://doi.org/10.1098/rspb.2011.1424

Westoff, C. F., & Ryder, N. B. (1977). The predictive validity of reproductive intentions. *Demography*, *14*(4), 431–453.

Yoon, S.-Y. (2017). The influence of a supportive environment for families on women's fertility intentions and behavior in South Korea. *Demographic Research*, *36*(January), 227–254. https://doi.org/10.4054/DemRes.2017.36.7