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Only Children by Choice vs. Only Children by Circumstances: Why Do Some Women Have Only One Child?

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Abstract

In an attempt to stimulate further theory and research on only children, we introduce two conceptual distinctions: Only children as independent variables vs. only children as dependent variables; and only children by choice vs. only children by circumstances. What little scientific research exists on only children to date focuses almost exclusively on only children as independent variables and fails to make a distinction between only children by choice and only children by circumstances. A focus on only children by choice as dependent variables explores the question of *why* some women choose to have only one child. As an empirical illustration, analyses of prospectively longitudinal data with a nationally representative sample in the United Kingdom (National Child Development Study) show that women who experience pregnancy complications are significantly less likely to have another child and significantly more likely to have only one child. Our results suggest that increased chances of pregnancy complications that American women now experience alone can explain about 10% of the increase in the number of only children in the United States in the last half century. If certain genes incline women to have pregnancy complications, it is possible that only children by circumstances are genetically more similar to children with siblings than to only children by choice.

Keywords Operant conditioning · WEIRD (Western, Educated, Industrialized, Rich and Democratic) · Behaviorism

Compared to related demographic concepts such as fertility, parenthood, and childlessness, only children receive relatively little academic attention (Sandler [1]). However, it seems to make little logical or scientific sense to study why individuals remain childless (Kanazawa [2]; Rybińska and Morgan [3]), why couples would like to have two children, preferably a boy and a girl (Pollard and Morgan [4]; Yamaguchi and Ferguson [5]), and why some families have a large number of children (Kohler et al. [6]; Murphy and Wang [7]), yet neglect the question of why some women and couples choose to have only one child. Having one child is just part of the continuum of demographic and reproductive behavior, from zero, to one, to two, to three, to many, and it should actively be studied by scientists, especially since the number of only children is sharply increasing in many countries (Breton and Prioux [8]; Sobotka and Beaujouan [9]). It does not make theoretical sense to study 0, 2, 3, and more, yet neglect studying 1.

What little scientific literature exists on only children focuses almost exclusively on confirming or disconfirming the common stereotype of only children as "selfish, socially inept, dependent on others, anxious, and generally maladjusted" (Polit and Falbo [10], p. 309). These studies take only children (or *onlies*) as *independent variables* and ask whether they are significantly different from children with siblings (or *siblings*) on various dimensions of personality, social and intellectual development, health, and economic and social outcomes. They seek to determine the *consequences* of being an only – whether onlies are better, worse, or no different than siblings on some criteria.

In particular, very little scholarship exists on the question of *why* some women and couples *choose* to have onlies. In other words, very few studies take onlies as *dependent variables* and ask what factors *cause* parents to have onlies – *why* their parents had them (but no more children subsequently). To the best of our knowledge, the *most recent* explicit and extensive attempt to explore the question of why some women and couples have onlies was Falbo ([11])

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nearly half a century ago, and, before that, Solomon et al. ([12]). This lack of attention to *why* some women and couples *choose* to have onlies has led to the confusion and conflation of *only children by choice* – whereby parents make a conscious and planned decision to have only one child – and *only children by circumstance* – where parents might have planned to have more children but their original plan was not successfully executed or completed due to circumstances such as divorce, educational and career considerations, illnesses, and declined fertility of older age. While women intentionally *choose* to pursue higher education or certain career paths, few (if any) women make these choices *in order to have fewer (or more) children.* Thus, when our theoretical focus is fertility intentions, education and earnings serve as circumstances, not intentions.

In this paper, we seek to stimulate further theory and research on onlies by explicitly introducing two conceptual distinctions hitherto absent in the literature on onlies: Only children as independent variables vs. only children as dependent variables; and only children by choice vs. only children by circumstances. As an empirical illustration of the importance of taking onlies as dependent variables and making a distinction between onlies by choice and by circumstances, our analyses of the National Child Development Study in the United Kingdom show that women who experience pregnancy complications are significantly less likely to choose to have more children (onlies by choice), even when factors that contribute to onlies by circumstances (such as marital status or age) are statistically controlled. Our empirical results suggest that the increased chances of pregnancy complications that American mothers now experience alone can explain about 10% of the increase in the number of onlies in the United States in the last half century.

Only Children as Independent Variables vs. Only Children as Dependent Variables

Almost all of the academic scholarship on onlies take them as independent variables, and explicitly compare them with siblings on various dimensions, to determine the consequences of being onlies or siblings. "Most quantitative studies compare only-children to those with siblings" (Sorensen [13], p. 14). A large portion of such scholarship seeks to confirm or disconfirm often negative stereotypes about onlies as somehow maladjusted due to their lack of siblings. The results of these studies appear mixed (Keenan et al. [14]). Most studies find that onlies are no different from siblings, and, on some dimensions, excel them (see Falbo and Polit [15]; and Polit and Falbo [10] for quantitative meta-analyses), while a few studies show that onlies are worse off than siblings (see Sorensen [13]; Chap. 1, for review).

One potential reason for the mixed findings may be that researchers and their studies fail to make a distinction between onlies by choice and onlies by circumstances. If parents who choose to have only one child are genetically different from parents who choose to have more, then their children are expected to be genetically different as well, *even when many of the latter type of parents end up with onlies despite their plans (onlies by circumstances).* If so, onlies by choice and onlies by circumstances can potentially be genetically different, and onlies by circumstances may actually be more similar to siblings than they are to onlies by choice.

To our knowledge, Dudová et al. ([16]) are the only ones who explicitly study only children as dependent variables. (The same team of researchers have written two other articles on related topics but only in Czech.) Dudová et al. ([16]) demonstrate that women who get divorced are 18% more likely, and men who get divorced are 23% more likely, to end up with onlies. They also show that men and women who postpone their first child until after 30 are significantly more likely to end up with onlies. Thus marital status (divorce subsequent to the first child) and age are important determinants of onlies as dependent variables. *These are only children by circumstances.*

At the same time, Dudová et al.'s ([16]) qualitative data of interviews with Czech parents also include Sophie, who wanted to have three children. "However, the experience of pregnancy and childbirth was difficult for Sophie and she did not want to bear more children" (p. 1478). Thus mother's experiences with the first pregnancy and childbirths are also important determinants of onlies as dependent variables. *These are only children by choice.*

In their comprehensive study of European populations, Breton and Prioux ([8]) make a distinction between onlies as independent variables and onlies as dependent variables (as well as onlies by choice and onlies by circumstances). However, in their search for causes and antecedents of onlies as dependent variables, they place a strong emphasis on "family values," which they unquestioningly assume stem from childhood socialization. They are not at all open to the possibility that such "family values" may not be acquired during childhood socialization but instead transmitted genetically from parents to children (Rowe [17]).

Only Children by Choice vs. Only Children by Circumstances

In recent years, research on onlies is predominated by Chinese scholars and/or Chinese samples. Chinese scholars studying onlies in China account for a vast majority of studies on onlies, and a significant proportion of them focuses on a single phenomenon – *shidu* (parents who lost their only children). Such a strong interest in onlies among

Chinese scholars is quite understandable, given the history of Chinese government's one child only policy. From 1979 to 2015, the Central Committee of the Chinese Communist Party enforced the draconian policy, under which Chinese parents, with very few exceptions, were allowed to have only one child (Cai and Feng [18]). As a result, there are 150 million onlies in China, and there is correspondingly strong academic interest in studying them, both by Chinese and non-Chinese scholars (Cai et al. [19]; Cameron et al. [20]; Jiao et al. [21]).

The problem with studying onlies in China – and with the predominance of Chinese studies in the literature on onlies – is that one cannot study *why* parents have onlies because, for four decades, they did not have a choice not to. An increasing number of evolutionary psychologists now believe that all studies in evolutionary psychology – whose aim it is to uncover evolved human nature, by elucidating how the human brain has been evolutionarily designed to operate and how the evolved psychological mechanisms translate to behavior – must be conducted in WEIRD (Western, Educated, Industrialized, Rich, and Developed) nations, because populations in such nations face the fewest cultural and institutional constraints on their behavior and are thus freest to express their evolved preferences and values (Christakis [22]; Kanazawa [23], [24]; Margolis and Myrskylä [25]; Maryanski [26]; Stoet and Geary [27]). "For, despite all the multiple ills of industrialized societies, WEIRD societies may be more compatible with our human nature than the high-density kinship constraints of horticultural societies or the "peasant" constraints of agrarian societies with their privileged few" (Maryanski [26], p. 104). "But ideally, if we want to identify a universal society and study bedrock, innate social features rather than the impact of environmental constraints, we should observe the emergence of a natural social organization in areas *without* severely limited natural resources" (Christakis [22], p. 55). "If one wanted to estimate the proportion of men who are genetically and hormonally inclined to be gay, one would want a sample from San Francisco or Brighton, not Tehran or even the !Kung San (even though the latter is often thought to resemble our ancestors, certainly much more so than the urbanites in San Francisco)" (Kanazawa [23], pp. 344–345). The study of onlies – *why* some women and couples *choose* to have onlies while others don't – may be another example of a scientific problem that can only be studied in WEIRD nations, where women and couples are freest to exercise their preferences and choose to have only one child or not. It certainly cannot be studied in China under the Communist rule, any more than sexual orientation can be studied in Qatar under the Islamic theocracy.

Many demographers have stated that very few couples choose to have onlies (Goldstein et al. [28]; Hagewen and Morgan [29]). "The European Values Study from 2017 suggests that if ideal living conditions were secured only 1% of Czechs would like to be lifelong childfree, 10% to have an only child, more than half to have two children and more than a third to have more than two children" (Dudová et al. [16], p. 1484n). The figures are comparable in other European nations (Goldstein et al. [28], p. 486, Fig. 2). A recent study of onlies in the United Kingdom in the last half century suggests that the proportion of onlies by circumstances has increased dramatically; in the 1958 birth cohort, 90% of onlies lived with both parents (suggesting that they may be onlies by choice), whereas, in the 2001 birth cohort, less than half of onlies did (suggesting that a majority of onlies in this cohort may be onlies by circumstances) (Goisis et al. [30]). The question is: *Why* do a small proportion of parents nonetheless *choose* to have only one child even when they face no economic constraints? How are the 10% of Europeans (and, presumably, others) who want to have only one child even under the ideal circumstances different from the vast majority who want more than one?

Explanations for why some women choose to have onlies that emphasize *either* the incompatibility of motherhood of two with professional careers *or* the cost of raising a second child (Sandler [1]) cannot really explain why women choose to have only one child, because the best solution for promoting professional careers or reducing costs would be to have no children. So if women's goal were to promote their careers or to reduce childrearing costs, they would choose to have no children, not one. So neither career considerations nor costs could be legitimate explanations for why women choose to have onlies. We acknowledge that having onlies might still represent the best *compromise* solution for women who want to "have it all," both careers and parenthood simultaneously. Our point here is merely that having onlies cannot be the solution for *solely* or *primarily* promoting women's careers or reducing costs. We further acknowledge that there may still be some residual negative stereotypes against childless women, although others (Sandler [1]) claim that there is just as much prejudice against mothers of onlies.

One potential factor that might cause women to have one child but no more is unexpectedly and particularly negative experiences associated with the first pregnancy and childbirth. Like Sophie, who was interviewed by Dudová et al. (2020), women may have planned to have multiple children, but find the experiences of the first pregnancy and childbirth so negative that they might be deterred from having more children. Following the principles of operant conditioning (Skinner [31]), women who were "punished" by their first pregnancy and childbirth should become less likely to want to have a subsequent child. One reason that women might be "punished" by their first childbirth may be pregnancy complications. Principles of operant conditioning would predict that women who experience pregnancy complications for

their first child should become less likely to choose to have a second (and subsequent) child. While our focus in this paper is on pregnancy complications as a "punisher" in the operant conditioning, we acknowledge that there could be other "punishers," such as women finding, only after the first child, that the costs of raising children were much higher than anticipated or that juggling a career and parenthood was much more difficult than originally anticipated. Such women, who might have earlier had plans to have more children, may choose not to as a result. These would also be "onlies by choice" in our conceptualization.

Falbo ([11]) makes a distinction between *psychological* and *situational* reasons for women to have only one child. This is similar to our distinction between only children by choice and only children by circumstances. However, Falbo includes difficulties in the first childbirth among the *situational*, not psychological, reasons. In sharp contrast, we include pregnancy complications as a reason to have onlies *by choice*, not by circumstances. Margolis and Myrskylä ([32]) also emphasize the importance of the experience of having the first child for the parents' subsequent decision to have another, but they focus on global well-being. In our analyses, we focus on one specific, physical factor: the experience of pregnancy complications. As an empirical illustration for the importance of studying why some women choose to have onlies, we will test our hypothesis with prospectively longitudinal data with a large, representative, population sample in the United Kingdom (the National Child Development Study).

An Empirical Illustration

Data

The National Child Development Study (NCDS) is a large, ongoing, and prospectively longitudinal study that has followed a *population* (not a sample) of British respondents since birth for over 60 years. The study included *all* babies ($n = 17{,}419$) born in Great Britain (England, Wales, and Scotland) during one week (03–09 March 1958). The respondents were subsequently reinterviewed in 1965 (Sweep 1 at age 7; $n = 15{,}496$), 1969 (Sweep 2 at age 11; $n = 18{,}285$), 1974 (Sweep 3 at age 16; $n = 14{,}469$), 1981 (Sweep 4 at age 23; $n = 12, 537$), 1991 (Sweep 5 at age 33; $n = 11{,}469$), 1999–2000 (Sweep 6 at age 41–42; $n = 11{,}419$), 2004–2005 (Sweep 7 at age 46–47; $n = 9{,}534$), 2008–2009 (Sweep 8 at age 50–51; $n = 9{,}790$), and 2013 (Sweep 9 at age 55; $n = 9{,}137$). There were more respondents in Sweep 2 than in the original sample (Sweep 0) because Sweep 2 sample included eligible children who were in the country in 1969 but not in 1958. In each sweep, personal interviews and questionnaires were administered to the respondents; to their mothers, teachers, and doctors during childhood; and to their partners and children in adulthood. Virtually all (97.8%) of the NCDS respondents were Caucasian. The Centre for Longitudinal Studies of University College London now conducts NCDS and the dataset is publicly and freely available to registered users of the UK Data Service (https://ukdataservice.ac.uk/).

Dependent Variables: Respondent's Only-child and Youngest-child Status

At age 16, NCDS asked if the respondent had any biological siblings, and, if so, their sexes and ages. From this information, we constructed two alternative dependent variables. First, we measured whether the respondent was an only (1 if an only, 0 otherwise). This is a very conservative definition of only-child status: Less than 3% of second children in France are born more than 10 years after the first (Breton and Prioux [8], p. 671n) and only 3% of second children are born more than 12 years after the first in Czechia (Dudová, 2022, p. 19n). Thus, while it is not impossible to have a biological sibling after 16 years, we assume that a NCDS respondent is an only if there is no biological sibling at 16.

In addition, we measured whether the respondent was the youngest child and thus had no younger siblings (1 if the youngest child, 0 otherwise). The second dependent variable was designed to assess whether the pregnancy complications experienced by the mother would lead her not to have additional children after the respondent, regardless of whether she had children *before* the respondent, and thus whether the respondent was an only or not.

Independent Variables: Mother's Pregnancy Complications

At Sweep 0, NCDS asked the mother if she had any abnormalities during pregnancy by asking whether she had any of the following conditions: Accidental antepartum hemorrhage; placenta previa; other antepartum hemorrhage; vaginal bleeding; and other abnormality. If the respondent's mother experienced one or more of the abnormal conditions listed, then the respondent was assigned pregnancy complications = 1. If the mother reported none of the abnormalities, then the respondent was assigned pregnancy complications = 0. Because our dependent variables are the respondent's only-child and youngest-child status, it is important to point out that none of the pregnancy complications measured by NCDS typically result in the mother's subsequent infertility or difficulty in conceiving (Fullerton et al. [33]; Gizzo et al. [34]; Nizard et al. [35]; Zhang et al. [36]).

Control Variables

In our multiple binary logistic regression equations, we controlled for many of the factors that might influence the mother to have an only by circumstances: Mother's age at birth (in years); mother's education, measured as the age at which she left full-time education (1 = before 13, 2 = 13–14, 3 = 14–15, 4 = 15–16, 5 = 16–17, 6 = 17–18, 7 = 18–19, 8 = 19–21, 9 = 21–23, and 10 = after 23); mother's annual net earnings in 1 K GBP; mother's social class of origin, measured as her father's social class (0 = unemployed, dead, retired, or no father, 1 = unskilled, 2 = semiskilled, 3 = skilled, 4 = white-collar, and 5 = professional); mother's marital status (1 = currently married, 0 = otherwise); and mother's BMI, as a general indicator of her health. The mother's religion or religiosity was not measured in NCDS. Once again, while women intentionally pursue higher education or certain careers (and thus earnings), they do not make these choices *in order to have fewer (or more) children.* Thus, when our empirical focus is fertility intentions, they serve as circumstances, not choices.

Results and Discussion

Figure 1, left panel, shows that, compared to mothers of NCDS siblings, mothers of NCDS onlies were significantly more likely to have experienced pregnancy complications (0.2961 vs. 0.2619; $t(845.549) = -1.976$, $p = .048$). Table 1, Column (1), shows that the significant difference in pregnancy complications between mothers of onlies and siblings was *not* due to factors that might contribute to having onlies by circumstances. Even net of mother's age at birth, education, earnings, social class of origin, current marital status, and BMI, the experience of pregnancy complications had a significantly positive association with the NCDS respondent's being an only ($b = 0.232$, $p = .037$,

Table 1 Associations between pregnancy complications and whether the respondent is an only child or has no younger siblings
National Child Development Study

	(1) Only child	(2) Youngest child
Pregnancy complications	0.232*	0.156*
	(0.111)	(0.066)
	1.109	*1.072*
Mother's age	0.041***	0.205***
	(0.009)	(0.006)
	1.265	*3.234*
Mother's education	−0.099*	−0.049*
	(0.048)	(0.025)
	0.873	*0.935*
Mother's earnings	0.552***	0.647***
	(0.101)	(0.061)
	1.312	*1.375*
Mother's social class of origin	−0.053	−0.056***
	(0.028)	(0.015)
	0.897	*0.892*
Mother's current marital status	−1.109***	−0.177
	(0.218)	(0.196)
	0.803	*0.966*
Mother's BMI	−0.045**	−0.030***
	(0.014)	(0.008)
	0.836	*0.888*
Constant	−1.513	−5.519
	(0.536)	(0.341)
Nagelkerke R^2	0.034	0.291
χ^2	85.850***	1592.663***
Number of cases	6,797	6,769

* $p < .05$ ** $p < .01$ *** $p < .001$

Main entries are unstandardized regression coefficients

(Numbers in parentheses are standard errors.)

Italicized numbers are standardized coefficients (change in odds associated with a 1 SD increase in independent variable)

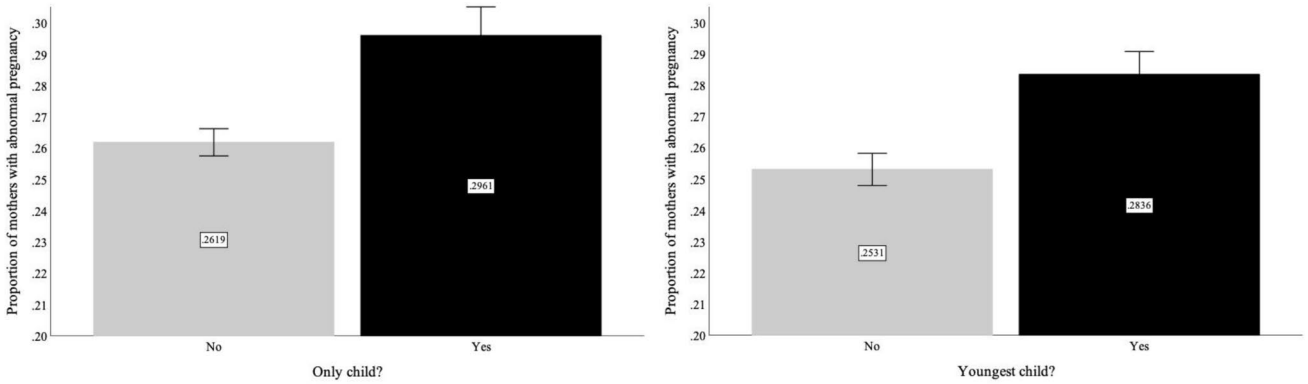

Fig. 1 Mean proportion of abnormal pregnancy experienced by the mother, by respondent's only-child and youngest-child status
National Child Development Study

standardized coefficient = 1.109). Mothers who experienced pregnancy complications had 26% greater odds of having an only ($e^{.232} = 1.261$). This is despite the fact that all control variables included in the equation, with the sole exception of mother's social class of origin, had significant associations with the only-child status. (The coefficient for mother's social class of origin was only marginally significant, $p = .056$.) It is interesting to note that mother's education and earnings had *opposite* associations with having an only: Net of each other and other controls, more educated mothers were significantly less likely to have an only, whereas mothers with higher earnings were significantly more likely to have an only.

Figure 1, right panel, shows that, compared to NCDS mothers who had subsequent children, NCDS mothers who had no more children were significantly more likely to have experienced pregnancy complications (0.2836 vs. 0.2531, $t(7458.096) = -3.398$, $p < .001$). Table 1, Column (2), shows that the significant difference in pregnancy complications between mothers who had more children and those who didn't was *not* due to factors that are statistically controlled in the multiple binary logistic regression equation. Naturally, mother's age had a very large effect on whether she went on to have subsequent children; a one standard deviation increase in mother's age at the respondent's birth *more than tripled* the odds that she did not have subsequent children. Nevertheless, even net of the strong effect of mother's age, the experience of pregnancy complications significantly predicted whether or not the mother went on to have subsequent children ($b = 0.156$, $p = .018$, standardized coefficient = 1.072).

The results presented in Figure 1 and Table 1 collectively show that mothers who were "punished" (in the operant conditioning sense) during the pregnancy, by experiencing pregnancy complications, were significantly less likely to have another child, and, as a result, their children were significantly more likely to be an only. The results convincingly demonstrate that pregnancy complications were a major factor in women deciding to have an only by choice.

General Discussion

The analyses of prospectively longitudinal data with a large, nationally representative samples in the National Child Development Study confirmed our operant conditioning prediction that mothers who are "punished" by complications such as antepartum hemorrhage or placenta previa during their pregnancy are more likely to choose not to have another child subsequently. Mothers who experience pregnancy complications are significantly more likely to have onlies, and, if they had prior children, significantly more likely *not* to have any subsequent children after the experience of pregnancy complications. In our multiple binary logistic regression equations, we controlled for the mother's age and BMI (as a general indicator of her health), so the effect of pregnancy complications was independent of such biological factors. The significant associations between pregnancy complications and the respondent's only-child and youngest-child status remained even after we statistically controlled for such potential contributors to having onlies by circumstances as mother's education, earnings, and current marital status. Mothers who experienced pregnancy complications had 26% greater odds of having onlies, and 17% ($e^{.159} = 1.169$) greater odds of not having any subsequent children.

In contrast to what little scholarship exists to date on only children, which typically takes onlies as independent variables and study how onlies are different from siblings – in particular, confirming or disconfirming negative stereotypes about onlies – we studied onlies as dependent variables and explored the causes and reasons that some women have only one child. We further made a clear conceptual distinction between onlies by choice and onlies by circumstances, and examined the effect of one potential cause of onlies by choice – pregnancy complications – while at the same time holding constant some of the common causes of onlies by circumstances, such as marital status, age, and educational and occupational considerations. Our results showed that the experience of pregnancy complications was a very strong determinant of onlies by choice, even when the determinants of onlies by circumstances were statistically controlled. Our study highlights the importance of both studying onlies as dependent variables, and of making a conceptual distinction between onlies by choice and by circumstances.

Our findings may be able to explain at least some of the increase in the number of onlies in the US. In 1984, 13% of American women experienced pregnancy complications (Gold et al. [37], p. 192, Table 2). By 2018, the figure had increased to 19.6% (Blue Cross Blue Shield [38], p. 3, Exhibit 2), an increase of 6.6%. At the same time, 11% of mothers in the US had only one child at the end of their reproductive careers in 1976, whereas the figure had increased to 22% by 2014 (Pew Research Center [39], p. 20). This translates into an increase in the odds of having an only from 0.11/0.89 = 0.124 in 1976 to the odds of 0.22/0.78 = 0.282 in 2014, an increase in odds of 0.158. The coefficient estimate in Table 1, Column 1, suggests that an increase in the probability of pregnancy complications by 6.6% would translate into an increase in the odds of having an only by $e^{(0.232*0.066)} = 1.015$. Thus the increase in the probability of pregnancy complications *alone*, *all by itself*, can explain 0.015/0.158 = 0.098 (9.8%) of the increase in the odds of having an only in the US since 1970s. Our findings thus suggest that the increase in the probability of pregnancy complications can explain about 10% of the increase in the number of onlies in the US in the last half century.

Pregnancy complications such as placenta previa are often caused by prior cesarean deliveries, advanced maternal age, and the use of assisted reproductive technology (Silver [40]). Now more and more American women experience these likely causes of pregnancy complications. Since 2010, a third of births in the US is delivered with cesarean section (Osterman et al. [41], p. 35, Table 17). In 2014, 8% of American women gave birth for the first time between the ages of 34 and 44, up from 3% two decades earlier (Pew Research Center [42], p. 4). After the first baby was born in the US with assisted reproductive technology in 1981, in 2019, 2.1% of all babies born in the US were conceived with assisted reproductive technology (Sunderam et al. [43]). We would therefore expect more expectant American women to experience pregnancy complications, and, therefore, to opt to have onlies.

If women who are prone to experiencing pregnancy complications for their first child are *genetically* different from other women, then their children are also expected to be genetically different. This observation has several implications that can potentially clarify the current confusion in the literature on onlies. First, if women who are *not* prone to experiencing pregnancy complications are more likely to go on to have subsequent children than women who are prone to such experiences are, as our results above show, then it does suggest that onlies might be genetically different from siblings in some yet unspecified ways. Second, if some women who are not prone to such experiences, and who might thus plan and choose to have more children, are nonetheless prevented from doing so due to their age or subsequent divorce, their onlies by circumstances may be genetically different from onlies by choice, borne by women who are prone to having pregnancy complications. In fact, this reasoning suggests that onlies by circumstances may be genetically more similar to siblings than they are to onlies by choice. It also leads us to speculate that youngest siblings might be genetically similar to onlies by choice and dissimilar to onlies by circumstances.

This can potentially explain why the current literature, which fails to make a distinction between onlies by choice and by circumstances, might produce conflicting findings about whether onlies are no different from, better than, or worse than siblings on some dimensions. For example, one study attributed 29% of variance in postpartum hemorrhage liability to either maternal or fetal genetic factors (Oberg et al. [44]). Another study identified human non-protein-coding metastasis associated lung adenocarcinoma transcript 1 (MALAT-1) gene as a likely contributor to placenta previa increta/percreta (Tseng et al. [45]), and a third study identified hypermethylated Ras-association domain family protein 1 (RASSF1) gene was strongly associated with placental-mediated pregnancy complications such as preeclampsia and placenta previa (Kim et al. [46]). Might these alleles have pleiotropic effects on other phenotypes? If so, can they potentially explain the differences between onlies by choice and onlies by circumstances, on the one hand, and the differences between onlies and siblings, on the other? Is it possible that onlies by circumstances are more similar to siblings than they are to onlies by choice?

There are some important limitations in our studies. First, while we used a high-quality, prospectively longitudinal dataset with a large, nationally representative sample, ours is just one study. Our findings must be replicated with other samples. In particular, our hypothesis will need to be further tested in the United States and other WEIRD nations (Kanazawa [24]). Second, we focused on only one potential factor that might influence women's decision to have only one child by choice – the experience of pregnancy complications. There are potentially numerous other factors that affect the same decision, although, for reasons that we enumerate above, the two that are most frequently cited – women's career considerations and costs of childrearing – could not be legitimate reasons for having onlies by choice. Third, our clear conceptual distinction between onlies by choice and onlies by circumstances may not always be very clear in actual empirical applications. For example, in our empirical illustrations, we included mother's age as a circumstantial factor, because, if women wait too long to have children, their fecundity declines with age and reaches zero after menopause. However, some older women still far before menopause may *choose* not to have additional children because of her age. It is possible that a common genetic factor might pleiotropically underlie a greater tendency for divorce (a circumstance) and a desire for fewer children (a choice). Further, just as circumstances might prevent women who want to have additional children from having them (onlies by circumstances), it is also possible that a choice not to have additional children might mask circumstantial factors (including genetic causes) that would have prohibited having more children.

Our purpose in this paper throughout was *not* to have the last word, but instead to have the *first* word, in stimulating future research on onlies. Future researchers should actively study onlies as dependent variables, make a clear distinction between onlies by choice and by circumstances, and explore other potential factors that might lead women and couples to choose to have only one child.

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Data Availability The dataset is publicly and freely available to registered users of the UK Data Service (https://ukdataservice.ac.uk/).

Code Availability Available upon request.

Declarations

Ethics Approval Not applicable. There are no human or animal subjects involved.

Consent to Participate Not applicable. There are no human subjects involved.

Consent for Publication Not applicable. There are no human subjects involved.

Conflict of interest None.

IRB Approval IRB approval is not applicable in the current research, as no human or animal subjects were involved in the study.

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