Where's Daddy?
Challenges in the Measurement of Men's Fertility

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March 5, 2020

SEHSD Working Paper # 2020-02
SIPP Working Paper #291

LATER PUBLISHED AS:

Monte, L., & J. Fields. (2020). "*Where's Daddy? Challenges in the measurement of men's fertility.*" In Analyzing Contemporary Fertility, edited by R. Shoen, Springer Series on Demographic and Population Analysis (51), Springer Press.

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TITLE: **Where's Daddy? Challenges in the measurement of men's fertility**[1]

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Abstract

In this chapter, we dissect the observed differences in men's and women's fertility as represented in the 2014 Survey of Income and Program Participation's (SIPP) Wave 1 data. We consider the differences between men's, women's, and children's reports of fathers and fatherhood. We argue that these data offer evidence of a "missing man" problem, rather than misreporting of the part of SIPP respondents. We then use the triangulation of these data points to model the size, and some of the characteristics, of the missing men. This estimation technique should be applied to other data sources to further disentangle what or who may be missing from our current estimates of men's fertility. Based on our derived estimates, we conclude by offering a re-estimation of key factors of men's fertility in a sample than did not differentially omit not just fathers, but certain types of fathers. We offer this as evidence in support of more, and more in-depth, research into men's fertility, and men's survey non-response.

1 Introduction

According to the 2014 Survey of Income and Program Participation (SIPP) Wave 1 data, there are just over 72 million men who are estimated to have biologically fathered about 174 million children. The sampled fathers reported their fertility without difficulty or high levels of missing data[3], and their responses about their children align well with data from the SIPP's parallel sample of mothers. However, the SIPP also contains contradictory data from children (of all ages), 194 million of whom reported having a living biological father.[4]

The SIPP is a nationally representative sample of the civilian non-institutionalized population of the United States. As such, it should include a representative sample of the population who are not in the Armed Forces or in institutions such as jails and hospitals. Under the sampling assumptions of the SIPP, we should be capturing a representative sample of the household populations of men, women, and children across all walks of life in the United States. How, then, do we end up with the fathers of 20 million children apparently not represented in the collected SIPP data?

The underrepresentation of men is a known challenge for survey research (Seltzer and Brandreth, 1994). Whether it is the challenge of sampling frames that disproportionately exclude some men (Pettit, 2012) or the fact that men are less willing participants in survey research than women (Fokkema et al., 2016;

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[1] This work is released to inform interested parties of ongoing research and to encourage discussion of work in progress. Any views or opinions expressed in the paper are the authors' own and do not necessarily reflect the views or opinions of the U.S. Census Bureau. All data are subject to error arising from a variety of sources, including sampling error, non-sampling error, modeling error, and any other sources of error. For further information on SIPP statistical standards and accuracy, see https://www.census.gov/programs-surveys/sipp/tech-documentation/source-accuracy-statements.html.

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[3] This information is per internal reviews of 2014 SIPP panel data missingness and keystroke audit trail data.

[4] Children may be of any age.

Buber-Ennser, 2014), the result is a gender bias in survey data. Social scientists relying on such data have employed many strategies to circumvent this imbalance.

Those who study population trends with regard to fertility have responded to this by focusing on the fertility of women. And there are numerous reasons why women's fertility is prioritized over men's, ranging from the belief that women are more reliable reporters to belief that the subjective meaning of fertility is more salient to women than to men. However, the most prominent motivation is likely that men's fertility has always been presumed to parallel women's – each child has one mother and one father, and so if women's fertility is more easily and reliably measured, it should be a sufficient proxy for men's reports of the same births.

These suppositions are problematic for a variety of reasons. We know both that fathers matter to children, and that being a father matters to men (Cabrera and Peters, 2000). The studies that challenge men's knowledge of their own fertility are explicit about the specific subgroups and births affected, and implicate underrepresentation as a more significant issue than misreporting at a national level (Rendall et al., 1999). Moreover, multiple data sources have registered higher level of childlessness for men than for women at a population level, which challenges the presumed parallels for men and women (Monte, 2017; Martinez et al., 2018)

All of this suggests both the need to redirect the attention of family demographers to the question of men's fertility, and the inherent challenges that researchers will face when they undertake this task. In this chapter, we will argue that there is evidence that men's fertility is important independent of women's, we will argue that there is suggestive evidence that men's fertility may be fundamentally different than women's, and we will argue for a model that allows us to speculate about what is missing in currently available estimates.

This chapter is organized around an examination of the measurement of fatherhood. Our central goal is to untangle some of the basic discrepancies in a characteristic as seemingly straightforward as the number of fathers in the U.S. population. To do this, we make use of the rich dataset that is the 2014 SIPP. We will use these data to parameterize what is omitted in survey data covering men and their fertility, and will provide building blocks for estimates of omissions in other datasets.

2 Literature Review

Fathers are instrumental to children and families across multiple dimensions (Lamb and Lewis, 2010; 2011; Cabrera and Tamis-LeMonda, 2012). Fathers' provision of economic support (either within a shared household, or via child support) is key to the financial well-being of many households with young children (Grall, 2018; Cross, 2019). Regular contact with fathers is associated with decreased risk behavior and higher school engagement in adolescence (Harris et al., 1998).[5]

For all of these reasons, much of the literature on fathers and father involvement focuses on outcomes for children. However, fatherhood can and does also have significant implications for the fathers themselves, and men's investment in fatherhood and fathering is likely related strongly to the salience of fatherhood in their own lives (Goldberg, 2015; Marsiglio et al., 2000). For example, Eggebeen et al. (2013) report in their review of the literature that there can be far-reaching health consequences of fatherhood for men depending on context, including changes in risk behaviors such as smoking and drinking and health outcomes such as disease. Fatherhood is also associated with larger and more robust social networks for

[5] There is some mixed evidence for non-resident fathers, where higher child well-being may lead to greater involvement from non-resident fathers (Hawkins, Amato, & King, 2007).

the men who father children, as well as greater attachment to the labor force (Eggebeen and Knoester, 2001). Other authors have found that men place great significance on being fathers, suggesting that the primacy of parenthood is not unique to women (Edin and Nelson, 2014). Moreover, the entry into fatherhood is also associated with stronger romantic attachments between men and their partners, and with greater closeness between men and their own parents (Goldberg, 2015; La Taillade et al., 2010).

The literature suggests that men's reports of their own fertility are incomplete for births that are of particular interest to policy makers, such as births to adolescent parents and births in nonmarital unions (see, for example, (Carlson and McLanahan, 2010; Cabrera and Peters, 2000)). We acknowledge those concerns. However, while such births are notable for the negative outcomes seen for both the adults who enter parenthood in these ways and for the children born to young or unmarried parents, we posit that these are, at a national level, a minority of all births. For example, data covering the period of 2011-2015 shows that only 13.8% of men became fathers during adolescence (Martinez et al., 2018). Similar research using a different survey found that only about a third of adolescent fathers reported their fertility unreliably (Boggess et al., 2007). While we are understandably concerned about adolescent fertility and men's unreliable reporting, the overlap of these two estimates suggests that such errors only apply to between four and five births out of every 100 first births; our concern for the few should not lead us to discard all fathers' reports of their fertility. Additionally, we know from data about women's fertility that both non-marital (Martin et al., 2018) and adolescent childbearing (Child_Trends, 2019) have been falling in recent years, suggesting again that fewer of men's childbearing events are at risk of being omitted in recent cohorts.[6]

There is also suggestive evidence that many men have responded to changing social contexts by becoming more active and involved fathers. For example, divorce and non-marital childbearing have caused men to have to navigate a fatherhood role that is considerably different from the one that a coresident father might navigate (Marsiglio et al., 2000). Women's rising labor force participation in conjunction with men's wage and/or labor force stagnation has prompted some men to renegotiate fatherhood from a traditional, removed breadwinner role to a more hands-on role (Goldscheider et al., 2015). Additionally, the growing body of knowledge indicating the importance of fathers for children's development has entered the popular discourse, and several recent qualitative studies have shown men striving to provide for the social and emotional development of their children in response (see, for example, (Edin and Nelson, 2014; Eggebeen and Knoester, 2001). Taken together, these changing frames of father involvement seem likely to further reduce the risk of men "forgetting" children in reporting their total fertility.

An alternate concern is that because men do not bear children, they may be unaware of the children they have fathered or uncertain of the paternity of their children. An examination of data from the NLSY79 found that for only 8% of the children reported by men as their biological offspring is there any uncertainty about paternity (Mott et al., 2007). Additionally, there is qualitative evidence that sexual encounters are generally between persons who know each other, and that unplanned pregnancies (when they occur) are not hidden from the father or the larger community as they might have been in past eras (Edin and Kefalas, 2011). Men's awareness of their own paternity is reinforced in the SIPP data. A review of the raw data reveals that very few men answered either paternity question ("Do you have children?' and "How many children have you biologically fathered?") with a response of "I don't know." For example, fewer than 50 men reported not knowing how many biological children they had fathered,

[6] Of course, while it is always possible that adolescent males are following a different trajectory and impregnating women who have aged out of their teenage years, data about partner's ages suggests that this is not the case Khandwala, Y. S., Zhang, C. A., Lu, Y., & Eisenberg, M. L. (2017). The age of fathers in the USA is rising: an analysis of 168,867,480 births from 1972 to 2015. *Human Reproduction*, 32(10), 2110-2116. doi:doi:10.1093/humrep/dex267..

less than a quarter of a percent of the eligible sample.[7] These data suggest that men in the SIPP have high confidence in their knowledge of their own fertility.

Some of this focus on men's incomplete reporting stems from an incomplete digestion of the literature. In 1999, the journal Demography published a seminal piece titled, "Incomplete Reporting of Men's Fertility in the United States and Britain" (Rendall et al., 1999). In this article, which is often cited in support of the argument that men are unreliable reporters of their own fertility (see, for example, (Joyner et al., 2012)), the authors write, "we find incompleteness of men's non-marital and previous-marriage fertility reporting in magnitudes of one third to one half" (p.142). However, the authors define two sources of incompleteness, examining both misreporting and the underrepresentation of men in surveys. Ultimately, although the role of misreports is damning for certain types of fertility and certain men, the authors write, "the contribution of underrepresentation exceeds that of non-reporting overall for both the United States and Britain" (p.142).

This is not to say that misreporting is not substantively important, but rather to redirect the conversation to the larger problem of underrepresentation. A detailed examination of the literature on men's fertility and the reporting thereof suggests that there is no need to throw the proverbial baby out with the bathwater and dismiss all men's reports of their own fertility given concerns about some high risk births. However, the research also suggests that the data may not be as complete as we would like, and this merits additional concern.

3 Men's Fertility in the SIPP[8]

The SIPP is a longitudinal panel survey, following a nationally-representative sample of the civilian, non-institutionalized population of the United States. The U.S. Census Bureau has administered the SIPP since the 1980s. However, the survey was redesigned prior to the 2014 panel. As part of this redesign, the SIPP fertility battery was completely overhauled. The 2014 SIPP[9] asks both men and women about their children ever born, all of their children's months and years of birth, and whether they are a grandparent. The 2014 SIPP was also the first nationally representative survey to include a direct question about multiple partner fertility, also asked of both men and women.[10] The instrument

[7] This is an unweighted count. The percent of the sample is unchanged when looking at weighted data.

[8] All comparative statements in this report have undergone statistical testing, and, unless otherwise noted, all comparisons are statistically significant at the 5% significance level.

[9] The first year of the 2014 SIPP was collected through personal-visit interviews from February 2014 through May 2014. Respondents were asked about their current status and events that happened during calendar year 2013. Respondents complete a monthly timeline from January of the reference year through their interview month, with the months from January through December of 2013 included on the public use release for the first year of the 2014 SIPP, as well as additional information, such as their own and their children's birthdates, which may precede the reference year.

[10] A recent analysis challenged the validity of the SIPP MPF question by disaggregating reported responses from edited responses (see Stykes, J. B., & Guzzo, K. B. (2019). Multiple-Partner Fertility: Variation Across Measurement Approaches. Cham, Switzerland: Springer.). We acknowledge the potential shortcomings in a direct question here and in other work (see Monte, L. M. (2019). Multiple-Partner Fertility in the United States: A Demographic Portrait. *Demography*, 56(1), 103-127. doi:http://dx.doi.org/10.1007/s13524-018-0743-y.), but the editing process employed by the Census Bureau combines both of the approaches employed by Stykes, J. B., & Guzzo, K. B. (2019). Multiple-Partner Fertility: Variation Across Measurement Approaches. Cham, Switzerland: Springer. , as well as additional logical imputation processes, and therefore we feel the SIPP is uniquely situated for comprehensive study of MPF.

additionally collects information on the number of childbearing unions a parent has, and whether any current union is a childbearing union.[11]

Although subject to the same concerns about household non-response as any national survey, the fertility data generally hold up well compared to other benchmarks.[12] Distributions of childlessness and children ever born by sex align with those produced by the National Survey of Family Growth (NSFG; see Martinez et al. (2018)), and the measurement and estimates of grandparenthood in 2014 have been consistent since the revision to the SIPP fertility history in 2001.[13] Additionally, Monte (2019) recently situated the SIPP's data on MPF in the wide variety of estimates available in the current literature and found those estimates robust and generally in line with other data.[14] The depth and breadth of the SIPP's measures, as well as comparability to other data, make the SIPP an especially robust resource for an in-depth examination of men's fertility.

Bachrach (2007) extrapolated from the National Longitudinal Survey of Youth 1979 panel data (NLSY79) that men aged 33-41 in 1998 reported an average of 1.4 children, which the author determined to reflect underreporting given an age-adjusted sample of women's reports of 1.8 children on average.[15] The SIPP shows a similar discrepancy by sex, with men of this age range reporting roughly 1.5 children on average. However, we interpret the results differently – rather than an underreporting of births, we see an underrepresentation of fathers.

As shown in Table 1, the primary distinction between men's and women's reports of their fertility in the SIPP is in childlessness. Thirty one percent of all women aged 15 and over are childless, while the same

[11] The SIPP's information on childbearing unions is unique among similar surveys as it is collected regardless of whether or not there are coresident children. This allows for the identification of shared childbearing within couples across the lifecourse.

[12] The sample loss rates for SIPP have been increasing over SIPP panels Atrostic, B. K., Bates, N., Burt, G., & Silberstein, A. (2001). Nonresponse in U.S. Government Household Surveys: Consistent Measures, Recent Trends, and New Insights. *Journal of Official Statistics*, 17(2), 209-226, Westra, A., & Nwaoha-Brown, F. (2017) 'Nonresponse Bias Analysis for Wave 1 2014 Survey of Income and Program Participation (SIPP) (ALYS-16)' U. S. C. Bureau. Washington, DC: U.S. Census Bureau. Available at: https://www2.census.gov/programs-surveys/sipp/tech-documentation/complete-documents/2014/2014_SIPP_Wave_1_Nonresponse_Bias_Report.pdf.. This trend in rising non-response is echoed in most large national surveys Curtin, R., Presser, S., & Singer, E. (2005). Changes in Telephone Survey Nonresponse over the Past Quarter Century. *The Public Opinion Quarterly*, 69(1), 87-98. Stable URL: https://www.jstor.org/stable/3521604, de Leeuw, E., & de Heer, W. (2002). Trends in Household Survey Nonresponse: A Longitudinal and International Comparison. In R. M. Groves, D. A. Dillman, J. L. Eltinge, & R. J. A. Little (Eds.), *Survey Nonresponse* (pp. 41-54). New York: Wiley, Groves, R. M., & Couper, M. P. (1998). Nonresponse in Household Interview Surveys. New York: Wiley. , Meyer, B. D., Mok, W. K. C., & Sullivan, J. X. (2015). Household Surveys in Crisis. *Journal of Economic Perspectives*, 29(4), 199-226. doi:10.1257/jep.29.4.199, Schoeni, R. F., Stafford, F., McGonagle, K. A., & Andreski, P. (2013). Response Rates in National Panel Surveys. *Annals of the American Academy of Political and Social Science*, 645, 60-87. http://www.jstor.org/stable/23479082
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3555140/pdf/nihms425313.pdf..

[13] This information is per internal reviews of 2014 SIPP panel data. See also Fields, J., O'Connell, M., & Downs, B. (2006). Grandparents in the United States, 2001. (Paper presented at the American Sociological Association, Montreal, Canada) for a discussion of the implementation and initial evaluation of grandparent questions in the 2001 SIPP.

[14] Estimates of MPF vary widely across the literature, largely because there is no consistent denominator, see Guzzo, K. B., & Dorius, C. (2016). Challenges in Measuring and Studying Multipartnered Fertility in American Survey Data. *Population Research and Policy Review*, 35(4), 553-579. doi:http://dx.doi.org/10.1007/s11113-016-9398-9.

[15] The author takes into account age differences in childbearing partnerships and estimates 1.8 children for women in their early 30s when the male cohort is 33-41.

is true of 40.5% of men aged 15 and over. This discrepancy is mirrored in reports of male and female fertility from the NSFG (Martinez et al., 2018).

While there is no immediate cause for concern in fewer men being fathers than is true for women who are mothers, the place where the SIPP data cause consternation is in the simultaneous availability of information on multiple partner fertility. Rates of paternity and maternity can only support more mothers if those women are having children with the same men. That is, more men can be childless if the men who do have children are more likely to have them with multiple women. However, the SIPP data show the opposite. While women are more likely to be mothers, they are also more likely to have children with multiple partners, and therein lies the logical fallacy (see Table 1).

What is also striking about men's and women's fertility in the SIPP is how the discrepancies largely level out once childless adults are removed from consideration. When looking at the bottom half of Table 1, which is limited to parents, we see much closer alignment between the distributions of men's and women's overall fertility.

TABLE 1 Distribution of children ever born by sex, all adults versus all parents
(Numbers in thousands)

	Women aged 15+		Men aged 15+	
	Number	Percent	Number	Percent
All adults	129,645	100.0	121,245	100.0
No children	40,127	31.0	49,094	40.5
1 child	20,599	15.9	17,634	14.5
2 children	33,916	26.2	27,843	23.0
3 children	19,884	15.3	15,312	12.6
4 or more children	15,120	11.7	11,362	9.4
Has children with more than one partner	14,905	11.5	10,498	8.7
Is currently married or cohabiting	70,739	54.6	70,685	58.3
Has children with current partner or spouse	45,877	35.4	45,923	37.9
All biological parents	89,518	100.0	72,151	100.0
1 child	20,599	23.0	17,634	24.4
2 children	33,916	37.9	27,843	38.6
3 children	19,884	22.2	15,312	21.2
4 or more children	15,120	16.9	11,362	15.7
Has children with more than one partner	14,905	16.7	10,498	14.6
Is currently married or cohabiting	57,985	64.8	56,986	79.0
Has children with current partner or spouse	45,877	51.2	45,923	63.6

Source: US Census Bureau, Survey of Income and Program Participation, 2014 panel, Wave 1

Differences in union status are also noteworthy. According to the SIPP, men are more likely to be both in unions, and specifically childbearing unions, than are women, and the same is true when the comparison is limited to mothers and fathers. The fact that about 80% of fathers in the SIPP are interviewed in coresidential unions, significantly more than the parallel percentage for mothers (63.6%), suggests that the SIPP is disproportionately omitting fathers not living with a partner. A related analysis (Monte, 2017) also recently found that fathers with minor children in the SIPP are much less likely to live with all of those minor children than are mothers.

These results suggest either an error in estimation or an omission. If we believe that women are more accurate and complete reporters, the balance with women's fertility among the men who are fathers suggests that surveyed fathers' reports of children ever born are fairly complete. However, the data simultaneously suggest that our sample likely includes a disproportionate number of men who are not fathers, and likely underrepresents fathers, but particularly omitting both fathers with higher MPF and fathers not living with partners or children. The latter is in line with other data on biased response to household surveys (Peytchev, 2013; Peytchev et al., 2009), but has particular ramifications for the study of men's fertility.

Although the SIPP was not designed to collect a representative sample of births, a comparison of the SIPP data to Vital Statistics data yields additional insights; see Table 2. As predicted by the literature on survey data regarding births to young men, the SIPP appears to capture fewer births to men in their teenage years and early 20s during calendar year 2013 than birth records would suggest that we should. However, for men who are in their 30s, the SIPP is capturing births roughly on par with Vital Statistics data for men.

TABLE 2 Annual birth rates for 2013 by age, men 15-54 (1)

	Births per 1,000 men	
	Vital Statistics	SIPP
Rate for all men aged 15-54	45.8	40.3
All races, by age		
15-19	12.3	8.2
20-24	55.7	31.8
25-29	90.6	72.0
30-34	101.8	104.3
35-39	66.6	65.4
40-44	27.0	34.0
45-49	8.8	8.9
50-54	2.7	2.4

Source: US Census Bureau, Survey of Income and Program Participation, 2014 panel, Wave 1, and National Center for Health Statistics, National Vital Statistics 2013

(1) Births in 2013 were used for this calculation so that a full year of births could be observed.

4 Competing Estimates in the SIPP

The SIPP collects complete fertility histories from all adults in the sampled households, both men and women, including children ever born, birthdates of those children, and whether a parent has multiple partner fertility. The SIPP also collects the number of unions in which a parent's children were born, whether a current union is a childbearing union, and whether each parent is also a grandparent.

What the SIPP does not collect is information about non-resident family members, which makes measuring parental multiple partner fertility impossible for children who do not live with both biological parents. As roughly one third of children under the age of 18 do not live with two biological parents, this amounts to a significant shortcoming of these data (Monte, 2019). However, the SIPP does collect information from all respondents (regardless of age) who do not live with two parents about the natality and mortality of those parents.

The concatenation of these data means that mothers report both the number of their children and the number of fathers of their children, men report their number children as well as the number of mothers of their children, and children report the number of living fathers and living mothers that they have. Notably, however, the number of unions reported is not the same as the number of mothers or fathers, as those union reports do not account for the same man having children with more than one woman, or the same woman having children with more than one man. However, with the information on men's and women's multiple partner fertility, we are able to reduce the number of unions by the proportion of those mothers and fathers who are going to be double counted in a simple sum of all unions.

TABLE 3 Competing reports of childbearing
(Numbers in thousands)

	Number of mothers	Number of fathers	Number of children of these parents	MPF rate for parents
Men's reports (N = 121,245)	70,835 (men's number of child bearing unions x (1- women's % MPF))	72,151	173,800 All men's total children ever born	14.6% (roughly 85,040 unions reported (1))
Women's reports (N = 129,645)	89,518	92,050 (women's number of child bearing unions x (1- Men's % MPF))	221,300 All women's total children ever born	16.7% (roughly 107,800 unions reported (1))
Children's reports (2) (N = 311,936)	NA	NA	223,467 respondents with a living mother; 194,323 respondents with a living father	NA

SOURCE: US Census Bureau, Survey of Income and Program Participation, 2014 Panel, Wave 1

(1) Counts are rounded to four significant digits to protect confidentiality.
(2) Children may be of any age, including adult children.

We can then use this information to cross-validate reports; see Table 3. For example, the population of men and women corresponds to population estimates and shows a difference of 8 million more women than men. However, the data show roughly 19 million more mothers than fathers, regardless of whether you use women's reports or men's. Men's multiple partner fertility (or MPF) would have to be twice as high as reported in order for women's reported childbearing unions to match the number of fathers in sample.

These divergences are further complicated when we look at parents' reports of their children ever born and children's reports of their living parents. Although children's reports of living mothers and mothers' reports of their children ever born align well (children report about 223 million living mothers, and mothers report about 221 million children ever born[16]), data from fathers are not in line with children's reports. That is, the reports of the number of children fathered based on survey reports from the men in our sample yield about 174 million children. However, we find approximately 194 million people reporting a living father at the time of the survey, suggesting that we fail to account for the fathers of about 20 million children.

There are two components to the underrepresentation of fathers – underrepresentation due to the sampling frame and underrepresentation due to differential non-response. The SIPP sample is comprised of the civilian, non-institutionalized population. As such, some number of fathers reported by children, or represented in Vital Statistics, are excluded from the SIPP sample due to those fathers being incarcerated or in the military, for example. We acknowledge the exclusion of such men, but will argue that they are the minority of omissions.[17]

The second source of underrepresentation are sampled non-respondents, meaning men in the sampling frame who declined to be interviewed.[18] If a certain subgroup (here, men who are fathers) is disproportionately likely to refused to be surveyed, this will bias resulting estimates. Available SIPP data on non-responding households do not offer insight into the characteristics of non-responding households or persons, but we will argue that the survey data available from responding households can shed some light on non-responding fathers. Regardless of their characteristics, when this second group is missing, men in responding households are weighted more to compensate for the absence. However, most weighting controls do not include parenthood, and therefore, differential missingness by paternity characteristics can be exacerbated by compensating for non-response in weighting.

5 How Much Are We Missing?

Using existing SIPP data, we are able to quickly generate two alternative estimates of the size of the population of missing fathers. These estimates range in size from roughly 7.3 million omitted men to about 13.8 million omitted men. In this section, we will walk the reader through the derivation of these estimates.

5.1 Using Children's and Fathers' Reports to Estimate Missing Men

In its simplest form, the count of persons with living fathers divided by a factor that represents the fertility levels of men should equal the count of fathers. This would include both fathers eligible to be sampled in the survey universe and those who reside outside it.

In the exercises below, we reconcile the difference in the count of children reported by the men in the survey data with the number of children reporting living fathers. The gaps in those counts represents several components of the population of fathers. For example, children will report fathers who may be

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[16] Readers should note that while children's reports are limited to mothers still alive, mothers' reports are not similarly limited. Although stillbirths and miscarriages are not included in women's reports of children ever born, women are not asked to limit their fertility reports to children still alive at the time of the survey. This discrepancy in reporting may account for the relatively small, but statistically significant, difference between women's reports of children and children's reports of mothers.

[17] It is estimated that there are 1.5 million men in prison (Kaeble, Glaze, Tsoutis & Minton, 2015), and roughly 1.8 million men in the active duty armed forces NPR (2011). By The Numbers: Today's Military. https://www.npr.org/2011/07/03/137536111/by-the-numbers-todays-military. Accessed 01/09/2020 2020..

[18] For additional information about sampling and coverage in the SIPP, see the Source and Accuracy statements: https://www.census.gov/programs-surveys/sipp/tech-documentation/source-accuracy-statements/source-accuracy-statements-2014.html

outside the survey universe and living in institutions, in the military, or overseas. These fathers would be represented by the children's count of living fathers, but not in the count of men in the survey who are fathers. Thus, the count of fathers from children's perspectives can be summarized as follows:

Children's (of all ages) Living Fathers

=

(Men in the survey universe * the number of children they have had)

+

(Men outside the survey universe * the number of children they have had)

The accounting requires that men and children reporting living fathers survive to be represented in these data. The count of children with living fathers is lower than the count of children with living mothers (as shown in Table 3) due to the imbalance in mortality between men and women.

If all missing fathers have only had a single child, then we would be missing roughly 20 million missing fathers. Of course, it seems unlikely that we are only missing single-child fathers. Across a population of 72 million fathers, only about 17 million report having had only one child (see Table 1), so the risk of having omitted 20 million such fathers seems improbable. Instead, it seems more likely that the omitted fathers have a variety of different parities. If we assume that the omitted fathers have the same fertility as the fathers surveyed, we can use the latter to estimate the number of fathers in the former group.

Most parents with multiple partner fertility have those children with only two partners (Monte, 2017). Given this, we can conservatively assume for these purposes that anyone who has MPF is counted twice in an accounting of parents of children. Therefore, if some number of women report having had children with 100 men, we can calculate from the SIPP estimates of paternal MPF (14.6%) that roughly 14-15 of those men are double counted, having fathered children with two of the reporting women. This will slightly overstate the number of unique fathers as it does not account for men with more than two unions. However, we can use this parameter to estimate the actual number of fathers for these women as the number of fathers multiplied by one minus the MPF rate. In this example, this would yield the following:

100 * (1-.146) =

100 * .854 =

roughly 85 unique fathers across women's reports of 100 unions.

We can use these various complementary pieces of data in the SIPP to estimate the size of the missing population; the components of this estimation are shown in Table 4. First, we use the distribution of children by men's parity as reported in the SIPP (shown in Column A) across the children whose fathers aren't captured to estimate the distribution of these children by the fathers' parity (shown in Column B). We then use the percent of men at each parity who have all of their children with one woman (or 1 – MPF rate; shown in Column C) to convert men's parity and multiple partner fertility into an estimate of unique fathers omitted.

If we again conservatively assume that all MPF fathers have children with two mothers, we can estimate the number of fathers at each parity using the same formulation used earlier to convert women's unions to a count of men (shown in Column D). To do this, we divide the number of children at each parity by that parity to reach an estimate of fathers, and then multiply that count of fathers by the rate of single partner fertility (1- MPF) to generate an estimate of *unique* fathers. Using these assumptions and summing the number of fathers omitted at each parity, the roughly 20 million children whose fathers are not represented in the SIPP sample can be expected to have been fathered by roughly 7.3 million fathers who are absent from the reported data (as shown at the bottom of Column D).

TABLE 4 Estimating missing dads using sampled fathers' and sampled children's reports
(Numbers in thousands)

	COLUMN A: Proportion of children at each fathers' parity level (1)	COLUMN B: If the children whose fathers are not captured in the SIPP sample are distributed by omitted father's parity in the same distribution as sampled fathers, how many children at each parity level are we missing? (Col A * 20,523)	COLUMN C: Men's percent single partner fertility by parity (1)	COLUMN D: Number of fathers missed by parity and SPF percent (Col B / parity)*Col C
Fathers' Parity				
1 child	10.1%	2,082	100.0%	2,082
2 children	32.0%	6,576	90.2%	2,966
3 children	26.4%	5,424	78.1%	1,412
4 or more children (2)	31.4%	6,443	61.3%	808
TOTAL	100.0%	20,523	100.0%	***7,268***

(1) SOURCE: US Census Bureau, Survey of Income and Program Participation, 2014 Panel, Wave 1
(2) For estimation purposes, the "4 or more" category is estimated as 4.89 in the calculation in Column D.

NOTE: Columns may not sum due to rounding.

5.2 Using Mothers' and Fathers' Reports to Estimate Missing Men

A second indirect check on the number of fathers can be constructed based on the reports of women's childbearing unions and estimates of men's fertility and MPF rates. Below is a more general path toward an estimate of the number of fathers using these inputs. This estimation will account for both the parity of men, and the multiple partner fertility of both men and women.

First, we use the relationship between the estimation of total fertility and multiple partner fertility as described by Schoen (2019). If $p_♀(j)$ is the fraction of all women who are of parity j at age 50, then it can be expressed as follows:

$$p_♀(j) = \exp(-TFR_♀)\, TFR_♀^{\,j} / j! \text{ where } j! \text{ (j factorial) equals } j(j-1)(j-2) \ldots 3\cdot2\cdot1. \qquad (1)$$

There is a corresponding factor $p_{♂}(j)$ that is the fraction of all men who have fathered j children (which resulted in live births) by age 50.[19] If men's fertility pattern differs greatly from women's then the underlying assumptions of the distribution of TFR for men would be violated. For the moment, we'll assume they are similar, such that men's can be shown as follows:

$$p_{♂}(j) = \exp(-TFR_{♂})\ TFR_{♂}^{j}\ /\ j! \quad (1a)$$

We further assume that the proportion of women having multiple partner fertility is 1 minus the proportion who have children with only one partner ($F_{♀}$). Denoting that prevalence of MPF by $W_{♀}$, we have

$$W_{♀} = 1 - F_{♀} \quad (2)$$

and for men,

$$W_{♂} = 1 - F_{♂} \quad (2a)$$

We treat women's reports of their fertility as accurate and complete. Within the SIPP data, we can observe the intersection of women's reported parity and successive unions ($U_{♀}$). Her child bearing unions (counted over k=1 to k=3+) and the distribution of her parity (from j=1 to j=4 or more) is represented below. In situations where the number of childbearing unions is more than the parity (illogical condition), we set the proportions to 0.

$$(U_{♀\ \text{k=1 to k=3+, j=1 to j=4+}}) = \begin{bmatrix} U_{♀(k=1)}, p_{♀(j=1)} & 0 & 0 \\ U_{♀(k=1)}, p_{♀(j=2)} & U_{♀(k=2)}, p_{♀(j=2)} & 0 \\ U_{♀(k=1)}, p_{♀(j=3)} & U_{♀(k=2)}, p_{♀(j=3)} & U_{♀(k=3+)}, p_{♀(j=3)} \\ U_{♀(k=1)}, p_{♀(j=4+)} & U_{♀(k=2)}, p_{♀(j=4+)} & U_{♀(k=3+)}, p_{♀(j=4+)} \end{bmatrix} \quad (3)$$

As a woman's parity increases, each successive child may or may not be fathered by the same man as her previous children. The probability that successive children have the same father declines across parity, reflecting union dissolution and the formation of new unions for higher order births. For each level of women's parity ($p_{♀j}$), there is a distribution of the men ($p_{♂h}$) who father those children ($Q_{♀}$). In the matrix below, we represent the combinations of partners by their parity for women where parity, again, goes from (j=1) to (j=4 or more), and her partners parity from (h=1) to (h=4 or more).

$$(Q_{♀\ \text{j=1 to j=4+, h=1 to h=4+}}) = \begin{bmatrix} p_{♀(j=1)}, p_{♂(h=1)} & \cdots & p_{♀(j=4+)}, p_{♂(h=1)} \\ \vdots & \ddots & \vdots \\ p_{♀(j=1)}, p_{♂(h=4+)} & \cdots & p_{♀(j=4+)}, p_{♂(h=4+)} \end{bmatrix} \quad (4)$$

The proportions in this matrix multiplied by the proportion of men having all their children with the same partner ($F_{♂}$) for the current level of men's parity and all preceding levels h(h–1)(h–2) ... 3·2·1

$$F_{♂} = \begin{bmatrix} F_{♂h=1} \\ F_{♂h=2} \\ F_{♂h=3} \\ F_{♂h=4+} \end{bmatrix} \quad (5)$$

[19] We acknowledge that this might reasonably be extended to a higher age for men, although the SIPP data show very little fertility after the age of 40 for either men or women (Monte, 2017).

If we simply multiply the number of unions at each parity ($U_{♀ kj}$) by the index for the number of unions those women represent, we generate a maximum number of possible fathers if each man is uniquely represented in a childbearing union.

$$\text{Maximum fathers} = [U_{♀ kj} * k] \quad (6)$$

In the SIPP data, women report about 107 million unions (35.6 million more than number of fathers present in the SIPP sample). Of course, multiple partner fertility among men means that some of the men represented in the childbearing unions of one woman are also represented in the childbearing unions of another woman in the distributions. However, we can use our understanding of the underlying patterns to work backwards to an estimate of unique fathers.

To adjust the maximum number of fathers to a more realistic adjusted estimate considering MPF, we multiply the estimated count of fathers at each of the women's parity and union combinations [$U_{♀ kj} * k$], by the proportion of men at each male parity within each of the women's parity ($Q_{♀jh}$) and union combinations who have all of their children with no multiple partner fertility ($F_{♂h(h-1)(h-2) \ldots 3 \cdot 2 \cdot 1}$).

$$\text{Fathers} = [U_{♀ kj} * k] * [(F_{♂h(h-1)(h-2) \ldots 3 \cdot 2 \cdot 1}) * (Q_{♀jh})] \quad (7)$$

Such an equation takes into account both his and her parity, both partners' multiple partner fertility, and the overlap therein to produce a count of unique fathers. Of course, for this relationship to produce reliable estimates of the number of fathers, the proportion of partners by parity, and parity of partners, are necessary to represent all childbearing unions. Additionally, the multiple partner fertility estimate needs to represent accurate MPF levels. Within these constraints, the SIPP data allow us to estimate the elements of the above final equation (Eq.7) with survey based levels of MPF (W), levels of single partner fertility (F), as well as the distributions of mothers' childbearing unions by her parity (U) and an estimate of the matrix of the proportions of partners by parity combination (Q).

In applying this equation to the SIPP data, we treat women's reports of their fertility as true and complete. As shown above, the number of unions is determined by multiplying the estimate of women reporting each number of unions by that number of unions (see Eq.6), resulting in roughly 107 million unions.[20] Of course, men's multiple partner fertility means that we are almost certainly double counting some of women's reported fathers, but these data provide a foundation for a closer estimate, and represent the union components in Eq. 7.

For these purposes, we also treat men's reports of their fertility in the SIPP as true, if not necessarily complete due to sampling and nonresponse concerns. Table 5 shows the tabulation of men's parity by women's parity within childbearing couples in the SIPP (shown mathematically as U_{kj} in Eq. 3 above). This cross-tabulation is limited to those men and women partnered in a childbearing union at the time of the interview.

As noted, restricting these estimates to childbearing couples likely results in conservative estimates of MPF.[21] This is because the coresidential childbearing couples observed at the time of the SIPP interview are likely more stable. Multiple partner fertility is expected to be higher for the men we fail to interview for the same reason we have shown deficits in divorced men in the survey data (Kreider and Fields,

[20] The intersection of women's reported parity and successive unions in the SIPP (U_{kj} in Eq.3) are shown in Appendix Table A.
[21] These estimates are additionally subject to sampling and response issues affecting all survey data collection, but are representative enough to generate an estimate of the number of fathers missing from survey data based on the characteristics of women's childbearing unions.

2001). The disruption and mobility associated with divorce and union status change leads to an underrepresentation of those households, and those households are also more likely to be multiple partner fertility households (Manlove et al., 2008). That implies fewer unions (and lower MPF rates) by sex in Table 5 than we should find in a sample that included individuals not in stable coresidential childbearing partnerships.

TABLE 5 Percent of childbearing couples in each parity combination.
(Distribution of U♀ by men's and women's parity)

Men's Parity	Women Parity 1 (E1)	Women Parity 2 (E2)	Women Parity 3 (E3)	Women Parity 4 or more (E4)
1	83.0	5.6	5.4	3.6
2	8.2	84.4	10.8	10.0
3	5.5	5.9	76.0	9.1
4 or more	3.4	4.1	7.9	77.3
TOTAL	100.0	100.0	100.0	100.0

SOURCE: US Census Bureau, Survey of Income and Program Participation, 2014 Panel, Wave 1

The distribution of fathers by mothers' parity (Q_{jh} represented in Eq.4) can then be combined with information on men's MPF, as shown in Table 5, to estimate the proportions of women's unions that represent unique fathers.

The first step to developing a closer estimate of the number of fathers is to understand the distribution of the multiple partner fertility component of women's partners. Table 6 shows how the concatenation of his and hers and shared fertility information can be used to derive proportions of unique fathers across unions. In Table 7, we apply those proportions to men's likelihood of having all children with the same women, which we hold constant across all combinations of men's and women's parity. More precisely, we multiply the proportion of women in each parity/partner parity combination (from Table 6) by the proportion of their partners who had each of their children with no multiple partner fertility (Col. C of Table 4). This comprises the second component of eq. 7 and adjusts the number of fathers from eq.6. In Table 7, the combination of these proportions is used to generate a count of unique fathers, distributed by her parity.

TABLE 6 Calculation of ratio of unique fathers across unions

	Sum of the proportion of women of a specific parity partnered with a man of each parity (E1, E2, E3, E4) who has fathered all prior children with the same partner (cumulative 1-MPF for current and prior parity – TABLE 4 (Col. C))			
Men's parity	Women Parity 1	Women Parity 2	Women Parity 3	Women Parity 4 or more
1	C_1*.830	C_1*.056	C_1*.054	C_1*.036
2	C_1*C_2*.082	C_1*C_2*.844	C_1*C_2*.108	C_1*C_2*.100
3	C_1*C_2*C_3*.055	C_1*C_2*C_3*.059	C_1*C_2*C_3*.760	C_1*C_2*C_3*.091
4 or more	C_1*C_2*C_3*C_4*.034	C_1*C_2*C_3*C_4*.041	C_1*C_2*C_3*C_4*.079	C_1*C_2*C_3*C_4*.773
Ratio of unique fathers to all unions (F)	0.960	0.892	0.744	0.548

The totals in each of the women's parity columns can be thought about as a discount on the number of unions by women's parity to reduce the unique number of men that they represent. Women of parity 1 are in childbearing partnerships with a man of parity 1 83% of the time. However, 17% of women of parity 1 are partnered with someone who also has a child or children with someone else. By accounting for these men's MPF, we can calculate that each union for women of parity 1 accounts for about .96 unique fathers. In contrast, women of parity 4 or more are in partnerships with men of parity 4 or more 77% of the time; when looking across all unions for women of parity 4 or more, each union represents only .55 unique fathers.

We can then use these ratio of unique fathers by unions as derived in Table 6 to augment the non-MPF adjusted counts of fathers resulting from women's unions by parity as shown in Column G of Table 7. In Table 7, the components of eq.7 come together and we show how the MPF "discount" reduces women's reported unions, again assuming that all MPF fathers have two unions. By multiplying reported unions by the percent of unions calculated to be with only one father we discount women's reported unions by men's MPF, and generate an adjusted estimate of the number of unique fathers in Column H. Based on this estimate, we expect that there are approximately 86 million unique fathers represented by the childbearing unions reported by women in the SIPP. That count represents an addition of about 13.8 million fathers over the weighted estimate of men who are fathers in the survey.

TABLE 7 Calculation of "Missing Men"
(Numbers in thousands)

Women's Parity	Reported total number of fathers if each union represented unique fathers (G)	Ratio of unique fathers to all unions (Row F values from TABLE 6)	Adjusted estimates of the total number of fathers discounting the impact of multiple partner fertility (E1, E2, E3, E4) * (G) (H)
1	20,599	0.960	19,780
2	38,731	0.892	34,563
3	25,752	0.744	19,150
4 or more	22,720	0.548	12,440
Total	107,800		85,933
Number of fathers missed from 72,151			13,782

NOTE: Columns may not sum due to rounding.

5.3 Reevaluating the competing estimates

These examples suggest that, based on children's reports of living fathers, we are about 7.3 million fathers short, and by women's reports of child bearing unions, 13.8 million fathers short. However, as noted earlier, there are some men who will be reported as fathers by sample members but who are themselves excluded from the SIPP sampling frame. To help narrow in on a closer estimate of the number of men we should expect to observe as fathers within the SIPP, we can make some calculations based on information about the group quarters population and their fertility.

Let us assume that we are legitimately excluding about 1.5 million men in prison (Kaeble et al., 2015), and for this example, we can use an estimate that as many as 80% have children (Glaze and Maruschak, 2008).[22] Similarly, there were roughly 2.2 million active service members at the time of the 2014 SIPP Wave 1 data collection, about 80% of whom were male (NPR, 2011). For the purposes of this exercise, we estimate that roughly half of those men were parents.[23] These populations together would represent 3.3 million men excluded from the SIPP sample, 2.1 million of whom would be fathers. These fathers are a significant component of the fathers outside the survey universe who may be reported by women (in their childbearing unions) or by children (in their count of living fathers).

Based on women's union reports and the revised estimate of the unique fathers represented in them (85.9 million) and the count of men reporting themselves as fathers (72.2 million), we have roughly 13.8 million fathers unaccounted for. If we subtract 2.1 million from this to remove the men outside the survey universe, there are roughly 11.7 million fathers who should be represented in the survey universe but who are not currently being accounted for.

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[22] It is not known how many incarcerated men have children; although between 52 and 63% of the population in prison were estimated to have minor children in 2007 (https://www.bjs.gov/content/pub/pdf/pptmc.pdf). Not restricting to minor children is our justification for estimating parenthood at 80%. https://www.bjs.gov/content/pub/pdf/cpus14.pdf

[23] Men in the military are younger, on average, than the full population of men Parker, K., Cilluffo, A., & Stepler, R. (2017). 6 facts about the U.S. military and its changing demographics. PEW Research Center. http://www.pewresearch.org/fact-tank/2017/04/13/6-facts-about-the-u-s-military-and-its-changing-demographics/. Accessed 10 February, 2020 2020., so we assume that their fertility is somewhat lower.

Alternately, the reports of men and children shown in Table 4 suggest an omission of 7.3 million men. If we again reduce this estimate by the 2.1 million fathers generically estimated to be outside the sampling frame, our estimates suggest that 5.2 million eligible fathers may be missing from our sampling frame.

Of course, a counter point to this suggestion of between 5 and 12 million missing fathers might be that the number of fathers in the survey data is accurate, but that the level of fertility and multiple partner fertility reported by those interviewed men is incomplete or incorrect. However, the magnitude of the change in multiple partner fertility that would be required refutes this as a viable assertion. In order for the number of fathers to be accurate in the weighted survey respondents, we find that MPF for men would have to more than double for the number of unions reported by women to equate to the number of men identifying as fathers. This lends more strength to the notion that it is not bad data, but instead missing men.

Without gross increases in men's number of unions, we are left with considering the number and representativeness of men identified as fathers in the survey data. If the men missing due to nonresponse are different from the responding men, then this is a potential source of bias and possible contributor to the apparent shortfall of men. Surveys like the SIPP weight responding household members to represent the total population of the sampled universe, members of civilian, non-institutional households (Survey of Income and Program Participation: 2014 Panel Users' Guide, 2016). [24] The foundation of this process lies in the population controls, and is based on estimates of the population and intercensal adjustments.

The weighting adjusts for the probability of sampling and then rakes the weighted estimates by characteristics like age, race, and sex. However, the fertility characteristics of men (and women) are not controlled through the weighting process. Weighting ensures that the survey estimates of men align with the population controls, but fails to be able to ensure that we end up with a fully representative weighted count when other characteristics are considered. This is neither new, nor a revelation, but may particularly impact any analysis of fatherhood. Without the ability to control the characteristic to an external benchmark, the imbalance is magnified through the weighting. Based on the characteristics we observe and the gaps in the estimates of fathers, we believe that, as Rendall et al. (1999) argued, underrepresentation of fathers, especially those under 40 years old and outside of couple households, is a significant source of the deviation.

6 Extensions of the Idea

The magnitude of the missing man problem has been the focus of this paper. However the ramifications of the omission are also substantively important. In this concluding section, we speculate about how these missing fathers might reframe our understanding of men's paternity. To do this, we use the fertility data reported by men in the SIPP, but add paternity into the weighting equation.

In Table 8, we use straightforward percentage adjustments to show how the characteristics of the SIPP's fathers would change under different weighting scenarios. Framed by the estimates of missing men derived above, we first try reweighting the data to obtain 11.7 million additional fathers, and reducing the

[24] Based on average weights for men, where each man in the survey represents about 4,400 men in the population, 7.3 million men equate to about 1,659 interviewed men, and 13.8 million men represent about 3,136 interviewed men.

count of childless men by the same number, per the estimate derived from women's and couples reports.[25] Second, we reweight to obtain 5.2 million additional fathers, again commensurately adjusting the count of childless men, per the estimate derived from children's reports.[26] Finally, we use the results from the first two reweighting experiments to inform a third experiment which will be discussed in depth below. Since the population controls represent all men in the civilian non-institutional household population, the weighted totals of men are kept stable through the adjustments in this exercise.

TABLE 8 Competing reports of childbearing revisited: Weighting experiments
(Numbers in thousands)

	Percent Childless	Number of Fathers	Percent MPF	Number of Mothers (1)	Parents' reports of children ever born (1)	Children's reports of living parents (2)
Men's reports						
<u>Original SIPP Weights:</u>	**40.5**	**72,151**	**8.7**	**70,830**	**173,800**	
<u>Reweighting Experiment 1:</u>						
Reweighted to add 11.7 million fathers	*30.8*	*83,912*	*10.1*	*82,380*	*202,100*	**194,323 living fathers**
<u>Reweighting Experiment 2:</u>						
Reweighted to add 5.2 million fathers	*36.2*	*77,346*	*9.3*	*75,930*	*186,300*	
<u>Reweighting Experiment 3 (3):</u>						
Reweighted to add 8.5 million fathers	*33.4*	*80,606*	*13.0*	*83,240*	*199,500*	
Women's reports	**31.0**	**92,050 (1)**	**11.5**	**89,518**	**221,300**	**223,467 living mothers**

SOURCE: US Census Bureau, Survey of Income and Program Participation, 2014 Panel, Wave 1

(1) Counts are rounded to four significant digits to protect confidentiality.
(2) Children may be of any age, including adult children.
(3) This is an estimate for consideration that is the midpoint between the two derived parameters above.

The shortcomings of the first two strategies are immediately apparent in the assorted fertility markers. Reweighting to gain 11.7 million additional fathers results in estimates of childlessness and MPF that align with women's and so do not violate any logical assumptions about comparative parity. However, this reweighting also results in an estimate of children ever born to men that far exceeds children's reports of living fathers – 202 million, 8 million more than desired.

In contrast, reweighting to obtain an additional 5.2 million fathers results in estimates that violate our logical assumptions about comparative parity. Under this reweighting scheme, the data continue to show that a higher proportion of men are childless than is true of women. However, men's MPF is still lower than women's, which cannot be true if childlessness is higher. Additionally, this reweighting results in fewer children than we should have, here an underestimate of about 8 million children.

[25] This is done by uniformly reducing the weights of childless men by 24.0% and increasing the weights for men with children by 16.3%.
[26] This is done by uniformly reducing the weights of childless men by 10.5% and increasing the weights for men with children by 7.1%.

The fundamental limitation of both of these parameters is that they are constrained by what we can and cannot measure within the SIPP data and are subject to all biases inherent in the sample. Additionally, these estimates of the size of the omitted population are generated using conservative estimates of sampled men's and couple's fertility. Reweighting based only on the paternity/childlessness divide cannot account for the characteristics of the omitted sample.

Informed by the shortcomings of these derived parameters and the logical inconsistencies in the fertility estimates that they produce, we also test a third alternative. We make three assumptions in developing this alternative. First, if the parameter driven primarily by women's and couple's reports resulted in high level estimates that matched women's data, while producing logical inconsistencies in substantive measures of men's fertility, then there is reason to believe that men and women have diverging fertility patterns and estimates of men's fertility should originate in men's reports. Second, if the larger parameter results in too many children, and the smaller not enough, perhaps the true size of the omitted sample of fathers is somewhere between the two derived parameters. And third, if both parameters relied on the MPF of reporting fathers and both arrived at still-insufficient estimates of men's MPF and childbearing partners, then a more precise reweighting would likely need to prioritize the reports of MPF fathers.

Under these assumptions, we consider a sample midway between the two derived parameters: 8.5 million omitted in-sample fathers. In order to increase the representation of MPF fathers and better represent the fathers missing from the survey responses, we arbitrarily up-weighted all MPF fathers by 50%. We then made commensurate adjustments to SPF fathers to ensure that we achieved an overall increase of 8.5 million more fathers, and reduced the weights for childless fathers to retain the match to population estimates by sex.[27] In doing so, the size and means of reweighting of the sample are less reliant on women's or children's reports and instead derive from a larger logic about men's fertility in the context of reported data. This reweighting experiment is also shown in Table 8.

This third experiment does better at meeting the logical constraints of the data. Men's childlessness is reduced from the reported high, but is still higher than women's. However, under this experimental reweighting, men's MPF is also higher than women's, which permits the higher childlessness rate. The experiment produces slightly more children than we would expect based on the children's estimate, and not quite enough mothers, but the estimates are closer to what we would expect than we achieved in any other estimation.

As with previous reweighting experiments, the constraint we face is that the underlying data come from the men who reported their fertility in the SIPP. All of the reweighting experiments described above redistribute the proportions of childless, fathers, and multiple partner fathers, but they cannot represent the characteristics of non-respondents if the men who refuse are significantly different from respondents.

Sample omissions are highlighted by the reweighting experiments. In these experiments, the distribution of fathers are largely unchanged by race and sex. Nonetheless, there is evidence that the coverage is differentially complete along dimensions such as age, parenthood, and partnership status. Our adjustments retain any imbalance that might exist in the responding distribution. Reweighting differentially by other characteristics is possible, but identifying the characteristics of the missing population is a critical next step. The data for the fathers we observe certainly suggests that the missing fathers are not missing at random.

7 Conclusion

[27] This was done by reducing the weight for childless men by 17.5%, and increasing the weight for single partner fertility fathers by 5.2%.

The purpose of this chapter was to examine and attempt to quantify what is missing in our estimation of men's fertility. However, a secondary purpose was to build support for the study of men's fertility, to direct future research, and to promote the accuracy of the estimates that we do have. The estimates for men's fertility across surveys suggest different trajectories than those observed for women, perhaps with higher levels of multiple partner fertility and longer periods of family formation. We believe that the inconsistencies that we have been discussing underline the importance of studying male fertility independent of women's.

In this analysis, we have attempted a variety of estimations of the missing relying on men's data as reported in the SIPP. We show that the SIPP data are reported with confidence and are supported by external benchmarks. We find no evidence in these data to suggest that the men in the SIPP – who represent men across the country – are either ill-informed about their fertility, or have misreported it. Within the limited number of nationally-representative datasets including information on men's fertility, the SIPP does and will robustly support a variety of analyses of men, women, and families.

However, data from the SIPP also serve to complicate the story. In the SIPP's estimates of men's and women's childlessness and multiple partner fertility (40.5% childless and 8.5% MPF for men and 31.0% childless and 11.5% MPF for women), we have unignorable contradictions in comparative parity that point to omissions in the sample that are not random. Using these data, we derive estimates that point to an omitted sample of fathers – and particularly young and MPF fathers not living with partners or children – that includes somewhere around 8.5 million men. Under this alternative specification, we speculate that national estimates of men's childlessness would be lower (33.4% of men) and that national estimates for men's MPF should be higher, around 13%.

Men's non-response has been an understudied component of demographic analyses. While some have suggested that social stigma may result in underestimation of MPF (item nonresponse;(Amorim and Tach, 2019)), we find that the substantive issue in these data is in the underrepresentation of fathers (survey nonresponse), and there is little evidence to suggest that fatherhood is a stigmatized status. We argue here that the data reported by the men in the SIPP are sound and substantively important and, while subject to the same caveats as all nationally-representative samples, the scope of the SIPP means that researchers who use these data are uniquely situated to offer insight into the omitted sample. Using these data, we are able to estimate the size and some of the likely characteristics of missing men.

The following speculation goes beyond what our data affirm or deny, but may be useful in contextualizing these findings.

We know that men are underrepresented in survey respondents proportionate to their numbers in the general population, and that this is particularly true for some subgroups of men (Pettit, 2012). At a fundamental level, we can imagine that this may mean that women are more willing respondents to surveys (and so men who live with a partner are more likely to have someone in the home agree to an interview). We further know that fathers are much less likely to have custody of children than are mothers (Grall, 2018), and that even within our SIPP sample, the observed fathers are much more likely to have minor children living elsewhere than are mothers (Monte, 2017). We also have suggestive evidence that household containing young children are more predictably home during certain hours due to children's schedules.[28] And we know that men's MPF is associated with increased residential, economic, and personal turbulence (Petren, 2017), leading MPF fathers to be disproportionately likely to be missed in household sampling frames.

[28] Personal communication with multiple SIPP field interviewers, Lindsay M. Monte, spring of 2014.

Under these “knowns”, we can make suppositions about some of the unknowns. If men are less willing participants than women, if living with children is associated with being home to answer the door to a survey taker, if fathers are less likely to live with children than mothers, and if such predictors are more likely for MPF fathers, all of these factors would conspire to increase non-response along the dimension of fatherhood, and particularly multiple partner fertility fatherhood. Stepping beyond what the available literature support, one can imagine that a father of young children who is living with neither his children nor the mother(s) of those children would perhaps be the least likely to answer the door and agree to participate in a federal survey.

Further research into the fertility of fathers must explore and improve the coverage of fathers, especially multiple partner fertility fathers, fathers not in coresidential unions, and fathers experiencing other lifecourse and fertility transitions. This measurement issue is one where differential coverage has real implications for our understanding of contemporary fertility. Our identification and description of this coverage issue in the SIPP illustrates the type of coverage evaluations necessary in all household surveys, especially on dimensions that are outside the scope of weighting or are critical components of substantive analyses. Immediate goals include figuring out either how to draw such men into national samples, or at minimum developing an understanding of their characteristics, and options for how to compensate for their omission.

In this chapter, we dissect the observed differences in men’s and women’s fertility as represented in the 2014 SIPP Wave 1 data. We consider the differences between men’s, women’s, and children’s reports of fathers and fatherhood. We argue that these data offer evidence of a “missing man” problem, rather than misreporting of the part of SIPP respondents. We then use the triangulation of these data points to model the size, and some of the characteristics, of the missing men. This estimation technique should be applied to other data sources to further disentangle what or who may be missing from our current estimates of men’s fertility. Based on our derived estimates, we conclude by offering a re-estimation of key factors of men’s fertility in a sample than did not differentially omit not just fathers, but certain types of fathers. We offer this as evidence in support of more, and more in-depth, research into men’s fertility, and men’s survey non-response.

Appendix TABLE A A count of women's unions by parity in the SIPP
(numbers in thousands)

		Number of childbearing unions			Estimated total number of fathers if each union represented unique fathers (I1*1+I2*2+I3*3 etc.)
Women's Parity	Total women	One union (I1)	Two unions (I2)	Three or more unions (I3)	(J)
1	20,599	20,599			20,599
2	33,916	29,101	4,815		38,731
3	19,884	14,909	4,082	893	25,752
4 or more	15,120	10,004	3,340	6,028	22,720
Total	89,518	74,163	12,237	6,921	107,800

SOURCE: US Census Bureau, Survey of Income and Program Participation, 2014 Panel, Wave 1

NOTE: The final total is not an exact sum as shown because the summing of 3+ unions and 4+ kids is done using the actual counts of parity by union. Columns may not sum due to rounding.

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