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ABSTRACT

We examine the stability of preferences over time using panel data from Kenya on fertility intentions, realizations, and recall of intentions. We find that desired fertility is very unstable, but that most people perceive their desires to be stable. Under hypothetical scenarios, few expect their desired fertility to increase over time. Moreover, when asked to recall past intentions, most respondents report previously wanting exactly as many children as they desire today. Biased recall of preferences over a major life decision could have important implications for measuring excess fertility, the evolution of norms, and the perceived need for family planning programs.

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Introduction

Many important decisions in young adulthood – regarding human capital investment, career, residential location, marriage and fertility – share common characteristics: these high-stakes decisions are relatively infrequent, costly to reverse (or irreversible), informed by limited personal experience, and made without knowing how own future preferences will evolve or how the choice itself will impact future preferences. Yet these decisions have the potential to shape individuals' entire life trajectories, raising the stakes around getting them "right".

Given the lack of personal experience in many significant domains, advice from more experienced individuals ("experts") might be especially beneficial for such momentous decisions – but how useful is this advice likely to be? There are many factors that could slow learning, including the fact that "experts" may be less-informed than they claim, or that their experience may not be directly applicable to others' situation. Yet even in cases where others' circumstances are similar, the quality of the advice provided will depend critically on the experts' understanding and recall of their own choices.

Previous research has identified the importance of intergenerational transmission for individual decision-making and cultural persistence (Bisin and Verdier, 2000, 2001), for choices such as female labor force participation and fertility (Fernández and Fogli, 2006, 2009; Alesina, Giuliano and Nunn, 2013). For practices such as female genital mutilation, existing work has found that older women who have gone through the procedure themselves act as gatekeepers of this tradition (UNHCR (2008), Bellemare, Novak and Steinmetz (2015), Coyne and Coyne (2014)). This last example in particular raises critical questions. How reliable is advice by experts when it is based on recall of their own past preferences, decisions and outcomes? Since recall and retrospection are supposed to be key ingredients to the learning that forms the basis for "expertise", how do people recall earlier desires and thus learn about their (in-)stability, as well as about the translation of past intentions into outcomes?

This reflection begs additional questions. First, how do people form their preferences with respect to important life decisions, and how stable are these preferences? If preferences are

unstable and strongly depend on circumstances, it might be difficult to correctly anticipate future developments and their impact on one's own preferences. Kuziemko et al. (2018) illustrate these challenges for the case of first-time mothers, who tend to overestimate their postnatal labor supply. Second, how stable do individuals expect their own preferences to be? We know many people have a tendency to extrapolate current preferences to different future states of the world (Loewenstein, O'Donoghue and Rabin (2003)), with evidence that this tendency applies to long-term decisions such as which college to attend (Simonsohn (2010)) or which car to buy (Busse et al. (2015)).

In this paper, we provide evidence that projection bias is important in choices related to marriage and fertility as well.[1] Moreover, we are among the first in any domain to examine whether the same tendency applies to retrospection and the reconstruction of past preferences.

Using a rich longitudinal data set on young Kenyan adults with up to 9 years of information, we explore these questions with an application to reproductive desires, decisions and outcomes. Reproductive decisions are major life choices with important individual, societal and even macroeconomic consequences.[2] These choices are made over many years, and once taken, are largely irreversible; having correct expectations about one's preferences given different future circumstances is therefore crucial when deciding whether and when to have more children.

Concretely, we thus seek to answer the following three questions in our sample of Kenyan women: How stable are reproductive desires with respect to women's desired number of children? How accurately do women forecast their future behavior and how their preferences depend on changing circumstances? And, how accurately do women recall their past fertility desires?

[1] As such, it is related to Odermatt and Stutzer (2015) showing projection bias for individuals' forecasts of future life satisfaction following major life events, underestimating adaptation to events such as marriage and widowhood. Consistent with their findings, our results suggest that people underestimate the variability of preferences over time.

[2] See Casterline and Lazarus (2010) for a summary.

We find that even in the context of a life domain as important as having children, desires vary substantially over time: across horizons of 3 to 9 years, more than 60% of respondents change their stated desired number of children (henceforth fertility desires), and 20% by 2 or more children.

Second, we find that many women underestimate how strongly they will adjust their preferences to certain scenarios, and mispredict own fertility behavior over the next 2 to 5 years. For instance, when asked how they would react to scenarios such as getting married soon or all children being of the same gender, most respond that they would still like to have the same number of children. For a small number of negative scenarios such as difficult pregnancies or worsening finances, sizeable shares suggest they would prefer fewer children. Opting to want more children is quite rare, and never a majority response to any scenario posed.

Despite these asymmetric expectations, large shares of respondents have both upward and downward changes in stated desired fertility between ages 18 and 28.

For example, while around 27% (24%) of women expect their desired fertility to increase in the case in which all children end up being girls (boys), 70% (47%) of those whose children all turned out to be daughters (sons) actually increase their desired number of children in future survey rounds.[3] Young Kenyan adults who had anticipated being largely indifferent to the gender of their children in fact end up caring more than they had thought. These patterns are consistent with theories of projection bias, applied to fertility desires.

We also find expectations to be incorrect in a more immediate way: when asked whether they expect to have another child in the next 2 or 5 years, a fair share mispredict their own behavior: 28% (45%) of women not expecting a child in the next 2 (5) years ended up having one. Together with increases in desired fertility across survey rounds, these patterns suggest that ex-post rationalization matters as well.

Third, we document that very few women are able to recall past desired fertility from

[3]Among those with at least one son and daughter, 39% increased desired fertility.

three years ago: only 31% correctly recall past desires, and just 9% among those who have changed their stated desired fertility. Instead, most believe they desired the exact same number of children 3 years ago as today. The strong anchoring at current desires suggests that current preferences not only exert a strong influence on expectations of future desires but also on recall of past preferences, e.g., through projection bias in retrospection or a cognitive desire for consistency. The anchoring at current preferences is asymmetric: it is particularly strong for those with higher stated desired fertility today than before. Given this asymmetry is only present for married women and mothers, it appears the difference does not stem mechanically from differences between upward or downward changes, but rather from the potential reasons behind these changes. Psychological concerns over feeling in control of one's own life, and perhaps most importantly the fear of expressing cruelty towards "unwanted" children could therefore drive some of this asymmetry.

The unique feature of our study - our ability to track Kenyan women over a long time period from fertility intentions to actual outcomes - allows us to compare individuals' recalled vs. actual past fertility intentions. Our finding of asymmetric recall of past fertility desires is related to a recent study by Zimmermann (2017), who finds asymmetric recall of one's IQ-test results a month later, a result driven by motivated reasoning.[4]

This illusion of stability has potentially important implications. Incorrect expectations and beliefs might result in sub-optimal decision-making for some women, such as getting married or starting childbearing too early. While advice based on accurate recall could be one way to improve these expectations, advice based on incorrect recall might contribute to inaccurate expectations instead and help perpetuate high fertility norms.[5] This is particularly harmful if incorrect recall and forgetting one's true past intentions involves ex-post rationalization of the benefits of having more children. Moreover, underestimating the extent

[4]Bénabou and Tirole (2016) provide a summary of motivated reasoning in economics. Further examples from lab-settings include Eil and Rao (2011) and Mobius et al. (2011).

[5]This could be one reason behind "imperfect empathy" towards one's children (Bisin and Verdier (2001)) and the strong correlation found between mothers' and their children's fertility levels shown in Fernández and Fogli (2006).

to which one's preferences have changed over time might lower tolerance for other viewpoints and thereby contribute to ideological polarization in society. However, inaccurate recall does not have to be exclusively negative. For the sake of individuals' mental health, it might be better to believe that one succeeded in attaining one's goals rather than dwelling on failures. Moreover, believing that all of one's children were always wanted rather than a "mistake" could improve their treatment by parents and the community (Guterman (2015)).

The results also have implications for survey methodology and the use of retrospective questions. When recalled answers are not only erroneous, but systematically biased, this could affect results based on them. Measures of excess fertility are an important example. Retrospective questions on past fertility desires — common in DHS surveys — underestimate the true extent of excess fertility, perhaps substantially; this contradicts the conclusion one might take away from the evidence in Pritchett (1994), for example. The frequency of changes in desired fertility further complicates standard measures of excess fertility. It is not obvious which reproductive desires to use as the "right" benchmark against one's actual number of children. Decomposing fertility into wanted and unwanted fertility is thus more challenging than it might seem, which affects the interpretation of widely used demographic measures.

Our findings are potentially of value to the study of fertility and family planning in several other ways. First, we contribute to research on reproductive intentions that suggests they are predictive of behavior, but not always stable.[6] Most of these studies focus on the extensive margin of wanting an additional child or not, and therefore might miss considerable changes in the intensive margin of fertility. Moreover, we are among the first to assess how stable people perceive their own reproductive desires to be. The results are also relevant to questions about the effectiveness of family planning interventions, suggesting reproductive intentions are alterable.[7]

[6]Findings from OECD-countries include Westoff and Ryder (1977), Rocca et al. (2010) or Iacovou and Tavares (2011), and for non-OECD countries Campbell and Campbell (1997), De Silva (1992), Vlassoff (1990), Bankole and Westoff (1998), and Curtis and Westoff (1996).

[7]See Miller and Babiarz (2016) and Mwaikambo et al. (2011) for reviews.

1 Data and context

The analysis utilizes the Kenyan Life Panel Survey (KLPS), a longitudinal data set following more than 5,000 individuals from Busia, a district in rural western Kenya. Starting in 2003, a representative sample of children who participated in a primary school-based deworming program (see Miguel and Kremer (2004)) was chosen to take part in a panel data collection effort, with survey rounds (so far) in 2003-05, 2007-09 and 2011-2014.

We focus on the portions of the survey containing information on reproductive intentions, realizations and recall of past intentions. Table 1 illustrates for which rounds we have these data. Reproductive intentions, i.e., the desired number of children, for individual i at survey round t is denoted by $x_{i,t}$. Realizations, i.e., the number of children born and alive by time t, are indicated by $f_{i,t}$. Recall of past fertility desires for time $t-j$ as collected at time t is denoted as $\hat{x}^R_{i,t-j|t}$.

In KLPS round 1, detailed questions regarding reproductive intentions were posed to a representative subset of 351 young women. These women were sampled from the subset of slightly older respondents at round 1, and thus are 1.5 years older on average than the full sample of females. 239 of them were interviewed for all three KLPS rounds; most of the analyses will rely on this subset of women, which we call "sample 1", since we have both detailed questions about reproductive intentions and expectations from round 1 and can thus compare recall in round 2 to their actual earlier intentions stated in round 1. "Sample 2" respondents were interviewed for both rounds 2 and 3, and comprise 4,194 women and men; this sample is used for some supplementary analyses.

Throughout the paper, reproductive desires are indicated by the answer to the following question (which was typically asked in Swahili): "Today, if you could choose exactly, how many children in total would you like yourself or your partner to give birth to (including those who have already been born)?"

There are several reasons why we think it sensible to interpret answers to this question as an upper bound on the number of desired children, drawing from responses to an ideal

Table 1: Survey Structure & Data Availability

		Round 1 (2003 - 2005)	Round 2 (2005 - 2007)	Round 3 (2011 - 2014)
Sample 1	Respondents	351	277	283
	Median Age	19	23	28
	Data Availability			
	Desires (x_t)	✓	✓	✓
	Recall ($\hat{x}^R_{t-1\|t}$)	-	✓	-
	Realizations (f_t)	✓	✓	✓
Sample 2	Respondents	5,209	5,081	5,255
	Median Age	18	22	26
	Data Availability			
	Desires (x_t)	-	✓	✓
	Recall ($\hat{x}^R_{t-1\|t}$)	-	✓	-
	Realizations (f_t)	✓	✓	✓

Notes: This table shows the timing of each KLPS survey round, the years in which the survey round was conducted, the number of respondents interviewed and their median age as well as data availability of key variables used in this paper. Respondents are from the Kenyan Life Panel Survey (KLPS), a longitudinal dataset including more than 5,000 individuals from Busia District, Kenya. Sample 1 consists of 351 women who were interviewed in great detail about reproductive desires in KLPS round 1 (see the text for more details). 277 and 283 of these women were re-surveyed in rounds 2 and 3, respectively, and 239 were interviewed during all survey rounds. Sample 2 consists of all individuals interviewed in KLPS rounds 1, 2 or 3 with women and men constituting equal shares of the sample. Expectations with respect to future fertility desires and behavior were only asked in Round 1, and recall was only a component in Round 2. Sample 1 is special, because we have data on reproductive desires from round 1 on, such that we can track changes for all survey rounds and compare recall of past desires from round 2 to actual desires in round 1. Throughout the paper, we use survey weights that adjust for the two-stage nature of KLPS tracking, for more details on the tracking strategy, see Baird et al. (2016) and Baird, Hamory and Miguel (2008).

life scenario. For one, when asked in round 1 whether they would rather choose to have one fewer child or one more child relative to their desired level of fertility, 74% of women say 'less". Furthermore, when confronted with hypothetical scenarios (explained in greater detail in section 3), most women do not expect their desired fertility to increase under positive scenarios (e.g., a positive household economic shock), but many do expect their desired fertility to fall under certain negative scenarios.

Almost all sample respondents would like to have between zero to six children; the majority of women want either 3 or 4 (see Figure A.1 for the full distribution), and on average women in rounds 2 and 3 desire 3.25 children. Men want slightly more children than women, at 3.5 on average, but start having children later: the share of women who have had a child (are married) increased from 26% (24%) in round 1 to 79% (72%) in round 3, while for men (who have nearly the exact same age distribution as women) it increases from only 6% (9%) up to 58% (56%).[8]

Desired fertility trends upwards over time, towards 4 children for men and 3.5 for women by the time they are in their late twenties. These desires are in line with data for the rest of Kenya, as presented in Askew, Maggwa and Obare (2017), where the "wanted" fertility rate in rural Kenya ranged from 3.9 in 2003 to 3.4 in 2014. The total fertility rate for all of Kenya was at 3.9 in 2014, with 3.1 in urban and 4.5 in rural areas. The "unwanted" fertility rate (using standard definitions) declined from 2.0 in 1993 to 0.9 in 2014.

Note that if we observe $f_{i,2} > x_{i,1}$ and $x_{i,2} \geq f_{i,2}$, we cannot be sure whether changes to preferences before round 2 was collected drove the higher fertility realizations by round 2, or whether this fertility itself led to some ex-post rationalization, as reflected in higher stated fertility preferences. This fundamental measurement issue (caused by infrequent survey data collection) complicates interpreting cases in which this pattern holds as being solely due to ex-post rationalization, an issue we return to below.

Importantly, for our confidence in the reliability of the data, fertility intentions are

[8]Table A.1 presents these summary statistics. Figure A.2 displays desired fertility and fertility realizations separately for women and men by age.

strongly correlated with subsequent behavior, confirming many previous findings in the demography literature.[9] Higher fertility intentions in round 1 are associated with more additional children born by round 3. Wanting one additional child is, on average, associated with having had roughly 0.3 more children between round 1 and 3. This pattern is similar both for those who already had a child at round 1 and for those who had not yet had a child (see Table 2). As expected, the coefficient estimates (on earlier fertility intentions) tend to rise over time as individuals have more time to attain their desired level of fertility.

Table 2: Reproductive desires and outcomes

	Dep. Var.: Number of Additional Children between Round 1 and ...					
	Round 2	Round 3	Round 2	Round 3	Round 2	Round 3
	All Women		**Pregnancies>0 (Rd 1)**		**Never Pregnant (Rd 1)**	
Desires	-0.002	0.188	0.097	0.290	0.159	0.330
	(0.057)	(0.052)	(0.083)	(0.084)	(0.076)	(0.105)
Mean	1.065	1.812	1.368	1.973	0.741	1.655
Std. Dev.	0.929	1.199	0.775	1.029	0.973	1.331
N	236	236	115	115	121	121
R-squared	0.000	0.040	0.020	0.101	0.034	0.078

Notes: "Desires" denotes the number of additional children desired, while "Number of Subsequent Children" denotes the number of children born after the first survey round. We report results from the following regressions: $f_{i,t} - f_{i,1} = \alpha + \beta(x_{i,1} - f_{i,1}) + \epsilon_i$ for $t = 2, 3$. The sample comprises all women in sample 1 who were interviewed for rounds 1, 2 and 3. Two out of 239 women gave non-numeric answers to the question on fertility desires, and one woman is missing information on fertility realizations for round 1. 115 of these 236 women had been pregnant at least once by round 1 ($Pregnancies > 0(Rd1)$), 121 had not (Never Pregnant (Rd 1)). Each column represents a separate regression. Regressions include no additional controls. Standard errors are clustered at the baseline school level and in parentheses. Tracking rate adjusted observation weights from the later survey round are used in each regression. Rows "Mean" and "Std. Dev." show these respective measures for the number of additional children between round 1 and later rounds.

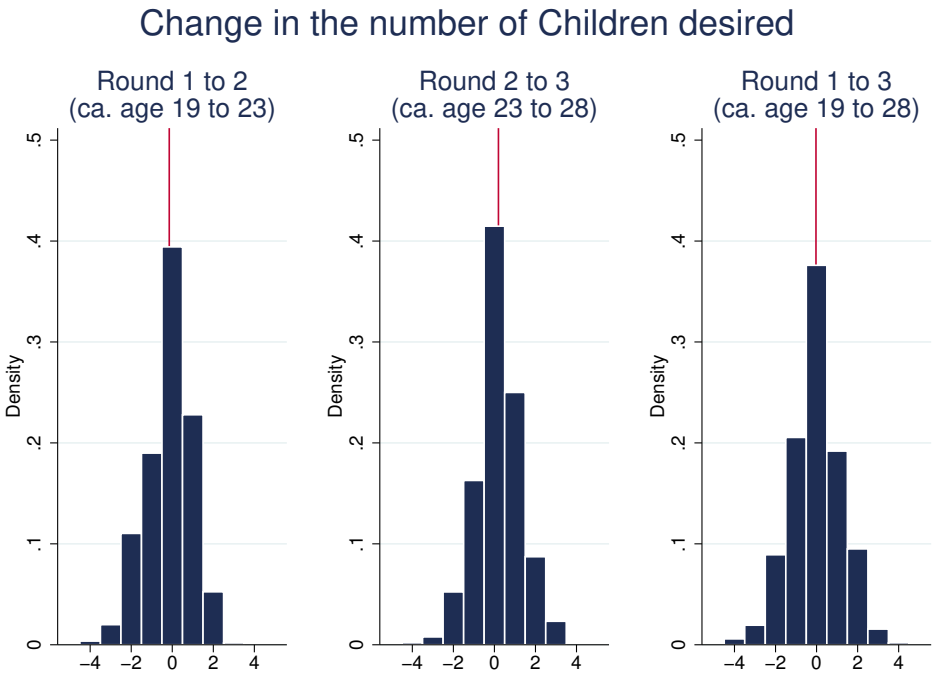
2 Changes in Desired Fertility over Time

Examination of both the average and the distribution of desired fertility suggests that desires are quite stable over time at a population level. However, this pattern obscures substantial variation over time in individual reproductive intentions, which are, in fact, not stable at all.

[9]See for example Günther and Harttgen (2016), Pritchett (1994), Campbell and Campbell (1997), Bankole and Westoff (1998), or Westoff and Ryder (1977).

Between each survey round, roughly 60% of women stated a different desired fertility level, with 20% of respondents changing by 2 or more children across rounds (see Figure 1). Moreover, individual men's desired fertility between rounds 2 and 3 is equally unstable (Figure A.3).

Figure 1: Distribution of changes in desired children between survey rounds



Notes: This figure plots the distribution of changes in fertility desires between survey rounds 1 and 2 ($x_2 - x_1$), survey rounds 2 and 3 ($x_3 - x_2$) and survey rounds 1 to 3 ($x_3 - x_1$) for the 239 women of sample 1 who were interviewed in all three survey rounds. Women who gave non-numerical answers to the desired fertility question in one of the two survey rounds used for each graph are dropped. Observations are weighted using weights from the later survey round. The vertical lines denote the average change in desires between rounds, with -0.146 between round 1 and 2, +0.196 between round 2 and 3, -0.029 between round 1 and 3.

These changes are not pure noise; they appear to carry meaningful signal. Not only do many women change their minds between adolescence and adulthood, the majority still continue to change their desired fertility into their 20's, whether or not they were initially married or had children. While the subset of women who had still not had children by round 3 were slightly more likely to have had stable desired fertility over time, a full 59% of them still changed stated desired fertility across survey rounds.[10] Yet compared to those women

[10]These results make use of the larger sample 2.

who had had a child by survey round 2, non-mothers were 14 percentage points less likely to have increased desired fertility. Most patterns are qualitatively similar for men, see Figure A.3.

"Power" within the household also appears to matter: women who (in round 3) said that they had at least a joint say (rather than less say) over whether to have another child with their partner were 8 percentage points less likely to have increased their desired fertility and 13 percentage points more likely to have lowered them. On average, more empowered women show a small average increase in desired fertility across survey rounds of just 0.04 children, while less empowered women have a larger increase, of 0.36 children.

Finally, we find that changes in desired fertility are statistically associated with many other factors, including individual migration to urban areas, educational attainment, the gender composition of one's children, and the use of contraceptives. For instance, those who in survey round 2 stated that they used any contraceptives were 11 percentage points less likely to show increased desired fertility over time, with an average change in desired fertility that was 0.26 children lower than the increase observed among those who stated that they did not use contraception.[11]

We take these strong statistical associations as evidence that changes in stated fertility desires carry meaningful signal in capturing individual preferences. Some of the changes we observe across survey rounds represent important departures from initial desires: 11.5% of women have more children by round 3 than their initially stated desires in round 1. Either these respondents later decided that they did in fact want more children and acted upon this change in preferences, or they had additional children unexpectedly. The empirical evidence on how women's power within the household, their use of contraceptives, and past experience having children affect the evolution of desired fertility over time suggests that a lack of control over some fertility outcomes, combined with some ex-post rationalization, is likely to be an element of the explanation.

[11] All of these results are available upon request.

Overall, our data indicate that experiencing meaningful changes in reproductive desires over time appears to be the norm rather than the exception among young Kenyans.[12] One potential explanation could be that reproductive intentions are weakly held by most individuals, and many people could be aware, say, that they are almost indifferent between having 3, 4 or 5 children. Yet this case seems unlikely in our data: in such a case, we might expect respondents to anticipate that their desired fertility could easily change over time and to have little confidence in the accuracy of their recall of previous fertility intentions. In the next section, we show that neither of these patterns holds empirically in our data, suggesting that people believe their fertility intentions to be quite strongly and stably held, despite the considerable variability over time that we document.

3 Expectations over Future Fertility

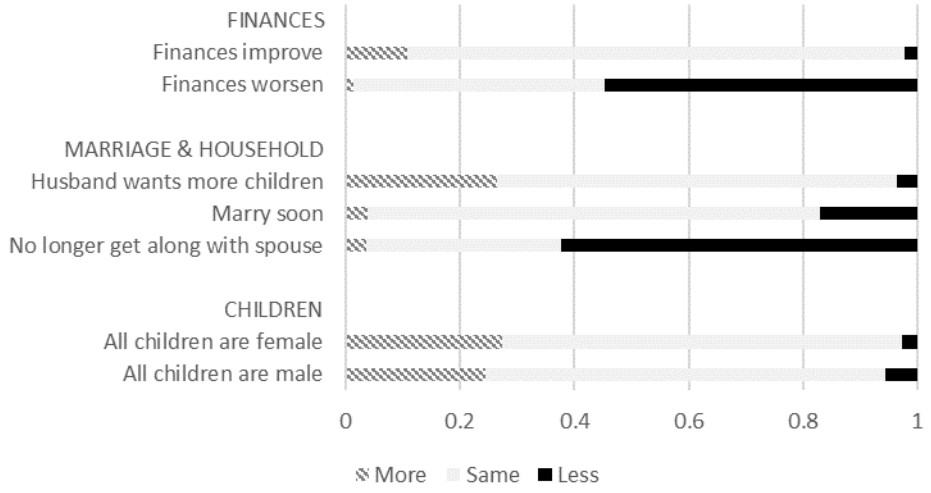
Many individuals in the sample appear to be open to lowering their desired fertility, as suggested by answers to a series of hypothetical scenarios. For instance, the KLPS survey asks: "In each situation, would you like to bear the same number of children, or a larger or smaller number?" For most scenarios, the vast majority of women said they would either want the same or fewer number of children.[13] As shown in Figure 2, the only scenarios in response to which at least 10% of women would like to have more children are: improving household finances; a situation in which all children are of the same gender; and if her husband wants more children. That said, only about 25% of respondents expect to increase desired fertility under the latter two scenarios, whereas 70% do not expect to change desired fertility at all. In comparison, in the case of worsening household finances, 55% of respondents state that they would want to have fewer children, and even higher shares of women state that they would reduce desired fertility if they no longer got along with their spouse, or if their pregnancies were difficult.

[12] Quesnel-Vallée and Morgan (2003) show that American women also change their intended fertility over time, but in contrast to young Kenyan women, they tend to lower it over time.

[13] All 19 scenarios are presented in Appendix Figure A.5.

The patterns documented in Figure 2 suggest that respondents expect to respond asymmetrically to positive and negative life scenarios: they state that they will largely not update their desired fertility under positive scenarios, but would lower it under negative scenarios, such as the negative household economic shocks that are all too common in Kenya. Together with the overwhelming majority of women stating that they prefer to have one fewer child rather than one more child, we view this pattern as suggestive evidence that the stated number of desired children is often an upper bound that corresponds to a rather ideal life scenario. Having more children than initially desired can thus potentially be seen as an indication that respondents' life outcomes turned out to be rosier than they had initially anticipated, or alternatively, that some of this additional fertility is due to respondents experiencing unexpected pregnancies.

Figure 2: Expectations for different scenarios: "In each situation, would you like to bear the same number of children, or a larger or smaller number?"



Notes: This figure portrays the share of women in sample 1 who answered "more", "same" or "less" for 7 selected hypothetical scenarios posed in the KLPS Round 1 data collection. Respondents answering "don't know" to a specific question are dropped. The maximum number of respondents answering "don't know" is 3 (for the scenario "Husband wants more children"). Data are available for sample 1. Those questions only applying to unmarried women were asked to 227 unmarried women. Observation weights are used. Results for all 19 scenarios posed in the survey are shown in Appendix Figure A.5.

Respondents' initial expectations that their desired fertility would be unchanging or even decreasing over time appear to be at odds with the fact that desired fertility does

change substantially across survey rounds for many respondents, and often in an upward direction: 30% of women increased their stated desired fertility between rounds 1 and 3. Respondents' expectations about how they would respond to particular scenarios also appear to understate how responsive their fertility would be: for instance, while 25% of women expect to increase their desired fertility in the case in which all children were the same gender (in the initial survey), 67% (50%) of women actually increased their stated desired fertility in a future survey round when they had had only daughters (sons), and had reached, but not yet surpassed, their previously reported desired number of children, $f_{i,3} = x_{i,2}$.[14] In contrast to what they initially said they would like to do, a large majority of the sample therefore does in fact want to have more children once they reach their previously stated desired fertility levels, particularly when all of their children are daughters. Expectations about changes in future desired fertility also seem to be systematically inaccurate for the case in which a woman's husband takes another wife: while respondents on average expect to have falling desired fertility in this case, women in our data who had no co-wife at round 2 but did have one by the round 3 survey were 10 percentage points more likely to have an increase in desired fertility.

While these inaccurate expectations are consistent with projection bias, we also asked women more directly whether they expected to have another child in the next 2 or 5 years. 27% (68%) expected to have another child in the next 2 (5) years, whereas 71% (29%) did not, and only 2% (3%) either said it depends or did not know. Among those who expected to have a child in the next 2 (5) years, 58% (76%) had at least one child. However, so did 28% (45%) of those who did not expect to have a child. While women who were mothers or married by round 1 were quite accurate when forecasting whether they would have another child — almost 90% of them end up having one — they are also particularly likely to be wrong if they had forecast that they would not have a child in the next 5 years: almost 70% of them end up having at least one additional child, and 35% have at least two, within the

[14]Even among women who had children of different genders, 39% increased their desired fertility. See Figure A.4 for a graphical illustration.

next 5 years. 16% (12.5%) of mothers (married women) make this forecasting error.[15]

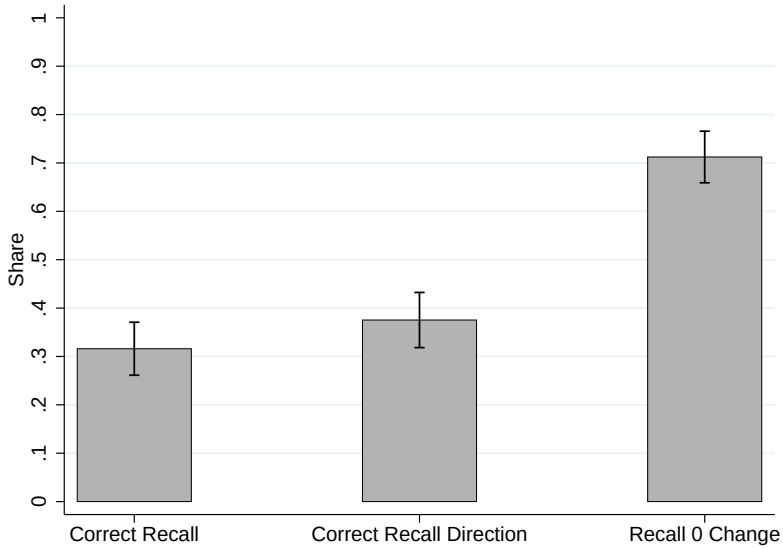
Taken together, the results presented in this section suggest that expectations about future fertility are far from perfect, both in terms of general forecasts of fertility over a given time horizon and under specific common life scenarios. Most women initially claim that they would prefer to have fewer children than their stated desired fertility, rather than more, but average fertility intentions are stagnant or even rise across survey rounds.

Of course, one of the many challenges individuals face when forming their expectations regarding future fertility is that they lack one key ingredient: the experience of having children. We next turn to retrospection in the later KLPS survey rounds regarding respondents' own earlier stated desired fertility. In principle, this lack of experience should not present an obstacle to accurate retrospection about one's own earlier intentions.

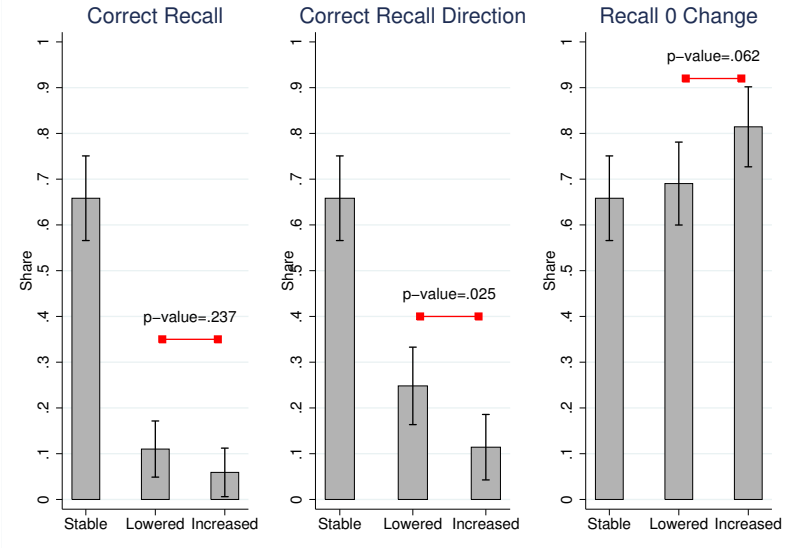
[15] Among the initially unmarried women or non-mothers who forecast they would not have a child in the next 5 years, 38% and 31%, respectively, end up having a child within 5 years.

Figure 3: Recall patterns

(a) Recall Performance Overall



(b) Recall Performance By Change in Desired Fertility



Notes: This graph plots the recall performance for all 277 women of sample 1 interviewed in both rounds 1 and 2, using round 2 observation weights. Recall measures are the following: Correct Recall ($\hat{x}^R_{1|2} = x_1$), Correct Recall Direction, i.e., correctly recalling into which direction one changed desires ($sgn(x_2 - \hat{x}^R_{1|2}) = sgn(x_2 - x_1)$) and Recall 0 Change, i.e., setting one's recalled equal to one's current desires ($\hat{x}^R_{1|2} = x_2$ or $\hat{x}^R_{1|2} - x_2 = 0$). Those recalling 0 change are correct if $x_2 = x_1$, but wrong when $x_2 \neq x_1$. Panel (b) reports recall performance by desire stability, for the women who had stable desires (N=101), those who lowered (N=100) and those who increased (N=76) desires between survey round 1 and 2. P-values provide results of a test of equality of proportions between those who increased vs. decreased desires. Not reported in the graph are p-values from testing equality of proportions between those with stable fertility desires and those whose fertility desires decreased (increased): p-values are 0.000 for all comparisons except for recalling 0 change with p-values of 0.628 (0.021) for comparing those with stable desires to those whose fertility desires decreased (increased). P-values from Fisher's exact test and bootstrapped [1,000 draws] tests for decreasing vs. increasing desires (using unweighted shares) are as follows: 0.122 and 0.071 for correct recall, 0.040 and 0.034 for recall direction and 0.061 and 0.052 for recalling 0 change.

4 Recall of Desired Fertility

Despite the fact that most individuals show large changes in desired fertility over time, few individuals appear able to recall these changes when asked in later survey rounds (see Figure 3). When discussing recall, we mean the answer to the following question asked in KLPS round 2: "If I had asked you the same question 3 years ago, how many children in total would you have said you would like you or your partner to give birth to (including those who had already been born)?" Not all respondents were interviewed exactly 3 years after their round 1 interview; patterns are largely the same for those who were interviewed 4 or 5 years after their round 1 interview, which we take as evidence that this imprecision in the question is not driving the results.[16]

We find that only about 30% of respondents correctly recalled their own past desired fertility, and fewer than 40% correctly recalled even the direction of the change in their desired fertility over time.[17] Among those whose desired fertility changed across survey rounds, just 9% were able to correctly recall their earlier stated desired fertility (and only 19% recall the change in sign). Instead, more than 70% of women state that they had wanted exactly the same number of children in the past as they currently desire, and nearly equal shares of men make the same claim (see Figure A.6).

Recall is thus strongly anchored at current fertility desires, and it is particularly so for those whose desired fertility increased over time. The right graph of Figure 3b shows that just 12% of those whose stated desired fertility increased across survey rounds are able to recall the direction of the change over time; a much higher proportion (25%) of respondents whose desired fertility fell over time were able to recall the direction of the change.

Taking all of this together, three empirical patterns stand out. First, recall of past fertility

[16] Only 50 out of 5077 respondents (0.98%) interviewed in round 2 chose the option "do not know", and none who are included in sample 1.

[17] This measure of a correct "recall direction" defines success as the respondent stating their past desired fertility was lower (higher/stable) than current desired fertility if they had increased (decreased/kept constant) desired fertility between rounds 1 and 2. Formally, it takes on a value of 1 if recalled desired fertility satisfies the following condition: $sgn(x_2 - \hat{x}^R_{1|2}) = sgn(x_2 - x_1)$.

intentions is poor overall, with most respondents failing to recall their past desired fertility. Second, this appears to be largely driven by recalled desired fertility being strongly anchored at current fertility intentions. Third, this anchoring is most pronounced — and recall errors therefore most common — for women whose desired fertility increased over time.

Why might recall performance be so poor? Given that most respondents apparently believe they did not change their desired fertility at all, current preferences may not only affect expectations of future preferences (as in projection bias), but also perceptions of past preferences. This "retrospection bias" implies that many people find it difficult to imagine that they ever wanted to have a different number of children in the past. Alternatively, the same pattern could be driven by a desire for cognitive consistency over time.

However, neither of these two explanations can easily account for the asymmetric recall performance we document above, in which those who have rising desired fertility over time appear to have particular difficulty recalling their earlier intentions.

Instead, this could be due to social image or self-image costs associated with a perceived lack of control over one's fertility, as well as a desire to avoid stating that some of one's children were (at least initially) "unwanted". Three additional patterns in recall behavior provide further suggestive evidence that active manipulation of memory is playing some role, too. First, the recall errors made by those whose desired fertility rises over time are not random; instead, those whose desired fertility rises over time are actually more likely than others to believe that their desired fertility has not changed at all. Second, this asymmetry in recall is particularly strong for those who initially had children or were married at the time of KLPS round 1, and are much weaker for others (Figure A.7). Third, the asymmetry is especially pronounced for those whose desired fertility changed by two children across survey rounds: those with large drops in desired fertility are much more likely to recall having lowered desired fertility over time, while those with large increases (of two children) in desired fertility are no more likely to state that their desired fertility rose than those whose desired fertility only increased by one child (see Figure A.8).

Regardless of the exact reasons for the poor recall of desired fertility, it has important implications both for the measurement of "excess fertility", as well as for learning about how fertility intentions map into outcomes.

The use of retrospective measures of reproductive desires — which is common in demographic research — in our data would likely result in massive underestimation of excess fertility. While 7.3% of young Kenyan women in our sample already had more children by KLPS round 2 than their stated desires in round 1, according to the earlier fertility desires they recalled (in round 2) this share would only be 2.4%. Had we relied only on the later survey round (as is typical in much other research), we would underestimate the prevalence of excess fertility among young Kenya women by over two-thirds, as shown in Figure A.9. Excess fertility would be even smaller, at just 1.3%, if judged against current desired fertility (x_2).

Further, systematically biased recall of desired fertility, in part driven by ex-post rationalization, could affect both individual and social learning about the mapping of fertility intentions into later outcomes. This could directly affect individuals' beliefs about how challenging it is to achieve goals that they set for themselves, possibly leading to greater optimism about future success and shaping later attitudes and behaviors. Moreover, beyond these individual impacts, inaccurate recall could contribute to maintaining high fertility norms in the Kenyan communities that we study, and complicate inter-generational learning about how best to use contraception and otherwise control fertility. Biased recall will make advice from older and more "experienced" adults (directed at younger adults) less valuable, might lead to rosy and unrealistic expectations about the process of having children, and transmit preferences about desired fertility that are higher than older individuals actually possessed at a younger age.

Of course, there could also be social gains from this type of biased recall. The most obvious beneficiaries are children whose parents have convinced themselves and others that they are in fact "wanted". Internalizing this belief may positively affect how parents interact

with their children, with a range of benefits for these children and their families.

5 Conclusion

"Life can only be understood backwards; but it must be lived forwards."

–Kierkegaard (1843)

We use an unusual multi-year panel data on reproductive desires and realizations among a population of Kenyan adults to document that preferences over a major life decision — having children — change frequently and substantially over time. Individuals' stated fertility preferences appear to depend strongly on circumstances such as intra-household bargaining, the gender composition of earlier children, and local social norms. The birth of unplanned or unexpected children, and later ex-post rationalization, also appear to play an important role in shaping recall of one's own earlier fertility intentions, with few parents stating that they had earlier wanted fewer children than they currently have.

We also provide evidence that many individuals struggle to think through and anticipate how their desired fertility will change in the future. This could lead to costly mistakes: not being able to predict how one's future behavior will be shaped by today's decisions could change the timing of marriage or fertility choices. While Kierkegaard's quote (above) is rather optimistic about human beings' ability to understanding life in hindsight, our panel data on fertility intentions and realizations among young Kenyan adults does not support his optimism: when reflecting on earlier fertility preferences, few respondents appear able (or willing) to acknowledge that their desires have changed at all. This illusion of stability in one's preferences may be important in shaping self-image and identity, local attitudes about the "ideal" number of children and fertility norms, as well as the type of advice that is transmitted to younger people about parenting, the process of having children, and even the need for government family planning programs.

While learning from more experienced individuals could, in principle, be highly benefi-

cial for infrequent high-stake decisions when there is limited scope for learning from own experience (such as having children), our data indicates that this advice may be distorted by systematically biased recall, ex post rationalization, and wishful thinking. Further research on these issues could be useful in the fertility domain and beyond, to generate better understanding of how — and why — people create narratives about their own life paths, draw lessons from them, and provide advice to others based on their own experience.

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A Appendix

Table A.1: Summary Statistics

	Women						**Men**		
	Sample 1			Full Sample			Full Sample		
Round	1	2	3	1	2	3	1	2	3
Age	19.30	23.46	28.11	17.62	21.47	25.91	17.94	21.92	26.20
# Desired Children	3.46	3.29	3.39	N.A.	3.25	3.27	N.A.	3.52	3.50
# Living Children	0.75	1.64	2.34	0.35	1.07	1.85	0.08	0.52	1.20
Parent	0.48	0.73	0.88	0.26	0.57	0.79	0.06	0.30	0.58
Married	0.43	0.67	0.80	0.24	0.50	0.72	0.09	0.28	0.56
Observations	239	239	239	2,343	2,506	2,575	2,866	2,575	2,680

Notes: Data for "sample 1" is only shown for those 239 women interviewed for all survey rounds. In all cases, information is based on those individuals for whom data is available. Presented here are weighted averages where observation weights are adjusted for the intense tracking rate in each round."Parent" is an indicator taking the value 1 if one has at least one living child. "Married" takes the value one if one is married at the moment of the interview for the respective round. Desired fertility at the time of round 1 was only gathered from sample 1, which is why there is missing information for all men and all remaining women of sample 2.

Table A.2: Desired Number of Children across 2 survey rounds

		Desired Number of Children at Round 1									
		0	1	2	3	4	5	6	7	8	Total
Desired Number of Children at Round 2	0	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.67
	1	0.00	0.53	0.25	1.15	0.78	0.00	0.33	0.00	0.00	3.05
	2	0.39	0.00	6.92	5.67	7.04	1.02	0.00	0.00	0.00	21.05
	3	0.00	0.00	8.18	12.86	10.72	1.31	0.18	0.37	0.22	33.83
	4	0.00	0.00	3.41	10.13	13.55	1.45	1.21	0.00	0.00	29.75
	5	0.00	0.00	0.18	1.08	1.66	5.45	0.00	0.00	0.00	8.37
	6	0.00	0.00	0.00	0.00	0.20	2.56	0.53	0.00	0.00	3.28
	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total	0.39	0.53	18.93	30.90	34.63	11.79	2.25	0.37	0.22	100

Sample Size	235
On-Diagonal	39.84
Off-Diagonal	60.16
Below Diagonal	27.78
Above Diagonal	32.38

		Desired Number of Children at Round 2									
		0	1	2	3	4	5	6	7	8	Total
Desired Number of Children at Round 3	0	0.00	0.00	0.35	0.27	0.19	0.40	0.00	0.00	0.00	1.21
	1	0.00	0.00	1.59	0.71	0.00	0.00	0.00	0.00	0.00	2.29
	2	0.00	1.84	10.74	5.39	2.46	0.00	0.00	0.00	0.00	20.43
	3	0.00	0.50	6.61	17.19	6.07	0.96	0.56	0.00	0.00	31.89
	4	0.00	0.92	4.13	10.22	10.56	2.52	0.42	0.00	0.00	28.76
	5	0.71	0.00	0.50	2.71	5.48	1.40	0.40	0.00	0.00	11.20
	6	0.00	0.00	0.00	0.60	1.46	1.04	0.92	0.00	0.00	4.03
	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.19
	Total	0.71	3.25	23.92	37.09	26.22	6.51	2.29	0.00	0.00	100

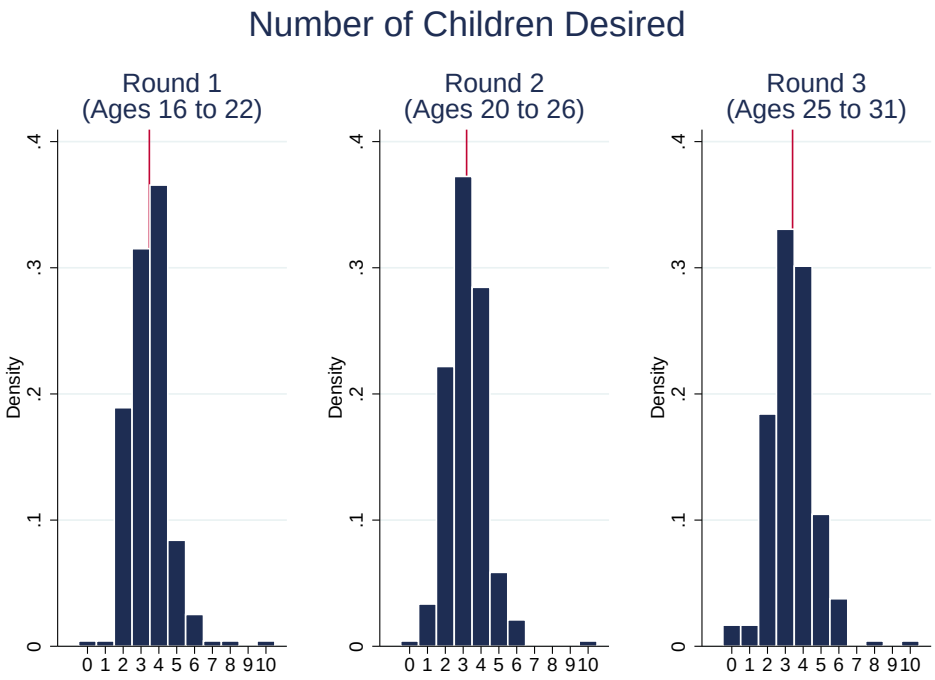
Sample Size	237
On-Diagonal	40.80
Off-Diagonal	59.20
Below Diagonal	36.91
Above Diagonal	22.29

		Desired Number of Children at Round 1									
		0	1	2	3	4	5	6	7	8	Total
Desired Number of Children at Round 3	0	0.00	0.00	0.27	0.36	0.19	0.40	0.00	0.00	0.00	1.21
	1	0.00	0.00	1.59	0.40	0.00	0.31	0.00	0.00	0.00	2.30
	2	0.42	0.56	5.92	5.95	6.19	0.79	0.36	0.00	0.00	20.19
	3	0.00	0.00	6.23	14.37	9.25	1.63	0.75	0.00	0.00	32.23
	4	0.00	0.00	5.25	6.92	13.91	2.57	0.19	0.00	0.00	28.84
	5	0.00	0.00	0.36	2.24	5.00	2.59	0.19	0.40	0.23	11.00
	6	0.00	0.00	0.00	1.23	1.51	0.92	0.38	0.00	0.00	4.04
	7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.19
	Total	0.42	0.56	19.62	31.46	36.22	9.22	1.86	0.40	0.23	100

Sample Size	236
On-Diagonal	37.16
Off-Diagonal	62.84
Below Diagonal	30.83
Above Diagonal	32.01

Notes: These tables show the share of respondents for each combination of desired children in rounds 1 and 2, 2 and 3 and 1 and 3 (as long as the number of desired children is 8 or lower in both survey rounds). Observations are weighted by weights in the later survey round.

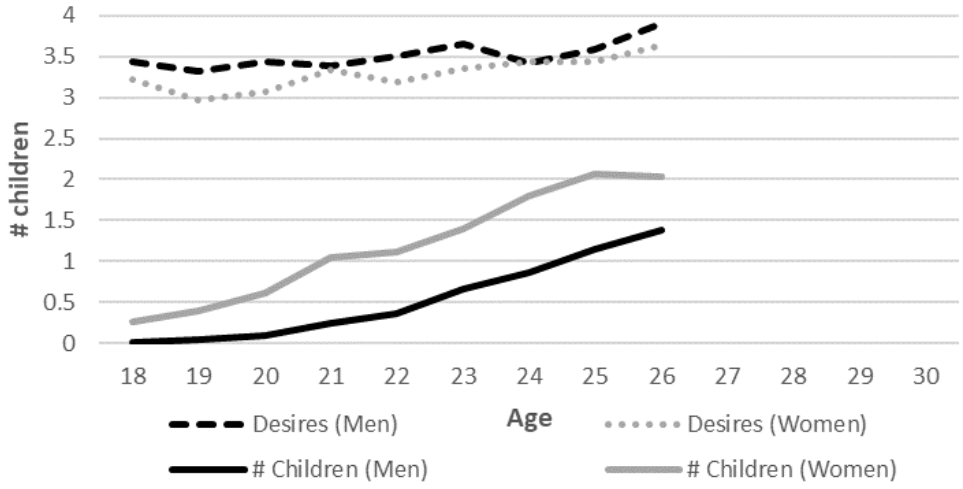
Figure A.1: Distribution of Number of Children desired across survey rounds



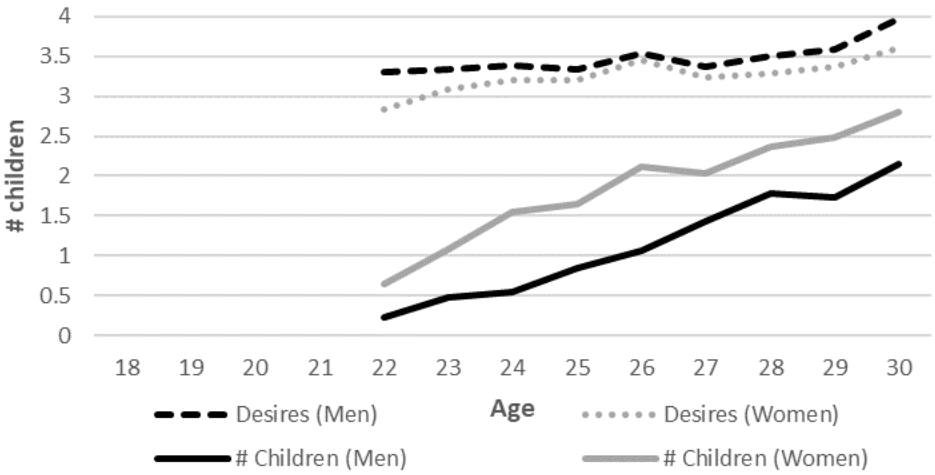
Notes: This figure shows the distribution of desired fertility for the 239 women of sample 1 who were interviewed for all three survey rounds. Observations are weighted by the respective survey round weights. Respondents who answered "don't know" are excluded. Those who answered "as many as possible" are re-coded as wanting 10 children. Vertical lines show the average desires of 3.46 in round 1, 3.29 in round 2 and 3.39 in round 3.

Figure A.2: Evolution of desired fertility and fertility realizations across ages

(a) Round 2 Data



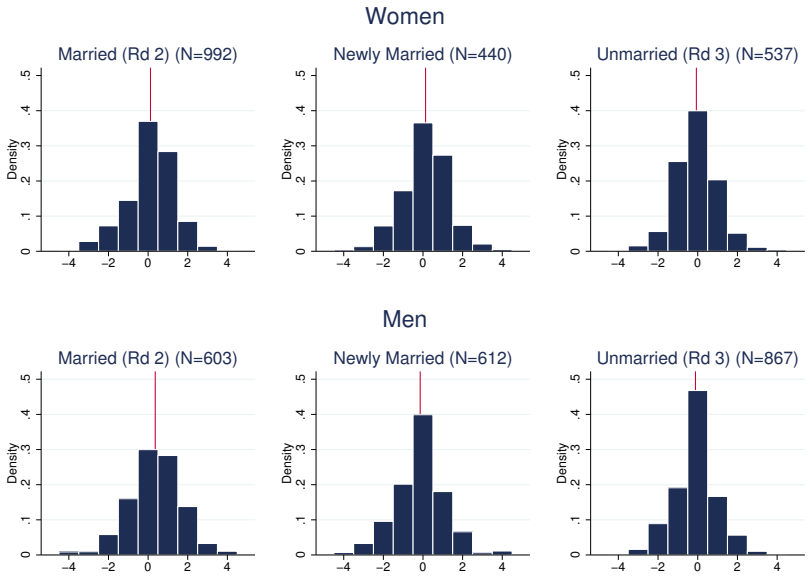
(b) Round 3 Data



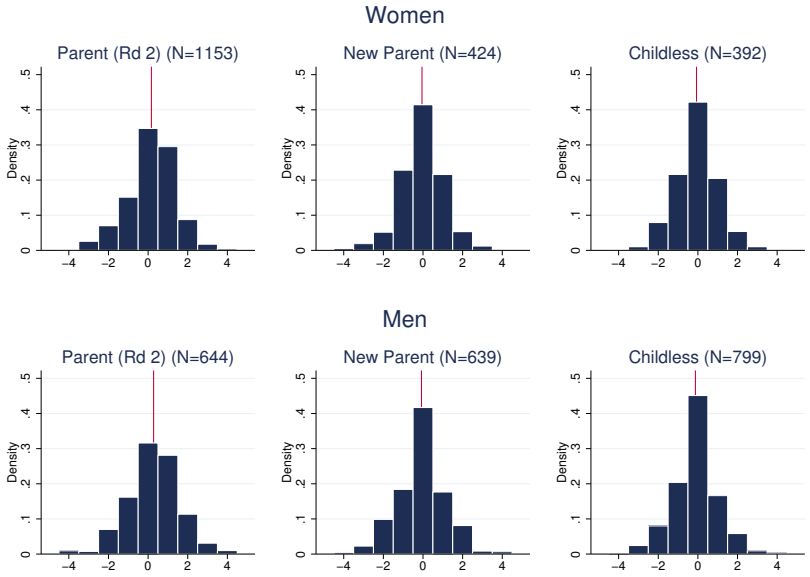
Notes: The figure plots average desired fertility and fertility realizations by age for sample 2 and separate by gender, using both rounds 2 and 3. Both panels display weighted averages of desired children and number of living children conditional on age, where the weights are adjusted for the intensive tracking rate. Only ages for which there are at least 100 observations for each gender are included, resulting in ages 18 to 26 for round 2 and 22 to 30 for round 3. Individuals answering "don't know" or "as many as possible" are excluded.

Figure A.3: Changes in Desired Fertility by Marital Status and Parenthood

(a) Changes in Desires Round 2 to 3 by Marital Status

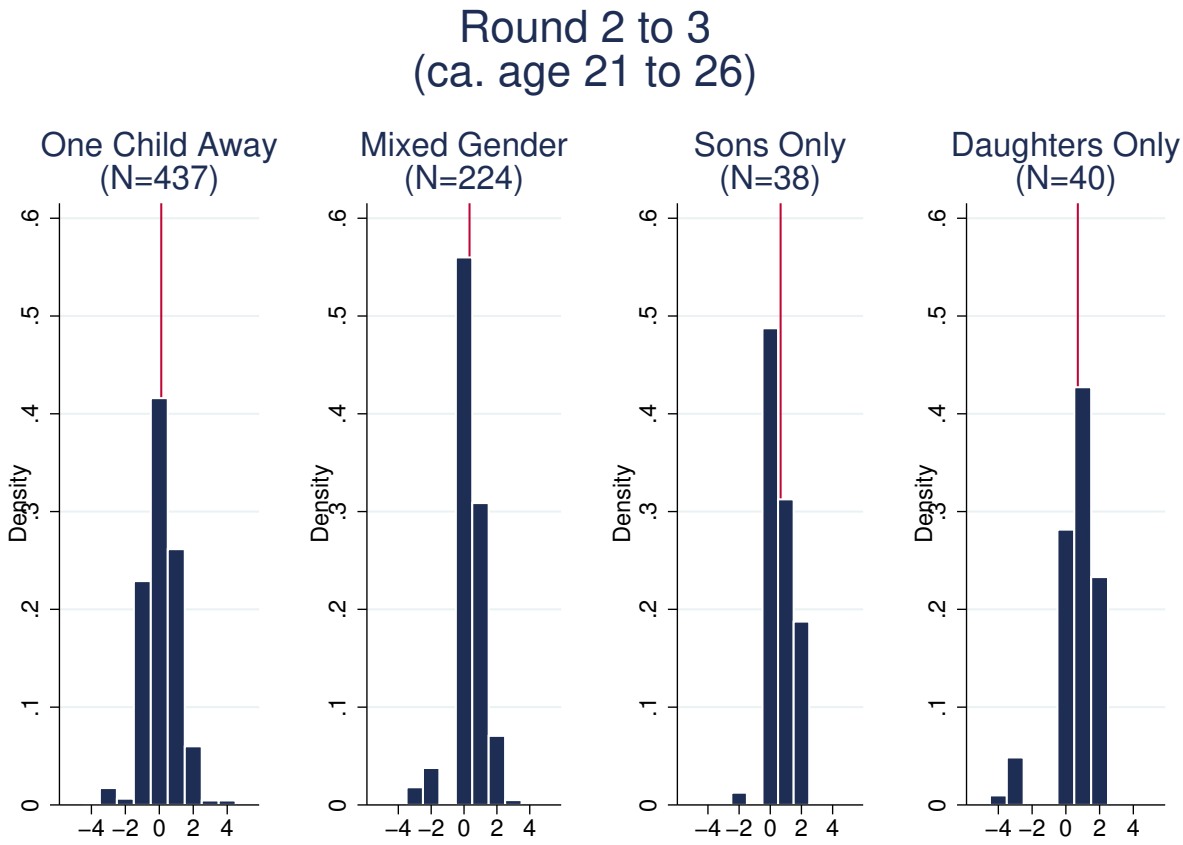


(b) Changes in Desires Round 2 to 3 by Parenthood



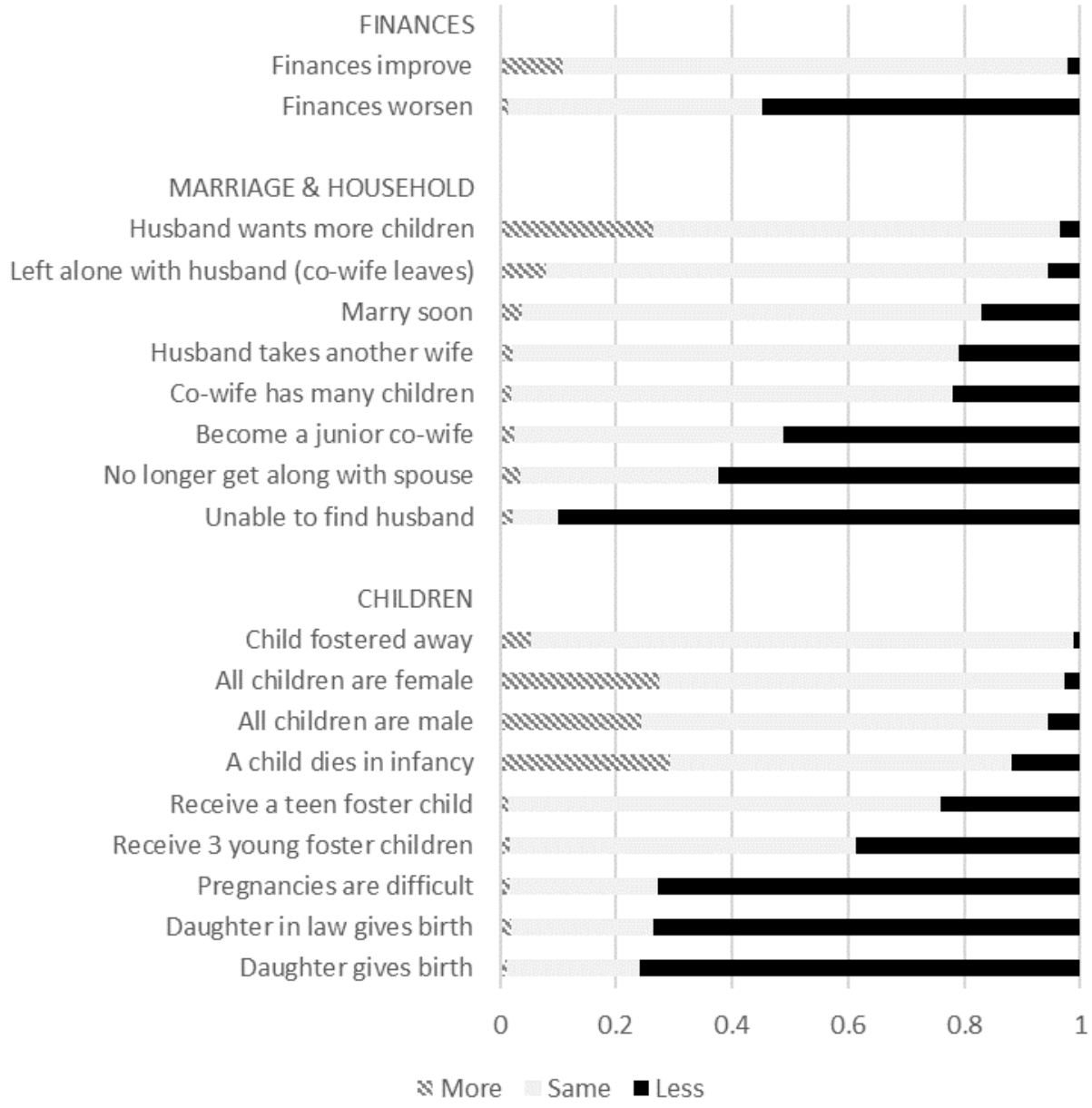
Notes: This figure plots changes in desires $(x_3 - x_2)$, for both women and men, separately by marital status and parenthood. From left to right, it distinguishes those who had been married (parents) by round 2, those who married or became parents between round 2 and 3 and those who were unmarried or childless by round 3. Observations are weighted using round 3 weights. Among "Unmarried (Rd. 3)", 26.83% increased desires, compared to 37.14% among "Newly Married" (p-value of 0.001). Average change in desires is -0.08 vs. +0.13 (p-value of 0.005). Comparisons of "Unmarried (Rd 3)" vs. "Married (Rd 2)" are similar. There are no significant differences between "Married (Rd 2)" and "Newly Married". For men, the patterns are similar. For panel b), the difference is between mothers at round 2 and the two other groups, recent mothers are significantly less likely (28.09%) to have increased desires than more experienced mothers ("Round 2") with 40.58% (p-value of 0.001). The average change in desires is -0.05 vs. +0.17 (significant at 1% level). The same qualititative patterns apply to men.

Figure A.4: Changes in Desired Fertility: Gender Realizations (Mothers who achieved their round 2 desired fertility, but do not yet have more children than they earlier desired)



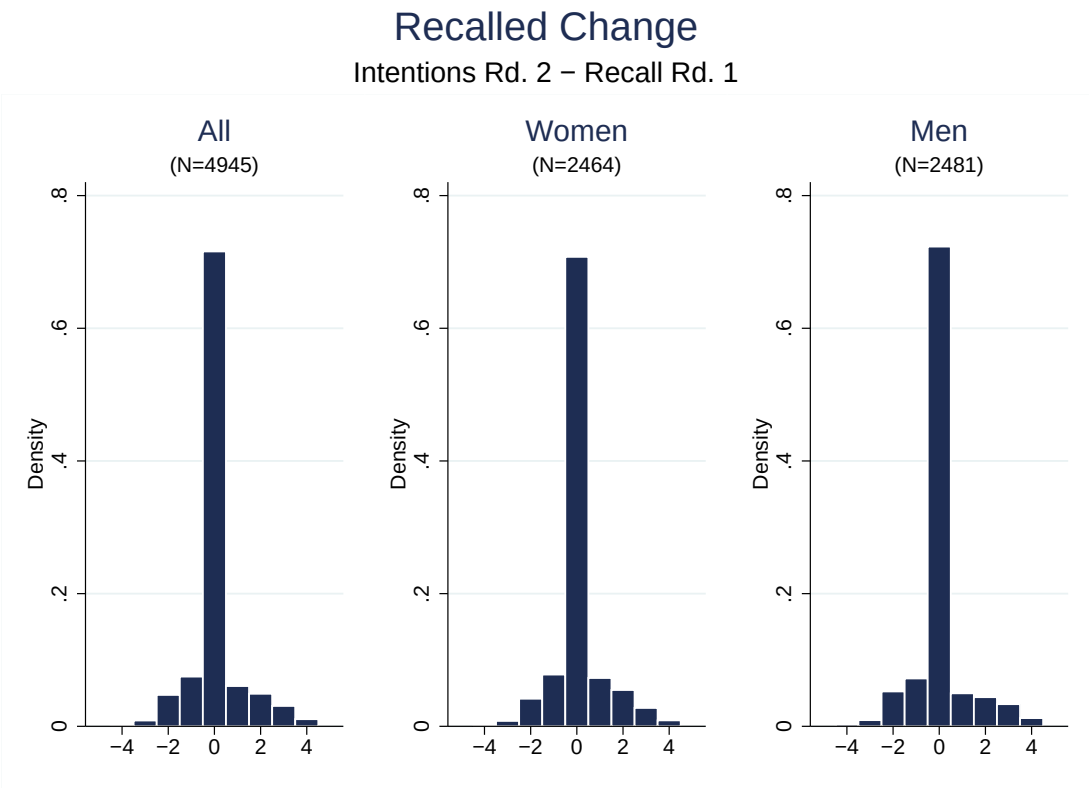
Notes: This graph depicts the change in desires ($x_3 - x_2$) for women who have not exceeded the number of children they desired in round 2 yet, who have at least two children and who did not experienced a dead birth or the death of a child between the survey rounds 2 and 3. Observations are weighted by round 3 weights. The left panel shows changes for the 437 women who by survey round 3 are one child away from their desired fertility ($f_3 = x_2 - 1$), call this "group 1". The 3 panels to the right of this graph show changes for women who have reached their round 2 desired fertility by round 3 ($f_3 = x_2$), separately for those whose desired children were of both genders (N=224, "group 2"), only boys (N=38, "group 3") or only girls (N=40, "group 4"). Average changes in desires [and shares increasing desires] (from left to right) were 0.12 [33%], 0.34 [39%], 0.64 [50%] and 0.72 [67%]. Following differences are statistically significant: the share increasing for groups 1 and 2 against group 4 (at the 1% level); the average change for group 1 vs. all other groups (1% level), group 2 vs. 3 (10% level) and group 4 (5% level).

Figure A.5: Expectations for different scenarios: "In each situation, would you like to bear the same number of children, or a larger or smaller number?"



Notes: This figure portrays the share of women in sample 1 who answered "more", "same" or "less" for all 19 selected hypothetical scenarios. Respondents answering "don't know" to a specific question are dropped. The maximum number of respondents answering "don't know" is 9 (for the scenario "Unable to find husband"). For all other scenarios, at most 3 women said they do not know. Answers are available only for women of sample 1 such that 351 women were asked these questions. Those questions only applying to unmarried women were asked to 227 unmarried women. Observation weights from round 1 are used.

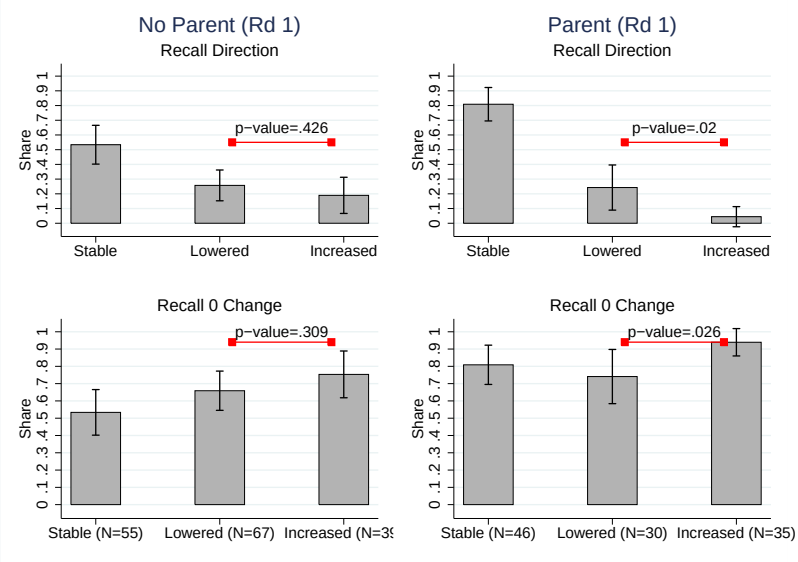
Figure A.6: Recalled Change for Women and Men



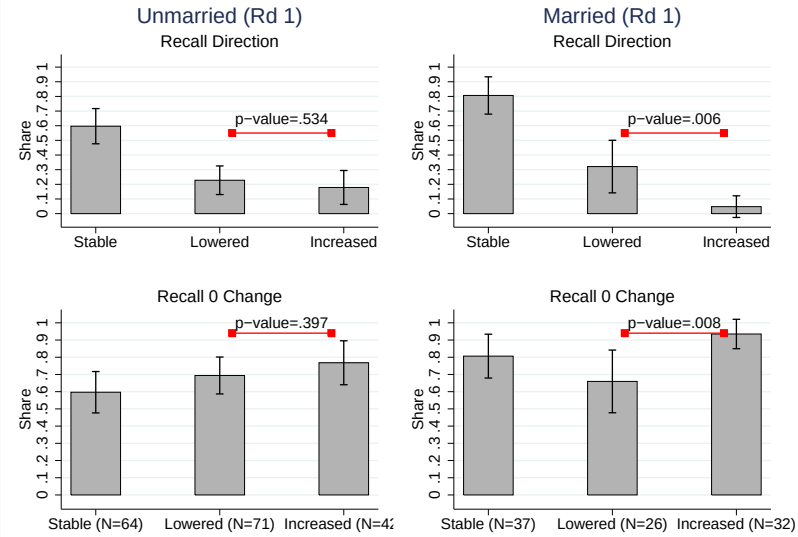
Notes: This graph plots the distribution of change individuals recall (i.e. $x_2 - \hat{x}^R_{1|2}$) for all respondents who answered the recall question in round 2, as well as broken down for women and men separately. As noted above the individual panels, 4,945 individuals answered these questions, 2,464 women and 2,481 men. Since we do not require data on desired fertility in round 1, the sample we can use in this case is much bigger. Observations are weighted by round 2 weights.

Figure A.7: Recall Performance By Parenthood and Marital Status at Round 1

(a) Recall Performance By Parenthood at Round 1

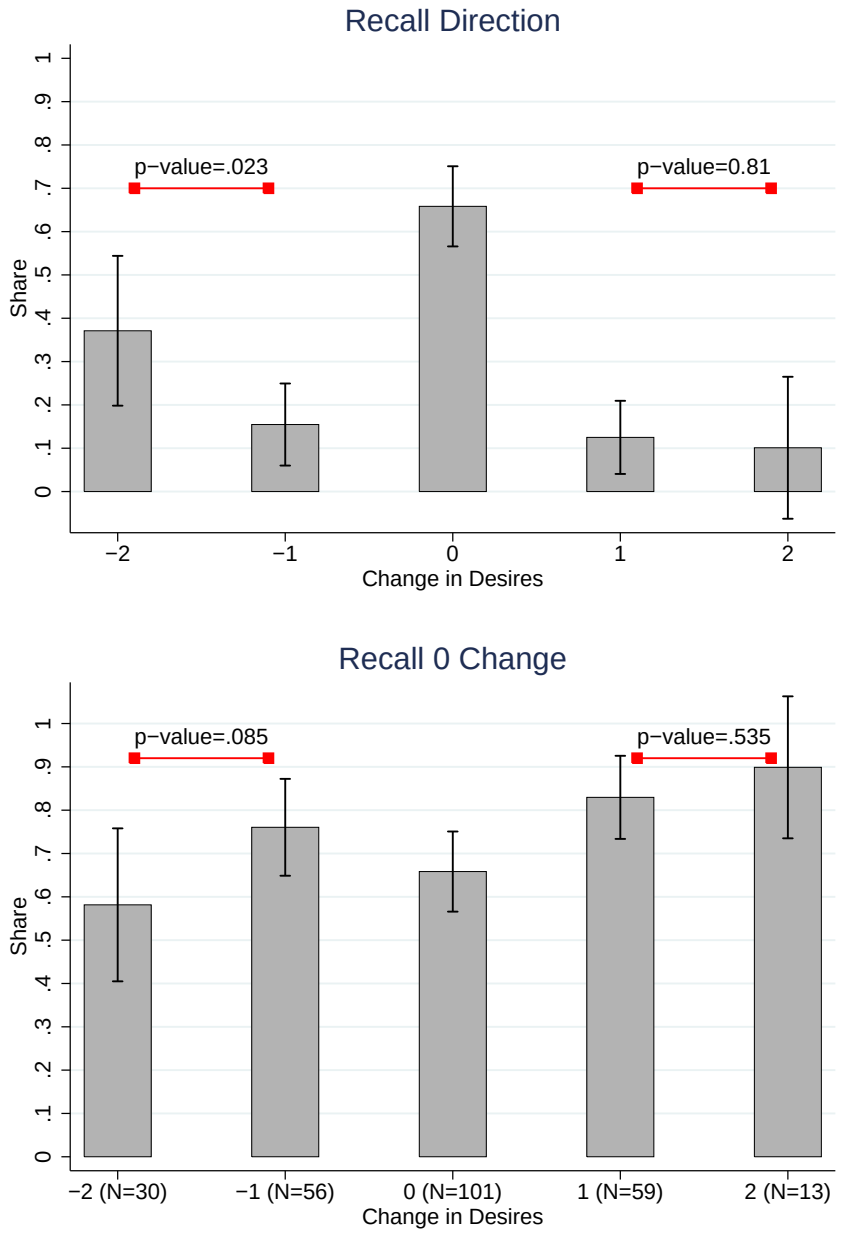


(b) Recall Performance By Marital Status at Round 1



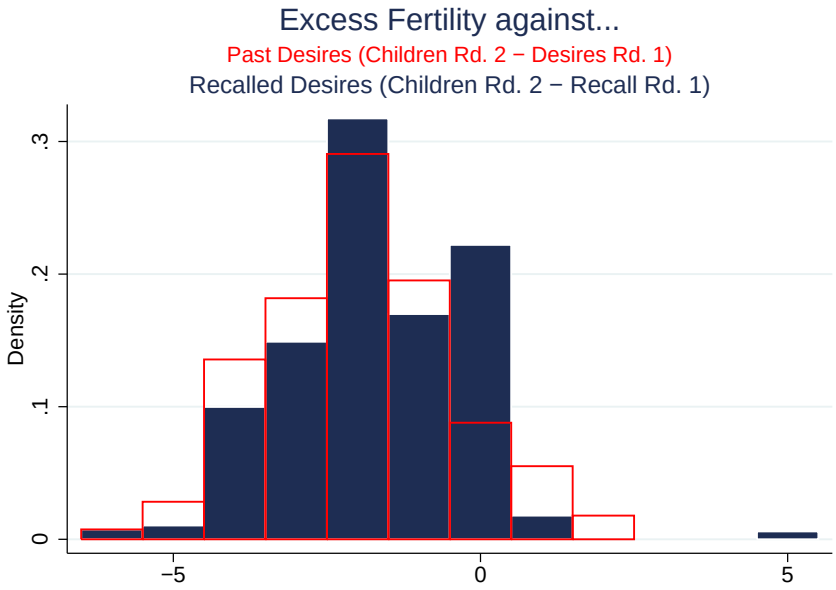
Notes: For all 277 women of sample 1 in both round 1 and 2, these graphs plot the shares for correctly recalling the direction of change and recalling zero change, separately by whether they were mothers (panel a)) or married (panel b)) by round 1 or not. Observation weights from round 2 are used. Fisher's exact test and bootstrapped versions (1,000 repetitions) for comparing those who increased vs. lowered desires (using unweighted observations) yield the following p-values: for "Recall Direction" 0.489 and 0.344 (for those without a child), 0.069 and 0.040 (for mothers). For recalling zero change: 0.399 and 0.325 (for those without a child), 0.094 and 0.053 (for mothers). For panel b): for "Recall Direction" 0.495 and 0.436 (for those not married), 0.032 and 0.017 (for those married). For recalling zero change: 0.528 and 0.376 (not married), 0.025 and 0.021 (married). There is no significant difference for either recall measure for those who lowered desires depending on whether they were married or not, or mothers or not at round 1. P-values for comparisons for those who increased desires are the following: by marital status (0.111 for recall direction, 0.067 for recalling zero change) and by motherhood (0.063 for recall direction, 0.031 for recalling zero change). Repeating the same for those with stable desires, the p-values are 0.004 in panel a) and 0.030 for panel b).

Figure A.8: Recall Performance conditional on the Magnitude of Changes in Desired Fertility



Notes: This table plots recall performance and behavior depending on how much women changed their desires between survey round 1 and 2 (i.e. $x_2 - x_1$), for all women who changed their desires by at most 2 children. This applies to 259 out of the 277 women who participated in the fertility modules for both, round 1 and 2. Observation weights from round 2 are used. The reported p-values are from testing for equivalence of proportions between those who lowered (increased) desires by two vs. one child. When using unweighted observations, p-values from Fisher's exact and bootstrapped tests (1,000 repetitions) are the following: for recall direction .037 and .028 (for those who lowered) and 1.0 and .870 (for those who increased). For recalling zero change: .093 and .057 (for those who lowered), 1.0 and .671 (for those who increased). Comparing proportions of those who lowered vs. those who increased desires, conditional on having changed by 2 children (1 child), yields following p-values: 0.073 (0.646) for recall direction, 0.041 (0.358) for recalling zero change.

Figure A.9: Measured and Perceived Excess Fertility by Round 2



Notes: This figure plots the distribution of excess fertility by round 2 as judged against true desires in round 1 (i.e. $f_2 - x_1$) [unfilled bars] as well as excess fertility as judged against recalled desires (i.e. $f_2 - \hat{x}^R_{1|2}$) [filled bars]. 273 women who participated in the fertility modules in round 1 and 2 and gave numeric answers in all rounds are included. The share of those with excess fertility is 7.30% as judged against true past desires and 2.38% as judged against recalled desires. It is 1.34% if judged against current desires (x_2). Intensive tracking adjusted respondent weights from round 2 are used.