

Parents' Knowledge And Predictions About The Age Of Menarche: Experimental Evidence From Honduras

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Abstract

Access to accurate, timely and age-appropriate information about menarche is an essential part of menstrual health. Reliable evidence shows that girls primarily obtain information from their mothers and/or other female family members, therefore, it is important to determine parents' knowledge and their predictions about other parents' knowledge of the age of menarche. To this end, we performed a pre-registered study with data collected from 360 households in Santa Rosa de Copán, Honduras. We implemented a novel procedure to avoid social desirability bias whereby participants answered two separated questions: *i*) their knowledge about the age of menarche (self-report) and *ii*) to predict or guess the modal response of the other participants regarding the same question (modal guess). Participants were paid according to accuracy. Both questions appeared randomly in the survey. Results show that parents' knowledge is high in the study area. Recent studies indicate the age of menarche at 12 years old and 56.11% of the sample gave the same response while 62.78% hit the modal value. We estimated the impact of different sociodemographic variables and found only marginal differences. Interestingly, people with formal education and women tend to respond with lower predictions.

Introduction

Until relatively recently, the topic of menstruation has been overlooked both in international conventions on human rights (Boosley and Wilson, 2013) and in body politics in development. The first attempts to address the issue in an international context originated primarily within the Water, Sanitation, and Hygiene sector in Africa and Asia, and have largely focused on Menstrual Hygiene Management (MHM)^[1] (UNICEF, 2013).

MHM programs have mainly been implemented in schools and are based on the general assumption that poor girls in developing countries share the same situation: *lack of information* about the menstrual cycle, shame and discomfort during menstruation due to cultural myths and taboos, limited choices about affordable products, insufficient access to private and safe facilities to manage bleeding and menstrual products, and high school dropout rates due to difficulties relating to mensuration (FSG, 2016; Kirk and Sommer, 2006; Mythri Speaks, 2016; Sclar et al., 2018; Sommer, 2010; Sumpter and Torondel, 2013; Winkler and Roaf, 2015). However, evidence to support the efficacy of MHM programs is far from conclusive (Accerenzi, 2018; Bobel, 2019; Hennegan, 2020).

A common limitation of such programs is that they often fail to include parents in their activities. However, it is important to acknowledge that parents are hugely influenced by social norms and are responsible for making the decisions on this matter at the household level. Hence, both parents' knowledge and their social norms play a critical role in the information that adolescents receive and how they behave.

As a consequence, in this paper we focus on *parents' knowledge and predictions about the age of menarche*. We explore whether parents have accurate knowledge about the age of menarche and whether they are able to predict or guess the distribution of the modal value of other parents' responses, in other words, the social norm (Nagel, 1995; Krupka et al., 2013). To overcome possible social desirability bias^[2] in the study (Krumpal, 2013; Latkin, 2017; Stuart and Grimes, 2009), we paid participants based on the accuracy of their answers (50 Honduran Lempiras if they hit the right answer).

There are two important aspects to consider in this study. First, access to accurate, timely, and age-appropriate information about menstruation is an essential part of menstrual health (Hennegan et al., 2021). Evidence shows that girls primarily obtain information from their mothers and/or other female family members (Chandra-Mouli and Patel, 2017; Lesch and Kruger, 2005; Uskul, 2004; Zakaria et al., 2019). Hence, determining whether parents are adequately

informed is of paramount importance, given that if they are misinformed they might not only provide girls with incorrect information, but they might also provide it too late, which leaves girls unprepared to face their first cycle (Uskul, 2004).

Second, most societies have established social norms about how menstruators and others are expected to behave in a given social situation (Gavrillats and Richerson, 2017; Lapinski and Rimal, 2005). General societal misinformation about the age of menarche could indicate that what parents consider “normal” is incorrect, which could lead them to making bad decisions regarding their daughters’ health.

To determine to what extent the general assumptions regarding parents’ knowledge about menstruation are accurate in West Honduras, we conducted a pre-registered field experiment in Santa Rosa de Copán (a region where no MHM or similar programs have ever been implemented)

To this end, we explored two research questions: a) do parents have accurate knowledge about the age of menarche? and b) can they accurately predict or guess whether other parents also have accurate knowledge about the age of menarche? The rest of the paper is organized as follows. The next section presents the methods and procedures. Section III describes the sample. Section IV focuses on the results and Section V presents the conclusions.

¹To understand the magnitude of this phenomenon, see Menstrual Hygiene Day <http://menstrualhygieneday.org>, Menstrual Health Hub <https://mhhub.org/>, and Society for Menstrual Cycle Research <http://menstruationresearch.org/>.

²While self-reported answers might be truthful or not, incentive compatible mechanisms (paid predictions) are strategy proof. In other words, a subject fares best by being truthful. For example, a country is having elections and there are two political parties: A and B. If a follower of party B is asked who will win, they will say B due to their own preferences/wishes, regardless of the true distribution of votes. In turn, a follower of party A would say A. However, if they are asked to “predict” the results and paid based on their accuracy then their best strategy would be to tell the truth, regardless of their own preferences.

I. Methods And Procedures

We ran a lab-in-the-field experiment in Santa Rosa de Copán (Honduras) from May 1-14, 2019, and randomly selected 360 households from four different districts (Osorio, El Carmen, Prado Alto, and Santa Teresa) to interview.

Participants were asked two separated questions: *i*) their knowledge about the age of menarche (self-report *SR*), and *ii*) to predict the modal response of the other participants regarding the same question (modal guess *MG*)[1]. Appendix A shows the original instructions (in Spanish) and B the translation in English. It is important to highlight that *SR* and *MG* are not necessarily correlated. While *SR* captures an individual’s knowledge about the age of menarche, *MG* measures society’s knowledge about the same subject.

Our design considers both incentives and possible order effects. We used a monetary incentive in the *MG* task (a monetary award was given if the mode was hit and 0 otherwise) to reduce social desirability bias. Given that the order of the questions may also contribute to bias (see Brañas-Garza et al., 2021), we randomized the question order using $p=0.5$ to *SR* à *MG* and $1-p$ to *MG* à *SR*. As a result, half of the participants ($n=186$) answered *SR* à *MG*, and the other half ($n=174$) *MG* à *SR* (see Appendix A and B).

We also collected participant sociodemographic characteristics to assess possible biases, primarily: sex, education, ethnic group, and socioeconomic status, as well as the composition of the household in terms of girls and boys.

The field experiment was conducted by a Honduran organization, PILARH. Enumerators were trained on the objectives of the study, how to conduct the survey, confidentiality, and informed consent. The method was pre-tested in the field

with 24 participants and reviewed before implementation.

Enumerators used paper-based questionnaires and received a list of households they had to visit, including the type of questionnaire (treatment) they had to implement. Face-to-face interviews were conducted in households and only one experimental subject was interviewed per household (father, mother, or guardian). The random allocation of participants into (order) treatments was made prior to the visit, therefore the enumerators had no influence on the selection.

The field study was pre-registered in AsPredicted before execution. The documentation can be consulted here: <https://aspredicted.org/ps766.pdf>.

³The ex-ante answer might be any positive (integer) number, although we expected numbers between 8 and 16.

ii. Sample And Outcome Variables

To ensure the sample selection included households from different socioeconomic groups, we considered 11 schools with populations reflecting different socioeconomic levels. The respondents from the socioeconomic groups were divided as follows: 31% were from low-income, 34% from middle income, and 35% from high income households.

Of the total 360 participants, 50 were men and 310 women. The age of respondents varied from 22 to 78 with the following frequencies: 22-25 (15%), 26-30 (28%), 31-35 (21%), 36-40 (16%), 41-45 (9%), 46-50 (4%), and over 50 (7%). Most respondents over 50 were grandparents.

The respondents cover the entire spectrum of level of education, although most are concentrated in the lower levels: 49% primary education (6 years of schooling) or less, while only 3% held a university degree or higher (see Appendix C).

As regards ethnicity: 11% were Chorti, 7% Lenca, almost 8% Maya Chorti, 70% Mestizo, and 4% were from other groups.

In order to assess poverty levels, respondents were asked about access to food in the week previous to the survey: 23% responded that they did not have enough money to feed their children.

Household composition was also determined to assess whether parents with at least one daughter were more informed than those with only sons: 35% of responders had only male children, whilst 65% had at least one female child, but only 21% had at least one daughter who was at least 12 or older (*experience*).

The main objective of this study was to determine whether parents had knowledge of the age of menarche and what they believe regarding other parents' knowledge. The age of menarche varies across countries and time, yet is considered healthy when it happens starts between the ages of 9 and 16. In Honduras, a recent study found that 93.3% of respondents had their first menstruation at 12 (Vides Torres et al., 2017)[1].

As can be seen below, our sample average is 12.13 with a mode exactly equal to 12. Using the data on the mean age of menarche in Honduras and the modal value of 12 from the sample, we defined the following outcome variables:

- *Self-report*: *SRHit* (takes the value of 1 if respondents answer 12 and 0 otherwise), *SRUnder* (=1 if reported age is lower than 12 and 0 otherwise) and *SROver* (=1 if reported age is higher than 12 and 0 otherwise).
- *Modal guess*: *MGHit* (takes the value of 1 if respondents guess 12 and 0 otherwise), *MGUnder* (=1 if respondents guess lower than 12 and 0 otherwise) and *MGOver* (=1 if respondents guess higher than 12 and 0 otherwise).

Therefore, the first set of items – *SRHit*, *SRUnder*, and *SROver* – determine whether parents have accurate knowledge while the second set – *MGHit*, *MGUnder*, and *MGOver* – explores whether they think other parents are also well

informed.

⁴Although the study was conducted in the municipality of Cholulteca, we consider it to be a good proxy for the situation of Santa Rosa de Copán as a whole.

iii. Results

Figure 1 shows the distribution of self-report answers, which highlights that the majority of the sample (56.11%) reported the exact value of the age of menarche, in other words, $SRHit=1$. Those who over/under reported are fairly distributed across the range, in fact, $SROver=25.28\%$ and $SRUnder=18.61\%$.

Table 1 provides the regression results for the outcome variables. The *order* dummy controls for the order of the questions. The variable *minority group* is equal to 1 if the respondent belongs to an ethnic minority group (Lenca, Chorti, Maya Chorti) and 0 if they are mestizo.

Column 1 shows that *age* and belonging to a *minority group* reduce the probability of providing the right answer, however this effect is only marginally significant ($p=0.09$ and $p=0.06$)[1]. Interestingly, the interaction between *female* and *minority* shows positive but marginal effects ($p=0.07$). Column 2 shows that respondents with higher *education* are less likely to overpredict ($p=0.001$), but more likely to underpredict the age of menarche (Column 3, $p=0.036$)[2]. In turn, *female* shows a significant and positive coefficient in $SRUnder$, suggesting that women tend to underpredict the age of menarche[3]. The other variables (*sufficient income*, *experience*, *minority*, and *task order*) have no effect on any of the three outcomes.

Result 1: Most of the sample had accurate knowledge about the age of menarche

We now focus on the results of the respondents' predictions or guesses about other respondents' knowledge as regards the age of menarche. As well as self-report responses, Figure 1 also shows the distribution of guesses. A significant percentage of the sample, 62.78%, hit the modal value. As in the case of self-reported data, those who over or underpredict are fairly distributed along the range.

In Column 4, Table 1, we estimated the probability of hitting the modal age answered by others. Respondents with *experience* have a lower probability of hitting the modal age ($p=0.01$) and are more likely to underpredict the mode ($p=0.04$). The rest of the variables are not significant. Column 5 shows that *education* and *task order* reduce the probability of overpredicting the modal age ($p=0.03$, $p=0.08$)[1], respectively). The other control variables have no significant effects.

Result 2: Most of the sample accurately guessed the modal value of the age of menarche.

Finally, we combined both self-report and guesses for each participant to ascertain an overall measure of their level of information[2]. Participants were labelled *informed* when $SRHit=MGHit=1$ and *misinformed* when $SRHit=MGHit=0$. We found that 45.56% of the sample belong to the former category while 26.67% fall into the latter.

Columns 7 and 8 show that parents with *experience* are less likely to be informed while parents with higher *education* have a positive and marginal effect on the probability of being misinformed. Interestingly, the other variables have no impact on the level of information.

Result 3: A large percentage of the sample had accurate knowledge about the age of menarche and accurately guessed the level of knowledge of the other respondents.

Overall, Results 1-3 show that the parents in our sample were well informed: not only do they have accurate knowledge about the age of menarche but they also accurately guessed the level of knowledge of the other participants.

It should be noted that our results are lower bound. If we considered a more generous definition of Hit, for instance, letting subjects make an error of “+/- 1 year” we would get even better results. In particular, *SRHit* would increase from 56.11% to 85.56%, *MGHit* from 62.78% to 95.83% and *SRHit=MGHit* from 45.56% to 83.05%. Therefore, as a rule, it should not be assumed that parents are uninformed.

⁵ The mean reported by minority groups is 12.10 while the mean reported by mestizos (majority) is 12.14. However, the difference between both groups is not significant ($p=0.74$).

⁶ For each additional year of education, the age of menarche reported decreased by 0.3%.

⁷ Females report an average age of menarche of 12.10 while males report an average of 12.28. This difference is not significant ($p=0.25$), and the result in Column 3 must be considered with caution since the sample is not balanced by sex.

⁸ When MG is the second question, the mean is 12.06 and when it is the first, 12.20 ($p=0.08$).

⁹ Both *SR* and *MG* show similar distributions: same mode, similar means (t-test, $p>0.40$) and correlation ($\rho=0.47$ ($p=0.00$)). In fact, we cannot reject the null hypothesis that both variables present the same distribution ($p>0.80$).

Iv. Discussion

A common hypothesis behind Menstrual Hygiene Management (MHM) programs is that poor adolescent girls in developing countries do not receive accurate, timely, and age-appropriate information about menstruation. Studies across the world show that adult members of the family, especially mothers and other female members, are one of the primary sources of information for adolescents on reproductive health.

Using data from 360 households, we determined that knowledge about the age of menarche is high among parents in Santa Rosa de Copán given that 56.11% reported the precise age of menarche that coincides with recent studies (provided by Vides Torres et al., 2017). Moreover, respondents were also able to predict (in a significant 62.78%) the modal response of other participants.

Interestingly, differences in knowledge are poorly explained by sociodemographics. Variables such as *education* and *experience (at least 1 daughter age > 12)*, both with the expected sign, only have marginal effects. These results are in line with Mbugua (2007), who found that educated mothers in urban Kenya experience sociocultural and religious inhibitions that hold them back from providing meaningful sex-education, including information about menarche, to their pre-adolescent and adolescent daughters. In accordance with Baumann et al. (2019), who found that caste/ethnicity was a significant predictor of menstrual knowledge and practices in Nepal, we also found that misinformation is related to *minority ethnic groups*, although only marginally. An unexpected result was that *females* (compared to males) are more likely to underpredict the age of menarche ($p = 0.001$). A possible explanation is that they rely more on personal experience.

Another interesting result is that no differences were found between the self-reported data and the guesses about the collective modal response. The latter implies that there was no social desirability bias, which suggests that the age of menarche is not such a sensitive topic in Honduras as it is in other cultures. A possible explanation is that the age of menarche might be less problematic than other topics surrounding the menstrual cycle. In order to address these issues,

further research is needed to understand the quality of society's knowledge as well as possible myths and taboos about menstruation that might affect girls' experience.

Table 1
Regression results for self-report, modal guesses, and informed variables

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|--------------|---------------|----------------|--------------|---------------|----------------|-----------------|--------------------|
| | <i>SRHit</i> | <i>SROver</i> | <i>SRUnder</i> | <i>MGHit</i> | <i>MGOver</i> | <i>MGUnder</i> | <i>Informed</i> | <i>Misinformed</i> |
| <i>Age</i> | -0.005* | 0.003 | 0.002 | -0.002 | 0.002 | 0.001 | -0.003 | 0.003 |
| | (0.003) | (0.003) | (0.002) | (0.003) | (0.003) | (0.002) | (0.003) | (0.003) |
| <i>Sufficient income</i> | -0.014 | -0.030 | 0.043 | -0.081 | 0.073 | 0.008 | -0.028 | 0.066 |
| | (0.063) | (0.057) | (0.047) | (0.060) | (0.051) | (0.044) | (0.064) | (0.053) |
| <i>Education (respondents)</i> | 0.007 | -0.018*** | 0.011** | 0.008 | -0.012** | 0.004 | 0.005 | -0.010* |
| | (0.006) | (0.006) | (0.005) | (0.006) | (0.005) | (0.005) | (0.006) | (0.006) |
| <i>Task order</i> | 0.015 | -0.027 | 0.012 | 0.047 | -0.076* | 0.028 | 0.000 | -0.062 |
| | (0.052) | (0.045) | (0.041) | (0.051) | (0.044) | (0.037) | (0.053) | (0.046) |
| <i>Experience (at least 1 daughter age > 12)</i> | -0.105 | 0.021 | 0.084 | -0.169** | 0.060 | 0.108** | -0.138** | 0.136** |
| | (0.066) | (0.057) | (0.055) | (0.066) | (0.058) | (0.053) | (0.064) | (0.063) |
| <i>Female</i> | -0.071 | -0.074 | 0.145*** | 0.053 | -0.096 | 0.043 | 0.002 | 0.019 |
| | (0.095) | (0.092) | (0.054) | (0.096) | (0.092) | (0.058) | (0.097) | (0.086) |
| <i>Minority</i> | -0.267* | 0.157 | 0.110 | 0.039 | -0.042 | 0.003 | -0.137 | 0.091 |
| | (0.142) | (0.144) | (0.106) | (0.141) | (0.132) | (0.093) | (0.141) | (0.131) |
| <i>Female and Minority</i> | 0.280* | -0.139 | -0.141 | -0.056 | 0.037 | 0.019 | 0.136 | -0.088 |
| | (0.155) | (0.154) | (0.115) | (0.153) | (0.143) | (0.100) | (0.154) | (0.141) |
| Constant | 0.762*** | 0.391*** | -0.153 | 0.669*** | 0.338** | -0.007 | 0.590*** | 0.158 |
| | (0.162) | (0.151) | (0.109) | (0.164) | (0.154) | (0.096) | (0.167) | (0.148) |
| Observations | 355 | 355 | 355 | 355 | 355 | 355 | 355 | 355 |
| R-squared | 0.031 | 0.054 | 0.035 | 0.037 | 0.037 | 0.025 | 0.026 | 0.043 |

Note: Columns 1 to 8 present the OLS estimations of the explanatory variables on the different outcome variables. Robust standard errors in parentheses. Asterisks represent different significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1.

Declarations

Ethics approval and consent to participate

Ethical approval for the study was provided by Loyola Andalucía Ethics Committee beforehand. All participants signed an informed consent document prior to data collection for this study.

Consent for publication

Not applicable

Availability of data and material

All of the main data has been included in the results. Additional materials with details may be obtained from the corresponding author. Data in Stata file is also available at the link:

<https://www.dropbox.com/sh/nckwermlmxsotyq/AADkZYVHXhToXS54XcvUGSNha?dl=0>.

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Authors' contributions

All authors were responsible for the structure of this paper. MA conceived, designed and performed the experiment, interpreted the data, and drafted the manuscript. DJ designed the study and performed the experiment, run the statistical analysis and drafted the manuscript. PB designed the study, performed the experiment, and did the critical revisions of the paper. The authors all approved the final versions for submission.

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Competing Interests

The authors declare that they have no competing interests.

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Figures

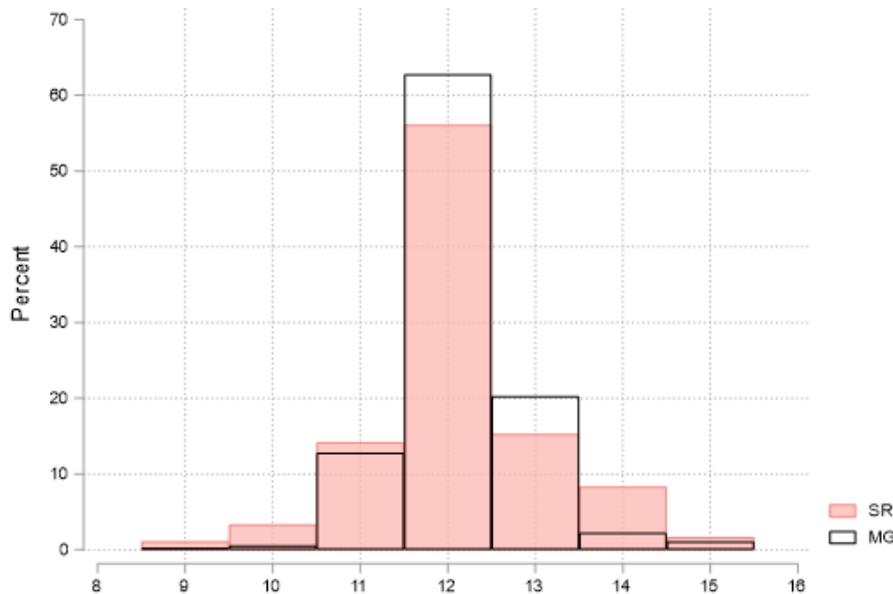


Figure 1

Distribution of self-report responses and modal guesses about the age of menarche

Supplementary Files

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- [Appendix.docx](#)