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Introduction

The understanding of human behavior lies at the core of economics and other behavioral sciences. In the pursuit of unravelling this mystery, a great deal of the evidence gathered has been WEIRD. Studying behavioral economics only in western, educated, industrialized, rich, and democratic countries (which have been termed WEIRD countries) is akin to fishing in a fishbowl and assuming that all fish in the ocean are tiny. While lab and field studies from the developed world have been monumental in establishing the fundamentals of behavioral economic theory that is increasingly informing current policy, the most vulnerable groups of people are still missing in the evidence in economics. This "one-size-fits-all" attitude towards the application of economics findings to different populations is limited in its scope and also leaves out those who can benefit the most from it. This thesis contributes towards our understanding of behavior and decision making for a subset of this very vulnerable group. It distinguishes itself by its central focus on populations from the South Asian subcontinent, but the findings hold significance in a larger, more universal setup for health (Chapter 1 and 2) and family (Chapter 3 and 4).

Vulnerable groups, not only in the developing world, face widespread health problems. The first two chapters of this thesis attempt to understand decision making in the health context. **Chapter 1 "Information Intervention to Promote Safe Water Consumption"**, conducted jointly with Daniel Salicath and Matthias Sutter, analyzes the consequences of a light-touch information intervention on changes in water quality, safe water practices, and mental health. It is set in the rural areas of the state of Bihar in India, in a region which is naturally affected by toxic arsenic in the groundwater. Due to the properties of arsenic being tasteless, colorless, and odorless when mixed with water, the population consuming it is largely unaware of the issue. Using a randomized controlled trial with more than 2,000 households, the aim of this project was to understand if information about low-cost/low-effort techniques of arsenic mitigation would change the arsenic quantity of the households' water source. Apart from arsenic being a problem for more than 100 million people world-wide, the learnings from this research could also be applied to other areas where preventive health care is required but there exists little or no information about the problem.

Despite the adjustments that had to be made to the project because of the COVID-

19 pandemic, the beginning of which coincided with the endline phase of data collection, we find evidence of our information intervention increasing conversation and knowledge about arsenic up to eight weeks after the intervention. We also find that it translates to significant reductions in arsenic quantity, healthy changes in behavior, and reduction in depression (a possible consequence of arsenic consumption). Though the findings from this chapter are still preliminary, it could pave the way for better understanding how low-income people can be better motivated to make choices for preventive healthcare. The benefits of investing in preventive practices are far in the future and are often difficult to visualize for target populations. This is where information interventions that help them change their behavior organically can help policymakers. For this project, I contributed my efforts in setting up the project, managing field staff, data monitoring, and data analysis.

The COVID-19 pandemic, while cutting short the field work in Bihar, also inspired the need to understand how beliefs and actions were changing at the onset of the pandemic. Policies concerning social distancing and lockdown measures were unheard-of and volatile when they began in March of 2020. The questions explored in **Chapter 2 "Trust in Government and Expectations about the COVID-19 Pandemic"**, concern trust in government, beliefs in others' actions, and expectations of return to normality after the COVID-19 pandemic. Using the background of changing policies in India and the United States of America, multiple phases of data were collected using online surveys in both countries. The chapter looks at whether trust in the federal government in India and the USA changes depending on the decision of the government to extend or revoke lockdown policies. Under normal circumstances, where moving reference points could prove to be a poor practice by the policymakers, it is seen here that India's decision to shift the date of reopening positively impacted trust in the government compared to the USA. It could be said that this change was, in part, influenced by the uncertainty of the situation where an ability to adapt to changing situations was viewed in a positive light.

Chapter 3 and chapter 4, have an eastward shift in geographical focus, but examine problems of equal importance. They are part of a project jointly conducted with Laura Breitkopf, Shyamal Chowdhury, Hannah Schildberg-Hörisch, and Matthias Sutter, where we attempt to understand the relationship between household environments, characteristics of parents, and outcomes of children. Among the understudied groups from non-WEIRD countries, children comprise a group that is overlooked to a large extent. One possible reason for this is due to the difficulty of studying the behavior and decision making among low-income children in a clear and controlled manner. In efforts to tackle this, our project involves creating a unique data set with families in rural Bangladesh. We conduct lab-in-field experiments with over 5,000 children and both their parents to get a better understanding of the factors that might influence their behaviors.

In **Chapter 3 "Economic Preferences and Behavior of Children"**, we show how the economic preferences of children are associated with their field behavior.

We find that time, risk, and social preference have predictive power over outcomes of children including their study attitudes, risky behaviors, prosociality, emotional problems and behavioral difficulties. We also find that the household environment could be a big influencing factor that could be affecting the emphasis that these preferences have on children's behaviors. Parental preferences and other sociodemographics of the household environment could be decisive for formation of skills in children and adolescents as previous research has pointed out. We also find parenting styles to have important role to play in the cognitive, non-cognitive, and behavioral outcomes of children, which is explored more in **Chapter 4 "Positive Parenting Styles and Skills of Children"**.

Recognizing the possibly considerable associations that parenting styles might have on the characteristics of children, we examine how positive parenting styles and field outcomes of children might be linked. We present a unified framework with a range of children's outcomes and find that positive parenting has a significant positive impact on both cognitive and non-cognitive outcomes of children and adolescents. Positive parenting is positively associated with desirable traits such as IQ, openness, consciousness, extraversion, and agreeableness, and negatively associated with less desirable outcomes such as neuroticism, emotional problems, and behavioral difficulties. In addition to the evidence confirming the universality of children's outcomes and parenting styles, we also find some differences among the children in our sample and those in developed countries as positive parenting is negatively associated with patience in children contradicting the normative understanding. This finding is supported by other literature in similar geographical regions. I contributed to these projects by doing field work, training the field staff, creating and testing the instruments, data monitoring, cleaning and analyzing the data. For Chapter 4, I also processed and analyzed the data.

In light of the foregoing, expanding our limits in terms of samples on which evidence is collected can help gain new insights and evidence for how people make decisions. This thesis is an effort in developing that agenda further so it can help inform better and more effective policy, and add to the growing academic literature in these domains.

Chapter 1

Information Intervention to Promote Safe Water Consumption

Joint with Daniel Salicath and Matthias Sutter

1.1 Introduction

Increase in knowledge is important for economic development in all areas, but especially so for health. An increase in awareness can cause people to behave in more advantageous ways. Researchers and policymakers have used information interventions to improve many key areas of the lives of the less-developed. These improvements include education, health, and productivity (Dupas and Miguel, 2017). While some of these interventions succeed in changing behavior, others are less successful. These mixed findings are especially common in the health context.[1] A clearer understanding of how information interventions work could provide an important framework to better design public policy.

In order to shed light on how information interventions work, one would need to explore its pathways. While there are no definite indications of which channels are required, some clear candidates have emerged in the recent literature. Beliefs, knowledge, conversation among peers, and social norms have been emphasized as factors that influence behavior change (Krupka and Weber, 2013; Delavande, 2014; Haushofer, John, and Orkin, 2019). Personal beliefs might lead people to respond differently to new information. Similarly, the prevailing social norms may act as a barrier for behavior change, even in the presence of more information. Despite the

1. See Kremer, Rao, and Schilbach (2019), chapter 5, pg. 382 where several mixed findings in the domain of health and information interventions are pointed. Some health information campaigns had no effect on behaviors, while others showed effects when information was personalized (Dupas, 2011). In Borland, Wilson, Fong, Hammond, Cummings, et al. (2009) warnings helped decrease tobacco use, but Anderson, Chisholm, and Fuhr (2009) did not find similar effects of decreasing alcohol use.

importance of social norms and beliefs for decision-making, there has been little research using them to better understand information interventions. As part of this study, we aim to fill this knowledge gap by testing for the effectiveness of social norms, beliefs, and a variety of other factors that could influence the effectiveness of information interventions in the health domain.

In this study, we investigate how an information intervention can successfully lead to changes in health behavior and aim to better understand the mechanisms of the intervention. The study is set in an area where there is an ongoing health problem, but the population lacks knowledge about the causes or prevention of the problem. Arsenic-contaminated groundwater is consumed by approximately 100 million people worldwide and has severe health consequences (Ahmed, Ahuja, Alauddin, Hug, Lloyd, et al., 2006; Madajewicz, Pfaff, Van Geen, Graziano, Hussein, et al., 2007; Chowdhury, Krause, and Zimmermann, 2016; Barnwal, Geen, Goltz, and Singh, 2017). Arsenic is a toxic element that affects health in both the short-term (as in skin-related diseases) and in the long-term (as in cancer). The problem is particularly pronounced in the plains of the River Ganges in India and Bangladesh. In these areas, arsenic occurs naturally in underground aquifers. Lack of awareness about the issue prevents people from employing methods to consume clean and safe water. We use this setting to study how an information intervention can capably affect the healthy water treatment practices in the region of Bihar, India. The study is novel in its emphasis on social norms and beliefs as pathways for this behavior change. We inform the heads of households about the dangers of arsenic in the groundwater and present low-cost and low-effort mitigation strategies. Our intervention follows recent works (Ravallion, Walle, Dutta, and Murgai, 2015; La Ferrara, 2016; Banerjee, Ferrara, and Orozco, 2019) where information was delivered in an audio-visual format[2] and was found to be an effective tool for behavior change. The intervention audio-visual introduces the problem of arsenic in the study area, and emphasizes treatment alternatives that are effective in limiting the dangers of arsenic. Consequently, we examine if the intervention causes improved health outcomes in the short-term, and study its effects on mental health. The study is also important in the regard that we emphasize measuring changes in health as a direct consequence of the intervention, which has been missing in previous studies. Health effects of better water treatment behavior, which is another one of our outcomes, can manifest later on in life with continued use.

In addition to this, we aimed to explore how groups may function differently from individuals (Charness and Sutter, 2012; Golub and Jackson, 2012; Breza and Chandrasekhar, 2019) in the context of an information intervention. We do so by implementing treatments for groups and individuals, separately. In the first treat-

2. Audio-visual format of information delivery ensures uniformity, is comparably low-cost, and engaging. We check for understanding of the content and how attentive subjects were with questions after watching the audio-visual.

ment, the information in the form of the audio-visual is conveyed individually to the household heads; and in the second treatment, households get the same audio-visual information, but in groups of three household heads.[3] The analysis with two treatments for this project will follow in subsequent versions of this chapter. For now, we pool the results of these treatments and compare them to the control group.

We find that there were significant changes in the quantity of arsenic in the primary drinking water for our treatments. Our results show that there is a reduction of arsenic by five micrograms per liter, which is sizable considering it is half of the threshold determined by the WHO as unhealthy. This change was substantiated by a three percentage point increase in reported behavior change in water treatment practices. This was achieved both with an increase in healthy water treatment practices and a decrease in unhealthy water treatment practices. We also find an increase in knowledge about arsenic, as measured by an index of questions testing for the content of the audio-visual. We saw a 16.5 percentage point increase in awareness about arsenic and a 0.88-point increase in knowledge about arsenic. We provide several insights on the mechanisms of the information intervention. The results indicate that social norms and personal beliefs were not important channels for this intervention. Instead, the results suggest that the low-cost and low-effort recommendations, as well as increasing knowledge were the most important reasons for the effectiveness of the intervention. We see, however, that the intervention was successful in affecting the belief that there are alternate options available for poorer people, as targeted by the methods we suggested in our intervention. We observe no clear effects on most health outcomes in the short-term, however, we do see a significant reduction in mental health issues in the treatment groups even in this short gestation period of eight weeks.

Our study makes four main contributions. The first contribution is that we show how an information intervention can successfully change behavior in a health setting by recommending low-cost alternatives. There has been a long debate on how to deal with the problem of arsenic in a sustainable way.[4] Previous interventions for arsenic-contaminated water have mainly aimed to convince households to switch to newer tubewells (Opar, Pfaff, Seddique, Ahmed, Graziano, et al., 2007). This recommendation is not always optimal because of two reasons. First, switching tubewells is inconvenient for many households. This is particularly true for the poorest households. Low-effort approaches could better motivate a larger number of people to adopt healthier water practices. For example, resting the water overnight to let the particles settle before drinking, or using treated surface water may be more conve-

3. Due to the COVID-19 pandemic, endline data collection had to be halted and we combine the analysis of these treatments in order to increase power. Details about the combination of the two treatments is provided in section 1.2.3.

4. For an extensive review of literature related to groundwater arsenic, see Krupoff, Mobarak, and Geen (2020).

nient than using a new tubewell. Next, emphasis on changing tubewells might lead households to switch to a tubewell with higher quantities of arsenic. As illustrated in previous literature, households have limited knowledge of how to identify safer tubewells and switching tubewells might fail to improve health outcomes (Pfaff, Schoenfeld Walker, Ahmed, and Geen, 2017). We employ an intervention recommended by local experts with the goal of providing low-cost and low-effort alternatives that do not primarily focus on switching tubewells.

The second contribution of our study is that we collect objective measurements of changes in levels of arsenic in the households by using field test kits. This measure ensures that the self-reported decrease in unhealthy behavior also has an objective and measurable output.[5] The measurement provides supportive evidence of increases in self-reported take-up of the recommended water treatment practices. Importantly, many studies have found contrasting findings between self-reported and objective measures in health settings (Duflo, Dupas, and Kremer, 2015; Dupas and Miguel, 2017). This is particularly true for studies that have investigated the adoption of water practices as they can be difficult to quantify. Social-desirability bias can be difficult to negate when only measuring self-reported outcomes. We claim precise results by collecting objective data to support the self-reported measures, thus providing measurable indications of how successful the information intervention was.

As a third contribution, we explore the mechanisms behind the functioning of the information interventions. Previous literature has suggested that social norms and personal beliefs may play an important role, and need to be accounted for when designing interventions (Bicchieri, 2016). We are one of the first, to our knowledge, to explore these as possible channels that affect information interventions. In our setting, it could be hypothesized that acting on new information could be closely associated with social norms and personal beliefs. This claim can be made considering the society is close-knit and opinions of others often matter a great deal. However, we do not find strong support for social norms and personal beliefs in influencing the changes in the level of arsenic in our treatment group. We find some weak evidence for changes in social norms, but these are not related to the changes in objective measures. Rather, our findings support factors such as gaining knowledge about arsenic as more predictive. Retaining more information about arsenic and having talked about it with peers seem to have positive influences on change in our treatment group.

Finally, we contribute to the growing literature in development economics on exploring ways to improve health outcomes. Several negative health impacts of arsenic consumption take a long time to manifest, as is demonstrated in our results where

5. Madajewicz et al. (2007) and Bennear, Tarozzi, Pfaff, Balasubramanya, Ahmed, et al. (2013) have studied problems related to arsenic, and measured the arsenic level of the drinking water for their households to test for unsafe water, but their main outcome was the decision of the households to 'switch' tubewells and not reduction in arsenic levels.

we do not find significant improvements in most health-related variables. Nonetheless, our results still find effects of the information intervention on mental health.[6] This result complements Chowdhury, Krause, and Zimmermann (2016), where consuming arsenic in water was associated negatively with mental health problems. We are the first to collect mental health data directly from our population in contrast to other studies that rely on cross-sectional data when studying mental health and arsenic consumption. We show that mental health issues can improve by adopting healthier water. Further, we explore the channels of these effects. Previous research points that arsenic consumption can worsen mental health physiologically, socially or psychologically. The physiological channel states that consuming arsenic affects brain functions, thereby increasing the probability of depression (Martinez, Kolb, Bell, Savage, and Allan, 2008). The channel can also affect people by making them physically sick, which can further lower their mental health (Dolan, Peasgood, and White, 2008). The social channel shows that arsenic is perceived to be contagious, which can lead to social stigma (Hassan, Atkins, and Dunn, 2005; Brinkel, Khan, and Kraemer, 2009; George, Factor-Litvak, Khan, Islam, Singha, et al., 2013). The psychological channel claims that seeing the health effects of arsenic and knowing that a primary water source is not safe, might cause people to worry and thus worsen mental health (Schwartz and Melech, 2000). Our novel evidence supports that mental health of our sample is affected by all of the three channels, and the intervention directly affects the physiological channel by reducing consumption of arsenic.

The rest of this chapter proceeds as follows: Section 1.2 describes the research design and the information intervention. In section 1.3, we present the data and outcomes of interest. In section 1.4, the empirical strategy of the study is presented. In section 1.5, the results are presented and discussed, followed by a set of robustness checks. Finally, section 1.6 concludes with recommendations and suggestions for future research.

1.2 Research Design

1.2.1 Study setting

Our study takes place in Bihar, a state in the northern Indian plains, south of the Himalayan mountains. Given the number of rivers that flow through Bihar, it is a fertile and mineral-rich agricultural state. Despite this, Bihar is one of the least developed states in India.[7] Recently there has been an increase in cancer incidence in Bihar, which has been attributed to the alarming levels of arsenic in the ground-

6. The long-term health outcomes will be investigated in the subsequent waves of the experiment.

7. Bihar has 33.74 percent (2013) of its population below the poverty line designated by India, and a Human Development Index of 0.566 (2018).

water.[8] Field studies have shown that arsenic concentrations are on the rise in the area, and more than 40 percent of all districts in Bihar are affected (Rajmohan and Prathapar, 2014). Our study was conducted in the district of Samastipur and adjoining regions.[9] The location was identified due to high levels of arsenic present in the groundwater and the population being a representative sample of Bihar.[10] There were no other campaigns about arsenic in the area, and close to the entire sample was unaware of arsenic and its consequences. At baseline, 97.3 percent stated never having seen a campaign about groundwater arsenic and 98.33 percent stated having no knowledge about arsenic. The area of the study was selected based upon district-level data of arsenic-affected areas provided by the Government of Bihar. The villages were situated near the bank of the River Ganges, which is believed to be the reason for concentration of arsenic in the aquifers. In prehistoric times, the river carried arsenic down from the mountains, which then coagulated in the plains due to sedimentation. This arsenic now comes up in shallow tubewells between 50 and 200ft (15 and 60 meters). Tubewells shallower than 50ft would have fewer instances of arsenic, but generally these aquifers get depleted and tubewells have to be dug deeper. Tubewells deeper than 200ft require extra monetary investments, which may not be affordable by the less-privileged.

1.2.2 Sample

The baseline survey and intervention were conducted in January of 2020. A total of 2,334 households from 158 villages were recruited to our sample. We targeted the low-caste hamlet in a village, where members of the Scheduled Castes (SC)/Scheduled Tribes (ST) and Other Backward Castes (OBC) communities reside.[11] The low-caste groups, being financially and politically disadvantaged, are less-aware, have fewer options for healthcare, and lack alternative sources of water

8. According to Mondal, Rahman, Suman, Sharma, Siddique, et al. (2020), the increase in arsenic concentration of drinking water has also led to an increase in arsenic exposure in food. For the people of Bihar, the median excess lifetime cancer risk due to arsenic exposure is estimated at two per 10,000 people.

9. Some villages were sampled from the Begusarai district bordering Samastipur. All villages were close to the border and similar in characteristics. For the analysis presented here, only the villages in Begusarai are shown since the endline was cut short.

10. The villages with high levels of arsenic were identified using data from the Public Health Engineering Department of Bihar (PHED). Samastipur district is representative of Bihar state in several dimensions, including sex ratio (Bihar-918, Samastipur-911), population growth (Bihar-25.42 percent, Samastipur-25.53 percent), literacy (Bihar-61.80 percent, Samastipur-61.86 percent), as per the Census of India 2011.

11. Scheduled Castes, Scheduled Tribes, and Other Backward Castes are community groups defined by the constitution of India as underprivileged caste groups. Members from these communities lack land and other capital resources, and are subjugated by the upper castes.

as compared to the upper-caste groups.[12] In our sample, 93.46 percent of baseline participants state they do not use any form of water purification treatments; and among most of the individuals that do employ water treatments, the practices are infrequent or done incorrectly.[13] Our sample was unaware of arsenic affecting people in the village, where 97.58 percent stated not knowing anyone having arsenic in their drinking water, while 34.27 percent had dangerous amounts of arsenic present in their primary water source. We chose to focus on the low-caste hamlets, as they are the group most exposed to the problem of arsenic in the groundwater, and have few means to tackle the problem.

1.2.3 Experimental design

We divided villages into one control group and two treatment groups. We created an information intervention for our treatments, with the goal of providing households with relevant information about arsenic in the groundwater.[14] The information intervention was a package containing an eight-minute long audio-visual and the results of an arsenic test of the primary drinking water source of the household.[15] The audio-visual contained information about the dangers of consuming arsenic contaminated water, common misconceptions, and effective solutions to mitigate the problem with minimal financial investments. This was shown to the household heads in the underprivileged hamlets of the villages. The contents of the audio-visual were based on information from UNICEF and the World Bank, and approved by two local authorities: Bihar State Pollution Control Board and Mahavir Cancer Center, Patna. First, the audio-visual introduced the problem of arsenic in the groundwater and how it affected the lives of people in Bihar. Local experts and villagers shared their experiences and explained the issue. Secondly, it presented several possible mitigation strategies that were not too expensive or inconvenient. The inexpensive household-level mitigation techniques included using treated surface water, and using water that had been resting still in a vessel for 12 hours, so the harmful element would settle to the bottom. In addition to those, switching over to a safer well, using bottled water from a safe source, and reverse osmosis (RO) filters were pitched as safer drinking water sources. It also encouraged the use of existing filters provided to some communities by NGOs. Finally, the audio-visual concluded by expressing that

12. Though this problem was not explicit in our sample, it is considered immoral for a person of the lower caste to access water from the same well as upper-caste persons.

13. Incorrect water treatment would include boiling water that contains arsenic. Boiling water with arsenic concentrates the quantity of arsenic, making it more harmful. In our sample, out of the people who were boiling their water, 26.8 percent of them should not have been doing it.

14. The design and outcome were pre-registered at the AEA ECT Registry at https://www.socialscienceregistry.org/trials/54773.

15. It was important for our information intervention to combine information from the audio-visual and from objective arsenic test results in order to provide households with the necessary information required to respond to the issue.

arsenic in the groundwater is something that affected many in the area and encouraged viewers to come together and find solutions. The control group was shown an audio-visual of the same length that was unrelated to water or arsenic.[16]

As part of the information intervention, we also tested the arsenic levels in the primary drinking water of the household and informed them about the result. We chose to focus on the primary drinking water as experts in the field suggest that direct intake of water is the most important contributor to arsenic increase in the body, causing illnesses. By focusing on primary drinking water, we avoid potential demand effects.[17] We informed households if the quantity of arsenic in their water was above or below the recommended WHO levels of safe water (ten micrograms per liter), allowing the households to react appropriately to their situation. The results of the water tests were provided to the respondents alone. In the control group, we measured the arsenic level, but the respondents were not informed of the results. We used the ITS Arsenic Econo-Quick field test kits, a validated toolkit used by the WHO and academics (George, Zheng, Graziano, Rasul, Hossain, et al., 2012; Barnwal, Geen, Goltz, and Singh, 2017) to get an indication of the presence of arsenic in the water source. Our field team was specially trained to conduct these tests at both the baseline and endline stages. The test took about 15 minutes and contained a visual scale, which was used to get objective measurements.[18]

The information treatment took place immediately after the collection of baseline data. The household head sat for the interview with an enumerator, and after completion, the respondent was shown the audio-visual on a mobile tablet. After watching the audio-visual, they were informed about the arsenic level of their drinking water. In the group treatment, the audio-visual was shown to three respondents at the same time. We test the effectiveness of the treatments by conducting an endline survey eight weeks after the intervention. A complete overview of the timeline and the series of events is provided in Appendix 1.B.

Treatment: Individual information. As part of this treatment, the eight-minute long audio-visual containing arsenic-related information is shown to each household head individually in their homes. Their primary drinking water is tested for arsenic, and they are informed about the results.

16. The audio-visual was about tiger conservation, and was released by the Press Information Bureau of India and the Wildlife Trust. The video is available on youtu.be/wrcWNtCc6Dk.

17. According to experts, households are less likely to give a different or cleaner water sample for testing when asked for their primary drinking water since they don't view it as dirty to begin with. We simply asked the respondents for a glass of water that they generally drink. This way of collecting water samples has been commonly used in other works by Kumar, Ali, Kumar, Kumar, Sagar, et al. (2021). Moreover, we collected observable information about the source of the water and bio-markers such as Mees' lines on fingernails, which indicate consumption of high levels of arsenic.

18. The result strips were preserved and later inspected by supervisors for ensuring accuracy in measurement and reporting by the field enumerators.

Treatment: Group information. In this treatment, the eight-minute long audio-visual containing arsenic related information is shown to a group of three randomly selected household heads in one village. We assemble the household heads, and they are shown the video together.[19] Their primary drinking water is tested for arsenic, and they are informed about the results individually.

Treatment: Control group. In the control group for this experiment, the household heads are individually shown an audio-visual unrelated to arsenic or water. An audio-visual of the same length of time is shown to keep the design consistent with the treatments. This audio-visual does not refer to arsenic or water, in order to not divert undue attention to water care in the gestation period. It pertained to tiger-conservation-related information awareness by the Government of India. Their primary drinking water is tested for arsenic, but they are not informed about the results.[20]

Table 1.1. Summary of treatments

		Audio-visual	No. of people	Water test result
Treatment	Individual	Arsenic video	1	Revealed individually
	Group	Arsenic video	3	Revealed individually
Control	Control	Wildlife video	1	Not revealed

1.2.4 Randomization

The experiment followed a clustered randomization design where we first randomly selected villages from a district, and then randomly selected 15 households in that village to be part of the study. The assignment of treatments was predetermined using STATA randomization. The treatment was administered at the village level. Any village too close to another was dropped from the list.[21] Our sample consisted of only the low-caste hamlets from the selected villages, and we verified local information with a responsible person from that village.[22] The households were selected

19. The audio-visual is shown in a private location, which is generally inside the home of one of the respondents.

20. The households in the control treatment were not informed about the level of arsenic. If they asked about the results it was told to them that it could not be revealed because of scientific purposes and that the results will be communicated to the local government body, Bihar Pollution Control Board, to take necessary steps for mitigating the problems at the village level.

21. Supervisors were instructed to eliminate the villages that were within a 500m radius of another selected village.

22. These people were the local government leaders or teachers in the Anganwadis (government kindergartens). We asked these people for information about the largest low-income hamlet of the

based on set right-hand rule, where a skipping pattern was determined based on the number of households in the hamlet.[23]

1.2.5 Implementation

The intervention was implemented over a period of 35 days. A total of 23 experienced enumerators were selected for data collection.[24] Enumerators were divided into teams of four, led by one supervisor. The supervisors monitored randomization, conducted checks, and supported enumerators when required. Daily monitoring, frequency checks, and controls were conducted to ensure data quality. Before the intervention took place, respondents were interviewed for the baseline survey, and played incentivized experimental games for time and risk preferences, and social norms. As part of the experimental games played, the respondents could win up to INR 450 (around USD 6.3) for the baseline and for the endline data collection stages. The sum of money was transferred to them via mobile phone recharge.[25] The amount received was large compared to the daily income of the respondents. The average daily income of men in rural Bihar is estimated at INR 294.4 (around USD 4) as of August 2018, and our incentive was about the same size for each round.

Endline data collection took place eight weeks after the intervention. Due to COVID-19, the collection of endline data had to be halted on 17 March, 2020 when 1,260 field surveys were completed. Data collection resumed using phone surveys for the remaining sample, starting 30 March, 2020. The survey had to be edited to fit into a 30-minute phone conversation and we were unable to conduct arsenic tests of the primary water source for this sample. In this chapter, we chose to focus on the sample where all data was collected in the field and the results only include these respondents. This allows us to support the self-reported findings with objective measures of arsenic levels at endline.

1.3 Data

Here we outline the main outcomes of interest. In this study, the main outcomes include (i) healthy water treatment practices, (ii) arsenic levels of primary drinking water, (iii) knowledge of arsenic, and (iv) health outcomes. The secondary outcomes

village. These local authorities are usually required to have accurate information about the location of the hamlets and the number of inhabitants there.

23. For example, in a hamlet with 100 households, a surveyor would recruit households from every fifth household. The surveyors would start with the fifth household, move on to the tenth household, and continue until they reached a total of 15 households.

24. The criteria for selection as an enumerator was a college degree (under-graduate/post-graduate), experience with data collection (minimum one year) and ability to speak Hindi/Bhojpuri.

25. Mobile phones are found in most households, and phone recharge is valued by people, and is a regular expenditure item. People are also used to this form of payment, and it has the advantage of being paid quickly and also on a later date.

collected were used to study the mechanisms of the treatment effects. They are mentioned below.

1.3.1 Primary outcomes

Healthy water treatment practices. The main behavioral outcomes that we measure are self-reported healthy practices of water treatment. In our context, a positive change in water treatment includes both an increase in healthy treatment of water, and a decrease in unhealthy treatment of water. For example, if an individual changes to a safer water source, rests water overnight for settling down of particles before drinking, uses treated surface water, etc., they are categorized as practicing healthy treatment. Unhealthy treatment of water consists of behaviors such as boiling water that contains arsenic, drinking untreated surface water, etc. Our analysis also accounts for a decrease in these unhealthy measures. An overview of healthy and unhealthy treatments of water that we considered is provided in Table 1.C.1. These behavioral measures were collected by asking the respondents about their regular water practices. As a method of ensuring compliance with self-reported behavior, the enumerators had to observe and take note of evidence of any changes in practices. For example, if the respondent mentioned that they installed a new tubewell, the new infrastructure had to be shown to the enumerator, or if the respondent mentioned that they rest the water overnight before using it, the storage unit was checked by the enumerator.

Arsenic levels of primary drinking water. Another main outcome for our intervention was the amount of measured arsenic level in the primary drinking water of a household. We measured the arsenic level in the water to observe the direct effects of our intervention as objective changes. Using field arsenic test kits, we were able to measure any changes in arsenic level between baseline and endline. The field water testing kit allowed for nine gradations of arsenic levels. For a visual representation of the scale, see Figure 1.E.3. The measurement kit presented clear categorization of whether the water contained safe or unsafe levels of arsenic. The measure provides a specific indication of water safety and if there were clear improvements or setbacks in water quality.

Knowledge of arsenic. One of the main goals of testing the efficiency of the information intervention in this context was because a large majority of people in the area did not know about arsenic. Only two percent of our sample claimed they had any knowledge about arsenic at the baseline level. We study the effectiveness of the information intervention by testing how well the respondents were able to retain information that they received as part of the treatment. We collected two measures of knowledge. The first measure is simply asking the respondents if they have any knowledge of arsenic. The second measure is administering a battery of arsenic re-

lated questions to those that state having arsenic knowledge. The questions include ten statements with responses "true or false".

Health outcomes. We examine how the information intervention created positive externalities for health. We look at several health outcomes including skin problems like hyperkeratosis, melanosis, and Mees' lines, stomach problems like diarrhea, constipation, etc., and other severe problems like lung, liver, or cancer issues. In the shorter term, however, we did not expect to observe big changes in these outcomes. In addition to these outcomes, we focused on mental health outcomes of arsenic consumption.

Arsenic has been indicated to have effects on mental health (Chowdhury, Krause, and Zimmermann, 2016). We used the Patient Health Questionnaire (PHQ-9) validated by Martin, Rief, Klaiberg, and Braehler (2006). This module scores nine different issues one might have faced over the past two weeks from zero ("not at all") to three ("nearly every day"). Using this score, one can calculate depression severity. Secondly, loneliness was approximated using the question from Haushofer (2013). As robustness checks, we also collected measures of life-satisfaction and well-being using the Cantril's ladder (Cantril, 1965).

1.3.2 Secondary outcomes and controls

Social norms. Social norms are defined as shared understandings among a reference group of people regarding the appropriateness or inappropriateness of certain actions in a given context. To elicit social norms, we used the elicitation method developed by Krupka and Weber (2013), which has been used to explain behavior in various experimental works (Gächter, Nosenzo, and Sefton, 2013; Krupka and Weber, 2013; d'Adda, Drouvelis, and Nosenzo, 2016; Krupka, Leider, and Jiang, 2016; Chang, Chen, and Krupka, 2019). It has also been employed in field settings to identify the effect of social norms on behavioral outcomes.[26] The Krupka–Weber elicitation method is a coordination game, in which people rate the social appropriateness of different behaviors. In our study, the heads of households rated four different social situations related to water usage on a four-point scale ranging from "very socially inappropriate" to "very socially appropriate". The situations chosen were flagged by local experts on social issues related to arsenic in the groundwater. For a list of situations used, see Appendix 1.E. A key aspect of the elicitation is that each participant receives a monetary reward if the stated appropriateness rating of a randomly selected situation matches the modal appropriateness rating of this action in the given village. This gives the participant an incentive to guess correctly what they believe is the prevailing social norm in the village.

26. See Burks and Krupka (2012) for more details.

To further add to this, we used a vignette with different levels of arsenic to investigate how social norms and beliefs are related to the quantity of arsenic.[27] This provides us with an exogenous variation in the strength of the social norms. Considering few people were aware about arsenic before the intervention, the questions asked pertained mainly to the safety of drinking water by mentioning what an unsafe level of arsenic would be in a hypothetical scenario.

Belief about water use. To measure beliefs about water use and arsenic, we used a scale inspired by Attanasio, Cunha, and Jervis (2019), where we presented different statements related to arsenic-contaminated water to our respondents. We asked the heads of households to imagine a hypothetical village and estimate how many people out of 100 would have a certain belief. The situations chosen to measure beliefs were related to returns on investments in preventive healthcare, water use, and effects of arsenic on the body. In order to ensure accuracy and understanding of the questions, we asked three control questions on unrelated topics at the beginning of the module, see Appendix 1.E.

Volume of conversation. Social networks are found throughout the literature to be important in spreading information (Alatas, Banerjee, Chandrasekhar, Hanna, and Olken, 2016; Banerjee, Chandrasekhar, Duflo, and Jackson, 2019; Breza and Chandrasekhar, 2019). We applied the methods used by Banerjee, Breza, Chandrasekhar, and Golub (2018) in measuring the volume of conversation about arsenic in the groundwater, where we asked how many times in the past month our respondents had arsenic-related conversations with their peers. We used this measure to look at whether engagement in social learning increased or decreased conditional on the treatment, and if that further induced changes in our primary outcomes. At the baseline, close to no one in our sample had engaged in conversations about arsenic in the past one month.

Time preferences. Time preferences correlate with multiple outcomes including savings and health behavior. They are important to account for when assessing the impact of our intervention (Borghans and Golsteyn, 2006; Chabris, Laibson, Morris, Schuldt, and Taubinsky, 2008; Dohmen, Falk, Huffman, and Sunde, 2010; Meier and Sprenger, 2010; Sutter, Kocher, Glätzle-Rützler, and Trautmann, 2013; Golsteyn, Grönqvist, and Lindahl, 2014; Alan and Ertac, 2018). We checked for patience, as measured by the number of patient choices made in a time preference game. We applied a simple choice list-approach, where the heads of households had to make tradeoffs between smaller-sooner rewards and larger-later rewards.[28] The choice lists used were kept simple in order to make the options easy to understand. There

27. See Fromell, Nosenzo, Owens, and Tufano (2019) for details of this approach.

28. See Bauer, Chytilová, and Morduch (2012) and Almås, Cappelen, Salvanes, Sørensen, and Tungodden (2016) for similar approaches.

were three choice sets with different time frames. Each choice set contained six alternatives that the participant could choose between, with the annual interest rate increasing for each subsequent alternative. The subject could make a choice between a smaller payment at an earlier date against a larger payment three months later. The earliest payment was always the day after the survey (“tomorrow") and the latest payment was one year and three months after the survey. For more details, see Appendix 1.E. One out of the 18 decisions made were randomly chosen for payment and the payment was delivered on the specific selected date.

Household information. A detailed household questionnaire was administered both at the baseline and endline level to collect important household-level variables. This included items such as socioeconomic characteristics of the household, health information on all members, and a measure to assess the assets of the family. The assets are estimated using a 15-item asset index used in Vyas, Srivastav, Mary, Goel, Srinivasan, et al. (2019) which is fitting to the context.

Table 1.2. Summary statistics for respondents in the sample at baseline

	Mean	SD	Min	Max	N
Age	40.70	11.38	18	65	1,254
Female	0.63	0.48	0	1	1,254
Married	0.99	0.08	0	1	1,254
Years of education	3.44	4.50	0	18	1,254
Backward caste	0.81	0.39	0	1	1,254
Savings accounts for household head	0.67	0.47	0	1	1,254
No.of savings accounts in the family	1.51	1.26	0	10	1,254
Asset index	8.37	2.52	1	15	1,254
Patience	7.01	6.09	0	18	1,254

1.4 Empirical Strategy

1.4.1 Experimental integrity

We test for balance across treatment and control by looking at key demographic variables and making sure that they do not significantly differ across the two groups. For the purpose of this chapter, we have pooled the results from the two treatments and have looked at them as one. We regress the primary outcomes from the treatments and control group at baseline. To ensure that the two treatments did not significantly differ on many accounts, we also check for balance between the endline values of the main outcomes for the individual and group treatment. The overall results presented here cover both treatments as one. In both sets of analyses, we use similar

specifications for the estimation of treatment effects, as shown in equation (1.1), here leaving out the controls $\boldsymbol{X}$.

1.4.2 Main specifications

Treatment and control comparison. The main hypotheses of this were included in the pre-registration plan. To measure the outcomes collected at the endline level, we employ the following specification:

$$y_{i1} = \alpha_0 + \alpha_1 T_i + \boldsymbol{\Phi X}_i + \boldsymbol{\Theta W}_i + \lambda_i + \varepsilon_i \tag{1.1}$$

Here y_{i1} is the outcome of interest for respondent i at the time of endline. In this case, treatments, T_i are the combined individual and group treatments. The pure control group is therefore the reference category, and the α parameters are the average treatment effects. $\boldsymbol{X}$ is the vector of respondent controls (age, gender, marital status, savings account, education, patient choices in time preference game at endline), and $\boldsymbol{W}$ is the vector of household controls (caste, savings account for the respondent, number of savings accounts in the household, index of household assets). All households for which we recorded the outcomes of interest are included in this specification. Standard errors are clustered at the village level, and the specification includes block-level[29] fixed effects as represented by λ.

For the outcomes where we have to measure the effects of the treatments, we use the following specifications to measure the differences in outcomes between the baseline and endline level:

$$y_{i1} - y_{i0} = \alpha_0 + \alpha_1 T_i + \boldsymbol{\Phi X}_i + \boldsymbol{\Theta W}_i + \lambda_i + \varepsilon_i \tag{1.2}$$

In the above mentioned equation y_{i0} represents the value of an outcome at the baseline level. The main outcome of interest here then is the change in the outcome variable. Similar to equation (1.1), the vectors of controls are at the individual and household levels.

Mechanisms. We test the mechanism of change using the following equation:

$$y_{i1} = \alpha_0 + \alpha_1 T_i + \alpha_2 \Delta As_i + \beta_1 (T_i \times \Delta As_i) + \boldsymbol{\Phi X}_i + \boldsymbol{\Theta W}_i + \lambda_i + \varepsilon_i \tag{1.3}$$

In the above equation ΔAs_i indicates the dummy variable for change in main outcome between baseline and endline. y_{i1} are the outcomes of individual i at the endline level. Coefficient β_1 is the measure of how the interaction between these treatments and change in main outcome affected the endline outcome.

29. Blocks are clusters of villages.

1.5 Results

1.5.1 Experimental integrity

The design of the experiment relied heavily on randomization of treatments being done appropriately. A strict protocol was followed, and in our results we do not find the characteristics of the treatment groups to be significantly different from each other. Table 1.A.1 provides results of baseline balance on demographic variables for the respondents' part of the experiment that appeared for both baseline and endline data collection cycles. This balance is between the control group and the pooled treatment group for the sample. To test the baseline balance, we estimate equation (1.1) with baseline demographics as the outcome variables. Column (1) shows the means and standard deviations of the control group, and column (2) shows the comparison of the treatment groups to the control. Our demographic variables are balanced across treatments, with no coefficients being significantly different between the treatment groups. For a visual representation of the treatment assignment, see Appendix 1.D.

For further analyses in this section, the two treatments are pooled together. We do this as there are minimal differences in the outcomes for the two treatments for the subset of the sample for which both baseline and endline data were collected. Table 1.A.2 presents results from a test of balance between the two treatments and their outcome variables at endline. The means and standard deviations of the individual treatment group are presented in column (1), and column (2) displays coefficients for comparisons in the group treatment. The outcomes mentioned here are our main outcomes as examined for the main results of the experiment. We see no statistically significant differences in the outcomes between these two groups, and have decided to pool together the results of the treatments in order to gain power for the analysis. From here on, the pooled treatment groups are referred to as the treatment group and is compared to the control group to examine effects of the intervention.

1.5.2 Effect on treatment group for healthy water treatment practices

We present the main results for changes in behavioral practices with regards to healthy water treatment in Table 1.3. We see significant changes in positive treatment of the primary drinking water in the treatment group. These results are based on self-reported outcomes at endline, where the participants responded to how they treat their primary drinking water. We asked for a wide variety of changes in water treatment and cross-checked it with the reported water source to determine if they are, in fact, healthier practices for the household. For example, boiling water is beneficial for households that use surface water, but dangerous for those who have tubewell water with arsenic in it. Further, purifying water with reverse osmosis filters

will be a positive treatment for any kind of water, including arsenic-laced water.[30] Here in column (1) the results reported are for those water treatment practices that are beneficial depending on the type of water source at endline. We can observe a three percentage point increase in the treatment groups relative to a control mean of -0.01. The result is significant at the one percent level.

Importantly, given our goal of increasing healthy treatment practices, in columns (2) and (3) we see both an increase in healthy treatment practices and a decrease in unhealthy treatment practices. We find a 1.4 percentage point increase in healthy treatment practices (significant at the five percent level), and 1.9 percentage point decrease in unhealthy treatment practices (significant at ten percent level). This finding is important since it demonstrates that the treatment group was able to display understanding of the problem they were informed about and also had the willingness to act on it.

Table 1.3. Changes in healthy treatment practices

	(1) Positive change in water treatment	(2) Increase in healthy treatment	(3) Increase in unhealthy treatment
Treatments	0.032**	0.014**	-0.019*
	(0.014)	(0.007)	(0.011)
Observations	1252	1252	1252
Respondent Ctrl	✓	✓	✓
Household Ctrl	✓	✓	✓
Control mean at endline	-0.01	0.02	0.03
R^2	0.025	0.01	0.028

Note: OLS estimates for healthy treatment practices outcomes of the experiment. For each treatment outcome coefficient and standard errors in parentheses are mentioned. Column (1) shows the results for a reported change in practices for water treatment. Healthy treatment practices include the actions recommended in the informational video, such as, boiling or filtering surface water, resting tubewell water, using RO/bottled water, etc. Column (2) shows results for outcome where 1 = the changed treatment practice was healthy. Column (3) shows results for outcome where 1 = the changed treatment practice was unhealthy. All columns show results with respondent controls (age, gender, marital status, savings accounts, education, patient choices in time preference game) and household controls (backward caste =1, number of savings accounts in household, and household asset index). Fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

1.5.3 Effect on treatment group for arsenic reduction and knowledge

Next, we ask whether our treatment had an effect on measured levels of arsenic in the primary drinking water. We compared the difference in measured levels at baseline and endline. The reason for measuring the difference in arsenic level was

30. An overview of healthy and unhealthy treatments of water that we considered is provided in Table 1.C.1.

also because there exist seasonal variations in the arsenic content in the groundwater. During the summer months, as the water level goes down, the arsenic concentration increases; this is when the endline of the experiment took place. Table 1.4 shows us the results for the effect on measured arsenic quantity in column (1). There is a weakly significant effect, at a ten percent significance level in the treatment group, where arsenic level decreases by five micrograms per liter as compared to the control group. The quantity is half of ten micrograms per liter, which is considered the threshold for arsenic safe water by the WHO. This is accompanied by both a 16.5 percentage point increase in respondents stating knowledge about arsenic in the treatment group (as seen in column (2)), as well as higher test performance of arsenic knowledge, significant at one percent levels (column (3)). We believe that the weak estimates are due to a lack of power. As the current sample contains only 55 percent of the full sample, we aim to add to the analysis with additional data to substantiate the results. Still, with the reduced number of respondents, we find a strong increase in awareness and knowledge quotient of our sample, indicating that spreading awareness in an audio-visual form is an effective strategy for seeding information for healthy practices.

Table 1.4. Changes in arsenic level and knowledge about arsenic

	(1) Arsenic in primary drinking water	(2) Do you know about arsenic?	(3) Knowledge about arsenic (max. 10)
Treatments	-0.005*	0.165***	0.875***
	(0.003)	(0.033)	(0.164)
Observations	1254	1254	1254
Respondent Ctrl	✓	✓	✓
Household Ctrl	✓	✓	✓
Control mean at endline	0.036	0.084	0.391
R^2	0.019	0.063	0.06

Note: OLS estimates presented for main outcome, where the outcome is the difference between the value at endline and at baseline. Restricted to only those with field activity at baseline and endline. Column (1) shows results for the two treatments for the measured arsenic quantity in the primary drinking water of the households measured at endline. Column (2) shows results for those who stated to know about arsenic in a binary question. Column (3) shows the score for the respondents who answered questions about arsenic in groundwater. They answered ten questions which were aggregated to get the arsenic score. The outcomes in this table are those that were pre-specified in the pre-analysis plan. All columns show results with respondent controls (age, gender, marital status, savings accounts, education, patient choices in time preference game) and household controls (backward caste =1, number of savings accounts in household, and household asset index). Fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

1.5.4 Effect on treatment group for change in health outcomes

Considering that consumption of arsenic is hypothesized to have a direct relationship with health problems in our population, we further checked for short-term health

effects of our intervention. We did not find strong results for immediate health outcome changes in our treatment group for many physical health problems, but did find a reduction in mental health problems as measured by the PHQ-9. We find a decrease of 1.04 points in depression in the treatment group between the baseline and endline, as seen in Table 1.5. For other outcomes such as skin problems, stomach related problems, cancer and lung problems, and doctor consultation, we do not find significant differences, however we do find non-significant negative relations for most of these outcomes in the treatment group. It is likely that our gestation period of eight-weeks was not sufficient time for the treated population to display strong changes in the outcomes that we inquire about.

Table 1.5. Difference in health outcomes at baseline and endline

	(1) Skin problems	(2) Stomach problems	(3) Cancer, lung or liver problems	(4) Prop of family consulted Dr.	(5) Mental health (PHQ-9)
Treatments	-0.034	-0.084	0.007	-0.031	-1.042***
	(0.046)	(0.093)	(0.041)	(0.023)	(0.387)
Observations	1260	1260	1260	1260	1260
Respondent Ctrl					✓
Household Ctrl	✓	✓	✓	✓	✓
Control mean at endline	0.205	0.844	0.198	0.168	3.691
R^2	0.023	0.079	0.040	0.035	0.025

Note: Note: OLS estimates for health outcomes of the experiment. For the treatments, outcome coefficient and standard errors in parentheses are mentioned. Column (1) shows results for occurance of skin problems (including melanosis, hyperkeratosis, and other skin related issues) in the family. Column (2) shows results for occurance of stomach related problems (gastritis, constipation, and diarrhea) in the family. Column (3) shows results for other severe illnesses in the family. Column (4) shows PHQ-9 mental health index where high values indicate more mental problems. Column (5) shows the results for proportion of family members that consulted the doctor in the past 1 month. All columns show results with respondent controls (age, gender, marital status, savings accounts, education, patient choices in time preference game) and household controls (backward caste =1, number of savings accounts in household, and household asset index). Fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

1.5.5 Mechanisms for change

To elucidate potential mechanisms which may account for the behavioral effects, we look at various secondary outcomes and how they interact with change in arsenic levels for our population. Table 1.6 shows the interaction between the treatment group and the group that showed changes in arsenic levels of their primary drinking water. The columns show results for social norms, beliefs about water, arsenic conversation, and knowledge about arsenic. Here we find that these interactions do not contain significant results.

The social norm index related to water use does not change significantly for the treatment group. In the social norm questions which contained a hypothetical

threshold for changing water source, we see a 16 percentage point positive change, significant at the ten percentage level. This does not hold for the interaction between treatment and change in arsenic levels. Column (3) – (5) show outcomes for changes in beliefs about water. The information regarding these beliefs was provided in the audio-visual. We find that those who show changes in arsenic level have more positive beliefs about treated surface water being a safe source as shown to them in the audio-visual. They report that, on average, 5.87 more people out of 100 in a similar village would believe this compared to the control group, significant at ten percent level. However this effect does not hold for the interaction. The treatment group is also less likely to believe in the inability of the poor to have safe water options (7.71 fewer people out of 100 in a similar village would believe this, significant at five percent level). Yet, again, we do not find this effect holding true for the interaction between treatment and change in arsenic level.

We find that our treatment group shows significant effects for having knowledge about arsenic and talking about it with others. There is also an increase in the number of people in the treatment group who had been suffering from arsenic-related problems. We, however, do not see these effects hold for the interaction term. The interaction term shows weak significance for claiming to know about arsenic with 8.3 percentage points (significant at ten percent level) as shown in column (7).

A possible reasoning for the limited change in drinking water source, and thereby arsenic level is explored further in Table 1.A.4 which looks at the perception of people about water safety. We find here that the beliefs of the treatment group about the safety of their drinking water is 11.6 percentage points lower when compared to the control group, significant at the five percent level. This means that more people in the treatments were able to realize that there may be a water safety problem. In the treatment groups we also see that there is a significantly larger group of people who did not change their water source because they thought it was safe. This, again, substantiates the effectiveness of the treatment in successfully making the treatment group understand that they were consuming high levels of arsenic. However, in columns (3) and (4) we do not see the treatment significantly affecting the perception of the treatment group about their water. This indicates that, even if the people in the treatment group were able to understand there was a certain problem that existed, we do not find that they were able to relate it back to issues in their own households.

1.5.6 Robustness checks

Using our data, we run additional analyses to ensure that the results presented in the section above also holds with different specifications.

Combining treatments. One potential concern for combining the treatments is that they have substantially different treatment effects. As shown in Table 1.A.2, there were no large differences in the sample included in the analysis. Furthermore,

we provide additional support in Table 1.A.3 that the two treatments did not significantly differ from each other when including the sample that was not physically interviewed at endline. This sample was not included in our main results, but if included, could present the treatments as having different effects. We therefore examine the two treatments for differences at endline for the sample that was included and the sample that was excluded. The results show that the treatments are comparable, also when including the sample that were interviewed over a phone survey two to three months after the intervention. We are therefore confident that the samples of the treatments are similar and combining them is appropriate.

Mental health. As an extra check on the results presented for the mental health effects of our treatment, we examined the results of our mental health outcomes with some supplementary specifications. Previous work has associated the consumption of arsenic water with negative mental health problems (Chowdhury, Krause, and Zimmermann, 2016). We find new evidence supporting the previous findings, but also provide new insights on the channels of arsenic affecting mental health that have remained unanswered. Previous literature proposes that arsenic consumption may worsen mental health physiologically, socially or psychologically. The physiological channel states that consuming arsenic affects brain functions, and thus increasing the likelihood of depression (Martinez, Kolb, Bell, Savage, and Allan, 2008). People might also become ill, which can further lower their mental health (Dolan, Peasgood, and White, 2008). The social channel shows that arsenic is perceived to be contagious, which can lead to social stigma (Hassan, Atkins, and Dunn, 2005; Brinkel, Khan, and Kraemer, 2009; George, Factor-Litvak, et al., 2013). Finally, the psychological channel claims that being in a situation where one observes the health effects of arsenic and knows that one‘s water source is not safe, might cause more worry and worsen mental health (Schwartz and Melech, 2000).

In Table 1.A.5 life satisfaction and loneliness measures are added to the model to explore if depression is linked with other psychological factors. We find these to be highly significant as well, with mental health being negatively correlated to life satisfaction and positively correlated to loneliness. This indicates that mental health is influenced by psychological channels in our context, as claimed in the literature. Controlling for beliefs about not interacting with people with skin diseases, we also find effects of social stigma due to skin playing a role in worsening mental health. We believe that the effects on mental health are driven by all three of the previously suggested channels. In Table 1.A.5, we included measures for two of the channels, which makes us believe that treatment effects support the importance of the physiological channel. The results thus suggest that our intervention improves mental health mainly through this channel.

Lasso regressions. To test for additional constraints, we also employ LASSO specifications for our analyses. Tables 1.A.7 to 1.A.9 show the results of the main outcomes with a different set of control variables. These control variables are deter-

mined through LASSO, which specifies the optimal number of controls for the regressions. This analysis took place in two stages. In the first stage for each of the models, we used our full set of control variables to determine what would be the optimal number of controls to use for an alternate OLS model. In the next stage we used only these particular control variables in the OLS regression. The variable indication treatment ($\alpha_1 T_1$) was present in every model. The results presented in the tables are similar to those shown in our main outcomes tables. This is a further verification that the model specification in the main results was done appropriately.

1.6 Conclusion

In this randomized controlled trial, we studied how a light touch information intervention can successfully improve healthy behavior for a rural population in Bihar, India. Specifically, we examined which factors are important for achieving behavior change. We implemented an audio-visual informational package for our sample explaining the effects of arsenic consumption and informing them about low-cost/low-effort mitigation techniques. Before the intervention, the sample was largely unaware about arsenic or its short- and long-term negative health impacts, such as skin problems, mental health issues, and cancer. The information intervention was successful in increasing knowledge and awareness about arsenic. The efficacy of the information intervention is highlighted in the water treatment practices that our sample started to employ in the eight-week gestation period. We find that the treatment group increased the take-up of positive water treatments and reduced unhealthy practices. This is evident in the reduction in measured arsenic quantity of their primary drinking water source. We see a sizable drop of five micrograms per liter in the treatment. The direct impacts on health for such an intervention are difficult to observe in a short time period, since accounting for real improvements in many of the health problems requires sustained changes. However, we find that our treatment group reported having a drop in depression on the PHQ-9 scale. The impact of arsenic on mental health has been documented in previous literature. Our study adds to the evidence by using a unique data set where mental health outcomes are collected from the field instead of using cross-sectional data. The results of the early effects of the intervention give ample indications to support the effectiveness of our intervention.

We proceed to explore the mechanisms of change in our context to elucidate how information interventions work. As suggested by the literature, we examined if social norms and beliefs were the channels through which these rectifications in health behavior took place. To do so, we made use of incentivized social norms experiments in the field. While we find some indications of changes in norms and beliefs in our treatment, at this point we do not have enough evidence to ascertain the role of social norms and beliefs-related changes in our context. Further data

collection could provide more evidence for sustained behavior change, knowledge retention, and long-term health impacts of the intervention.

There are still many avenues to be explored about information interventions as previous literature has reported mixed findings in the health context (Dupas and Miguel, 2017; Kremer, Rao, and Schilbach, 2019). The insights we provide are important in efforts to understand the impact of these types of interventions. For example, we find that, as a result of our experiment, the perceptions about the safety of water in our treatment group changed, as is seen in Table 1.A.4.

The method used to deliver information may also play an important role. With a light touch informational audio-visual, we were able to effectively seed information in our sample. The problem of groundwater arsenic is not unique to Bihar, and affects about 100 million people across the world, many of them unaware about the issue. Our findings are crucial as they speak for a methodological push in design and delivery of information packages. Information-based interventions can prove to be vital especially in the case of disaster management, where information must be spread in a way that quickly leads to behavior change. In the COVID-19 pandemic, a lot of information-based policies were used, and found to be important drivers of encouraging positive behavior during a pandemic. Further research should explore heterogeneity in populations that respond to a certain kind of information packaging (Ravallion, Walle, Dutta, and Murgai, 2015; La Ferrara, 2016; Banerjee, Ferrara, and Orozco, 2019). Extending the use of low-cost/low-effort interventions to other settings and behaviors of interest is promising ground for future work.

Table 1.6. Mechanisms of change in arsenic from baseline to endline

	(1) Social norms index	(2) Norm: Change at 1 unit of As	(3) "Clean water good for health"	(4) "Treated surface water is clean"	(5) "Poor people have no choice for water"	(6) Had arsenic conversation (past 1m)	(7) Do you know about arsenic?	(8) Knowledge about arsenic (max. 10)
Treatments	-0.008	0.160*	-0.061	-1.28	-7.714**	0.086***	0.138***	0.777***
	(0.009)	(0.083)	(1.488)	(2.789)	(3.291)	(0.017)	(0.033)	(0.163)
Change in Arsenic level	-0.01	0.121	0.267	5.784*	1.113	0.038*	0.009	0.025
	(0.01)	(0.088)	(1.795)	(3.463)	(3.193)	(0.02)	(0.033)	(0.154)
Treat * Change	0.002	-0.112	-1.375	-4.092	1.947	0.019	0.083*	0.352
	(0.013)	(0.104)	(2.352)	(4.107)	(4.134)	(0.035)	(0.048)	-0.241
Observations	1254	1254	1254	1254	1254	1254	1254	1254
Respondent Ctrl	✓	✓	✓	✓	✓	✓	✓	✓
Household Ctrl	✓	✓	✓	✓	✓	✓	✓	✓
Control mean at endline	0.478	-0.952	90.014	39.73	53.35	0.018	0.082	0.379
R^2	0.013	0.037	0.014	0.021	0.036	0.065	0.097	0.092

Note: OLS estimates shown for various outcomes and treatment groups interacting with dummy for change in arsenic level for household's primary drinking water between baseline and endline. Column (1) shows effects on the social norms index where higher values indicate healthier norms towards using water. Column (2) shows the responses for the social norm question pertaining to switching drinking water source at 1 unit (0.01 microgram/l) of arsenic where higher numbers indicate stronger norms for switching water source. Columns (3) (4) and (5) show results for belief questions pertaining to behavior around water. Here the respondent had to indicate how many people out of 100 in a village similar to theirs would have the stated belief. Column (6) shows results for a dummy indicating if the respondent had conversation related to arsenic in the groundwater in the past 1 month (30 days). Column (7) shows results for respondents who claimed to know about arsenic in a binary question. Column (8) shows score for the respondents who answered questions about arsenic in groundwater. They answered ten questions which were aggregated to get the arsenic score. All columns show results with respondent controls (age, gender, marital status, savings accounts education, patient choices in time preference game) and household controls (backward caste =1, number of savings accounts in household, and household asset index). Fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Appendix 1.A Additional Results

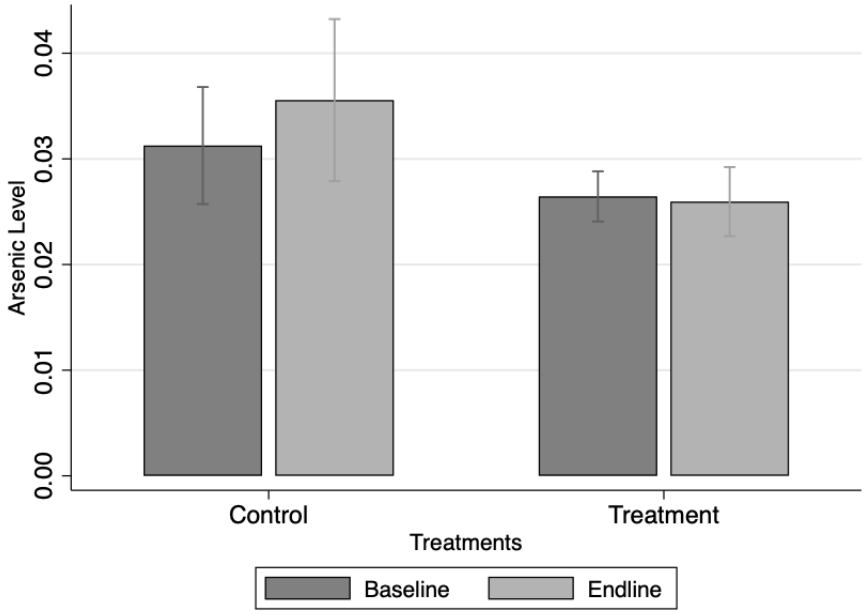


Figure 1.A.1. Arsenic level across treatments

Note: The figure shows arsenic level measured for 1,254 households at baseline and endline. There exists seasonal variation in arsenic content of the groundwater. At baseline (winter) the arsenic levels were lower, at endline (summer) the arsenic content increases across treatments. Here as the arsenic level in treatment did not significantly change, it shows that the overall level of arsenic declined.

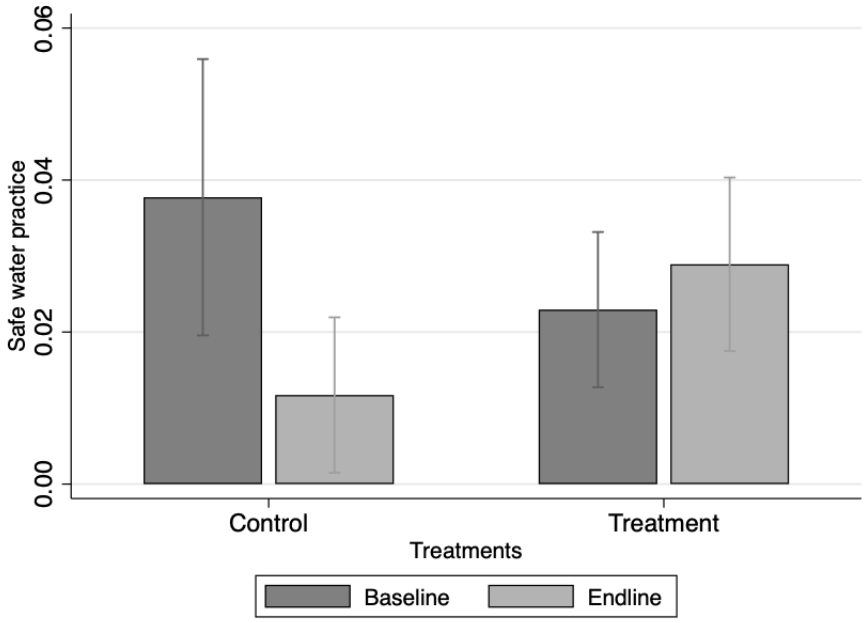


Figure 1.A.2. Safe water practices across treatments

Note: The figure shows safe water practices measured for 1,254 households at baseline and endline.

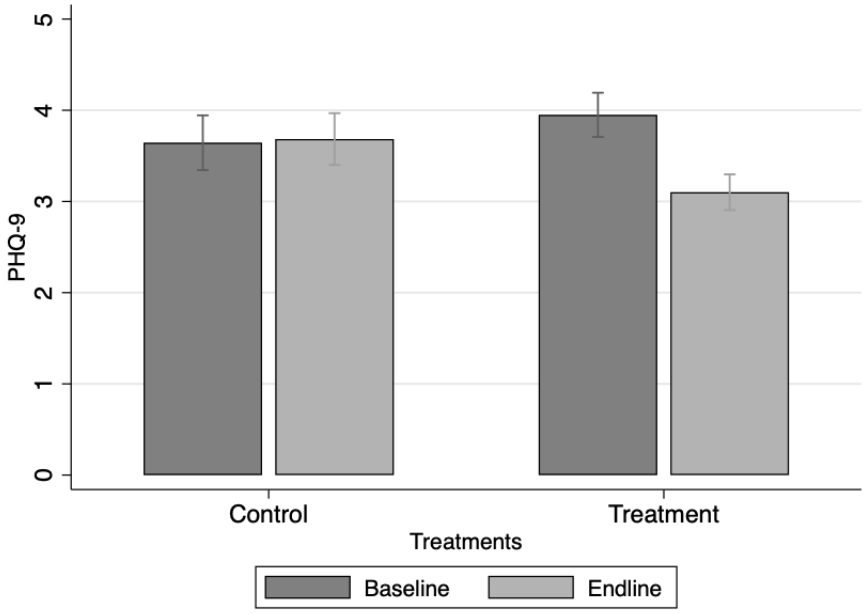


Figure 1.A.3. PHQ-9 across treatments

Note: The figure shows PHQ-9 depression index measured for 1,254 household heads at baseline and endline.

Table 1.A.1. Baseline balance between treatments and control - restricted sample

	(1) Control mean (SD)	(2) Treatments	(3) N
Age	40.48 (11.52)	1.2 (0.83)	1254
Female	0.61 (0.49)	-0.02 (0.04)	1254
Married	1.99 (0.05)	-0.01 (0.01)	1254
Years of education	3.71 (4.74)	-0.01 (0.41)	1254
Backward caste	0.8 (0.4)	-0.06 (0.07)	1254
Savings account for household head	0.64 (0.48)	0.02 (0.04)	1254
No. of savings accounts in the family	1.52 (1.34)	-0.07 (0.2)	1254
Asset index	8.44 (2.49)	0.18 (0.24)	1254
Joint test (p-value)		0.63	

Note: OLS estimates for baseline differences between the control and combined treatment arms. Column (1) shows the mean and standard deviation for the given outcome in the control group. Column (2) shows the estimates for the treatments compared to the control group, standard errors in parentheses. All columns include fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level. The last row shows the joint significance of the coefficients in the corresponding column from SUR estimation.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 1.A.2. Endline balance between individual and group treatments - restricted sample

	(1) Individual mean (SD)	(2) Group treatment	(3) N
Arsenic in primary drinking water	0.03	0	833
	(0.06)	(0.01)	
Do you know about arsenic?	0.26	-0.06	836
	(0.44)	(0.05)	
Knowledge about arsenic (max. 10)	1.37	-0.34	836
	(2.39)	(0.25)	
Had arsenic conversation (past 1m)	0.13	-0.04	836
	(0.34)	(0.03)	
Social norms index	0.42	-0.03***	836
	(0.1)	(0.01)	
Norm: Change at 1 unit of As	0.32	-0.02	836
	(0.62)	(0.07)	
“Clean water good for health”	89.33	0.42	836
	(17.13)	(1.75)	
“Treated surface water is clean”	38.38	2.18	836
	(26.09)	(2.46)	
“Poor people have no choice for water"	45.51	2.97	836
	(27.41)	(3.51)	
Joint test (p-value)		0.17	

Note: OLS estimates for baseline differences between the two treatment arms. Column (1) shows the mean and standard deviation for the given outcome in the individual group. Column (2) shows the estimates for the group treatment compared to the individual group, standard errors in parentheses.All columns include fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level. The last row shows the joint significance of the coefficients in the corresponding column from SUR estimation.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 1.A.3. Endline balance between individual and group treatments - entire sample as measured by the phone survey

	(1) Individual mean (SD)	(2) Group treatment	(3) N
Arsenic in primary drinking water	0.03 (0.06)	0 (0.01)	833
Do you know about arsenic?	0.23 (0.42)	-0.02 (0.04)	1592
Knowledge about arsenic (max. 10)	1.21 (2.34)	-0.12 (0.21)	1592
Had arsenic conversation (past 1m)	0.13 (0.34)	-0.04 (0.03)	1592
Social norms index	0.46 (0.16)	0 (0.01)	1592
Norm: Change at 1 unit of As	0.32 (0.62)	-0.02 (0.07)	836
“Clean water good for health”	89.26 (17.01)	0.27 (1.61)	1592
“Treated surface water is clean”	40.91 (28.35)	2.51 (2.5)	1592
“Poor people have no choice for water"	47.73 (27.28)	1.19 (2.58)	1592
Joint test (p-value)		0.95	

Note: OLS estimates for baseline differences between the two treatment arms. Column (1) shows the mean and standard deviation for the given outcome in the individual group. Column (2) shows the estimates for the group treatment compared to the individual group, standard errors in parentheses. For the rows that have N>1500, additional responses were collected using a phone survey. All columns include fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level. The last row shows the joint significance of the coefficients in the corresponding column from SUR estimation.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 1.A.4. Perceptions about drinking water safety

	(1) Difference between endline and baseline: Thinking water is safe	(2) No change in water source because it is safe	(3) Correct perception about safety of drinking water	(4) Correct perception about safety of water when it is safe
Treatments	-0.116**	0.088*	0.009	0.032
	(0.051)	(0.05)	(0.048)	(0.06)
Observations	1252	968	1254	1022
Respondent Ctrl	✓	✓	✓	✓
Household Ctrl	✓	✓	✓	✓
Control mean at endline	0.231	0.722	0.656	0.679
R^2	0.024	0.054	0.032	0.075

Note: OLS estimates for perception outcomes of the experiment. For each treatment outcome coefficient and standard errors in parentheses are mentioned. Column (1) shows the results for the difference between the values of endline and baseline for whether the respondent thought their drinking water was safe. Outcome is binary. Column (2) shows results for respondents who chose not to change their drinking water because they perceived it as safe. This outcome collected during the endline survey. Column (3) shows results for correct perception about water safety, i.e. mentioning their water is safe, when the arsenic test result shows it is safe, or mentioning it is unsafe when the test results show it is unsafe. Column (4) shows results for correct perception about safety of water when the arsenic test shows that the water is safe. All columns show results with respondent controls (age, gender, marital status, savings accounts, education, patient choices in time preference game) and household controls (backward caste =1, number of savings accounts in household, and household asset index). Fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 1.A.5. Treatment effects for mental health - controlling for psychological outcomes

	(1) Mental Health (PHQ-9)	(2) Mental Health (PHQ-9)	(3) Mental Health (PHQ-9)	(4) Mental Health (PHQ-9)
Treatments	-1.126***	-1.008***	-1.071***	-1.051***
	(0.396)	(0.329)	(0.377)	(0.317)
Life satisfaction	-0.174***			-0.171***
	(0.049)			(0.045)
Loneliness		2.669***		2.693***
		(0.219)		(0.212)
Stigma			0.540***	0.630***
			(0.130)	(0.120)
Observations	1247	1247	1247	1247
Respondent Ctrl	✓	✓	✓	✓
Household Ctrl	✓	✓	✓	✓
R^2	0.037	0.168	0.041	0.199

Note: OLS estimates shown for psychological outcomes and treatment groups. Column (4) shows effects on PHQ-9 mental health index, controlling for difference in loneliness (binary outcome) and difference in life satisfaction (Cantril's ladder 0-10) and difference in stigma (standardized belief that one should avoid contact with people who have skin diseases) . Columns (1) (2) and (3) control for these factors individually. The results are with respondent controls (age, gender, marital status, savings accounts education, patient choices in time preference game) and household controls (backward caste =1, number of savings accounts in household, and household asset index). Fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village. Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 1.A.6. Mechanisms of change in adopting better water treatment practices from baseline to endline

	(1) Social norms index	(2) Norm: Change at 1 unit of As	(3) "Clean water good for health"	(4) "Treated surface water is clean"	(5) "Poor people have no choice for water"	(6) Had arsenic conversation (past 1m)	(7) Do you know about arsenic?	(8) Knowledge about arsenic (max. 10)
Treatments	-0.008	0.126	-0.574	-2.445	-6.909**	0.091***	0.163***	0.884***
	(0.009)	(0.078)	(1.354)	(2.474)	(2.870)	(0.017)	(0.031)	(0.150)
Change in healthy treatment	0.025**	0.093	5.272	5.725	-4.970	-0.035	0.179	1.729
	(0.010)	(0.217)	(4.424)	(7.954)	(7.567)	(0.022)	(0.199)	(1.596)
Treat * Change	0.019	-0.091	-0.062	-11.718	1.930	0.074	0.067	-0.342
	(0.015)	(0.270)	(5.064)	(9.099)	(10.327)	(0.078)	(0.227)	(1.729)
Observations	1252	1252	1252	1252	1252	1252	1252	1252
Respondent Ctrl	✓	✓	✓	✓	✓	✓	✓	✓
Household Ctrl	✓	✓	✓	✓	✓	✓	✓	✓
Control mean at endline	0.474	0.188	89.961	41.712	53.967	0.029	0.081	0.364
R^2	0.014	0.035	0.015	0.017	0.034	0.058	0.095	0.096

Note: OLS estimates shown for various outcomes and treatment groups interacting with dummy for change in increasing healthy treatment of water for household's primary drinking water between baseline and endline. Column (1) shows effects on the social norms index where higher values indicate healthier norms towards using water. Column (2) shows the responses for the social norm question pertaining to switching drinking water source at 1 unit (0.01 microgram/l) of arsenic where higher numbers indicate stronger norms for switching water source. Columns (3) (4) and (5) show results for belief questions pertaining to behavior around water. Here the respondent had to indicate how many people out of 100 in a village similar to theirs would have the stated belief. Column (6) shows results for a dummy indicating if the respondent had conversation related to arsenic in the groundwater in the past 1 month (30 days). Column (7) shows results for respondents who claimed to know about arsenic in a binary question. Column (8) shows score for the respondents who answered questions about arsenic in groundwater. They answered ten questions which were aggregated to get the arsenic score. All columns show results with respondent controls (age, gender, marital status, savings accounts education, patient choices in time preference game) and household controls (backward caste =1, number of savings accounts in household, and household asset index). Fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 1.A.7. Changes in healthy treatment practices: LASSO regression

	(1) Positive change in water treatment	(2) Increase in healthy treatment	(3) Increase in unhealthy treatment
Treatments	0.032**	0.013*	-0.019*
	(0.014)	(0.007)	(0.011)
Observations	1252	1252	1252
Control mean at endline	-0.01	0.02	0.03
R^2	0.024	0.006	0.027

Note: OLS estimates for healthy treatment practices outcomes where only the controls specified from LASSO regressions are used. For each treatment outcome coefficient and standard errors in parentheses are mentioned. Column (1) shows the results for a reported change in practices for water treatment. Healthy treatment practices include the actions recommended in the informational video, such as, boiling or filtering surface water, resting tubewell water, using RO/bottled water, etc. Column (2) shows results for outcome where 1 = the changed treatment practice was healthy. Column (3) shows results for outcome where 1 = the changed treatment practice was unhealthy. Fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 1.A.8. Changes in arsenic level and knowledge about arsenic: LASSO regression

	(1) Arsenic in primary drinking water	(2) Do you know about arsenic?	(3) Knowledge about arsenic (max. 10)
Treatments	-0.005*	0.165***	0.875***
	(0.003)	(0.033)	(0.162)
Observations	1254	1254	1254
Control mean at endline	0.036	0.084	0.391
R^2	0.019	0.063	0.060

Note: OLS estimates presented for main outcome, where the outcome is the difference between the value at endline and at baseline. Restricted to only those with field activity at baseline and endline. Only the controls specified from LASSO regressions are used. Column (1) shows results for the two treatments for the measured arsenic quantity in the primary drinking water of the households measured at endline. Column (2) shows results for those who stated to know about arsenic in a binary question. Column (3) shows the score for the respondents who answered questions about arsenic in groundwater. They answered ten questions which were aggregated to get the arsenic score. The outcomes in this table are those that were prespecified in the pre-analysis plan. Fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 1.A.9. Difference in health outcomes at baseline and endline: LASSO regression

	(1) Skin problems	(2) Stomach problem	(3) Cancer, lung or liver problems	(4) Prop of family consulted Dr.	(5) Mental health (PHQ-9)
Treatments	-0.030	-0.073	0.007	-0.031	-1.035***
	(0.047)	(0.094)	(0.042)	(0.023)	(0.388)
Observations	1254	1254	1254	1254	1254
Control mean at endline	0.205	0.844	0.198	0.168	3.691
R^2	0.016	0.078	0.040	0.035	0.024

Note: Note: OLS estimates for health outcomes of the experiment where only the controls specified from LASSO regressions are used. For the treatments, outcome coefficient and standard errors in parentheses are mentioned. Column (1) shows results for occurrence of skin problems (including melanosis, hyperkeratosis, and other skin related issues) in the family. Column (2) shows results for occurrence of stomach related problems (gastritis, constipation, and diarrhea) in the family. Column (3) shows results for other severe illnesses in the family. Column (4) shows PHQ-9 mental health index where high values indicate more mental problems. Column (5) shows the results for proportion of family members that consulted the doctor in the past 1 month. Fixed effects are at the block level (administrative cluster of villages) and standard errors clustered at the village level.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Appendix 1.B Timeline

Control

Baseline Respondent data collection
Drinking water arsenic test
Intervention Showing of tiger conservation audio-visual
– Gestation Period *8 weeks –*
Endline Respondent data collection
Drinking water arsenic test

Treatment

Baseline Respondent data collection
Drinking water arsenic test
Intervention Showing of arsenic audio-visual
Revealing arsenic test result
– Gestation Period *8 weeks –*
Endline Respondent data collection
Drinking water arsenic test and results

Appendix 1.C Healthy Treatment Practices

Table 1.C.1. Healthy water treatment practices based on the source

Source/Treatment	None	Boil	Candle filter	Chlorine	Reverse osmosis	Cloth
Pond/river/surface water		✓	✓	✓	✓	
Tubewell with As					✓	
Tubewell without As	✓	✓	✓	✓	✓	✓
Well		✓	✓	✓	✓	
Waterfall/spring		✓	✓	✓	✓	
Rain water		✓	✓	✓	✓	
Bottled water	✓	✓	✓	✓	✓	✓
Borewell withs As					✓	
Borewell without As	✓	✓	✓	✓	✓	✓

Note: Most of the water sources and treatments were in these categories. An “other" category was created for both treatment and source which was determined to be healthy on a case by case basis.

Appendix 1.D Map

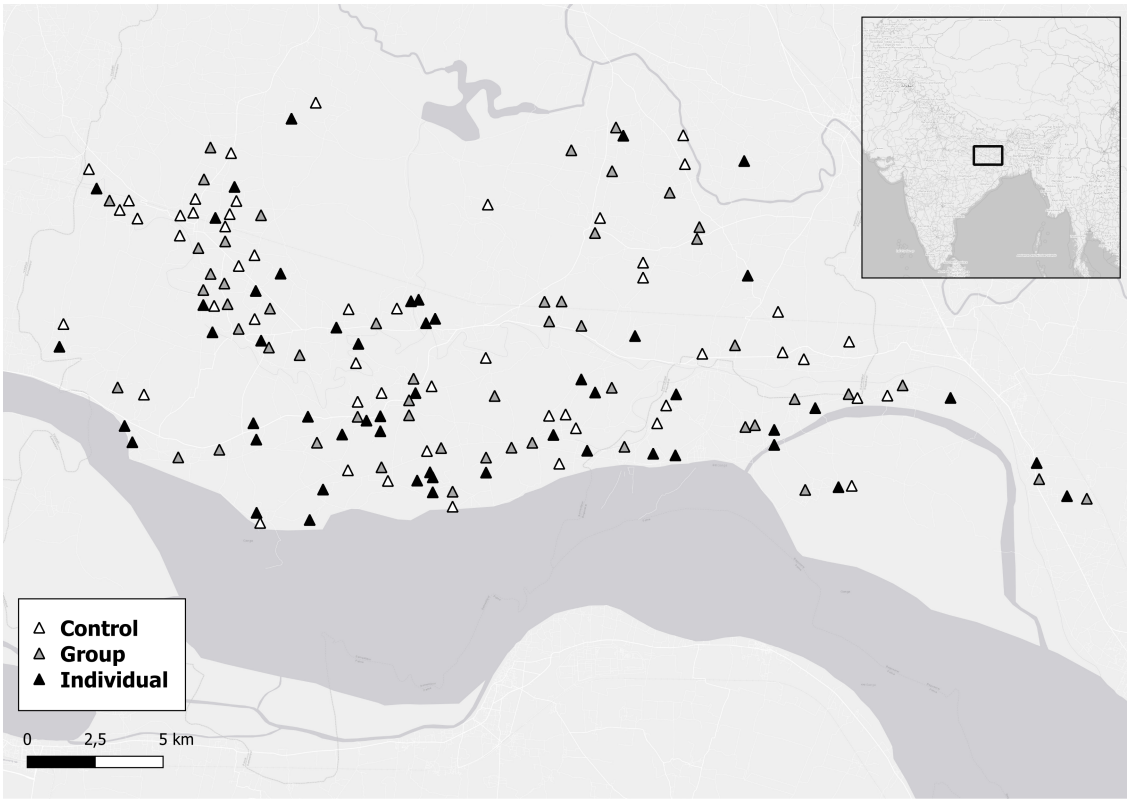


Figure 1.D.1. Map of treatment villages in Samastipur, Bihar

Appendix 1.E Survey

General Information

Name of respondent		
Relationship of respondent to household head?	○ Self	○ Spouse
Is the household head male?	○ Yes	○ No
What is your phone number?		
Alternate phone number for recharge?		
Service provider for phone		
Religion	○ Hindu ○ Muslim ○ Christian ○ Sikh ○ Jain ○ Other	
Caste	○ Scheduled Caste ○ Scheduled Tribe ○ OBC ○General ○ Other	

Time preferences[31]

Now I would like to ask you questions about amounts of money that you can receive at different times. For example, I can ask you if you would like to get 100 rupees tomorrow or 105 rupees in three months. There is no correct answer, I am interested in knowing your personal preference. At the end, one questions will be randomly chosen by the computer and the choice you would have made will be implemented. For example, if in the chosen option you have selected to get 100 rupees tomorrow, you will get 100 rupees through mobile recharge. If you have chosen to get 105 rupees in 3 months, then we will transfer 105 rupees to your mobile in three months' time. Remember, there is no correct answer, I am interested in knowing what your personal preference is.

Choice set 1

Payoff alternative	Payment Option A (pays amount below tomorrow)	Payment Option B (pays amount below after 3 months)	Annual interest rate in %	Preferred Payment Option (A or B)
1	100	105	20%	
2	100	110	40%	
3	100	120	80%	
4	100	125	100%	
5	100	150	200%	
6	100	200	400%	

Choice set 2

Payoff alternative	Payment Option A (pays amount below after 1 month)	Payment Option B (pays amount below after 4 months)	Annual interest rate in %	Preferred Payment Option (A or B)
1	100	105	20%	
2	100	110	40%	
3	100	120	80%	
4	100	125	100%	
5	100	150	200%	
6	100	200	400%	

31. We randomize which game is first between the time preferences and social norms.

Choice set 3

Payoff alternative	Payment Option A (pays amount below after 1 year)	Payment Option B (pays amount below after 1 year 3 months)	Annual interest rate in %	Preferred Payment Option (A or B)
1	100	105	20%	
2	100	110	40%	
3	100	120	80%	
4	100	125	100%	
5	100	150	200%	
6	100	200	400%	

Social norms

Now we will play a game with you in which you can win up to 150 rupees. In this game you will have to evaluate a person's behavior, by selecting an option. We will ask the same questions to many people in your village. If your selected response is the same as that of most other people in your village, you will receive 150 rupees. We will ask you 4 questions, and then from those we will randomly select one question to pay you, through mobile phone recharge.

In these questions we will ask you if this behavior is considered right or wrong. For each behavior you will have to judge how appropriate or how inappropriate it is considered in your village. Keep in mind that we will give you the prize money only when your randomly selected question has the answer which is the same as that of most people in your village.

For example think about this: Suresh is at a chai store, where he sees that there is a wallet left on a table. How appropriate will it be for Suresh to take the wallet?

Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate
○	○	○	○

Do you have any questions?
If this were the situation we asked you about in the study, you would indicate the extent to which you believe taking the wallet would be "socially appropriate" and "consistent with moral or proper social behavior" or "socially inappropriate" and "inconsistent with moral or proper social behavior". Recall that by socially appropriate we mean behavior that most people agree is the "correct" or "ethical" thing to do.

For example, suppose you thought that taking the wallet was very socially inappropriate. Then, you would indicate your response by selecting the first box.

For each choice you make, we will compare your response to the response of one other randomly selected participant to this village. If you give the same response as the one provided by the selected other participant, then you will receive 150 INR. This amount will be paid to you, later in the evening through a mobile recharge.

For instance, in the example situation above, if your response had been "somewhat socially inappropriate," then you would receive 150 INR if this was also the response provided by a randomly selected other participant in the village. Otherwise you would not receive any money for this question.

1. Suresh has a lot of skin problems. He has been falling sick and gets stomach pains often. He is a poor person from a low caste and does not have many resources. How appropriate is it for Suresh to drink water directly out of tubewell even if he suspects that the water is slightly dirty?

Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate
○	○	○	○

2. How appropriate would it be for Suresh to ask another person from a higher caste to use his well to get safe water?

Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate
○	○	○	○

3. After testing, Suresh finds out that the hand pump he uses has arsenic in it. How appropriate is it for him to prevent people from drinking water from that handpump?

Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate
○	○	○	○

4. Suresh goes to his neighbor's house. His neighbor offers him water from a hand pump that likely has arsenic in it. How appropriate would it be for Suresh to refuse drinking the water?

Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate
○	○	○	○

Risk preferences[32]

Similar to the other games, you can earn money in this game as well. How much money you will earn depends mainly on your decisions.

In this game, you need to select the gamble you would like to play from among six different gambles, which are listed below. You must select one and only one of these gambles. The computer will randomly select one gamble to pay. Each gamble has a HIGH and a LOW option. If the gamble you picked, also gets picked by the computer, you have 50% chance of getting the HIGH option and 50% chance of getting the LOW option.

Notice that the low outcome is decreasing and the high outcome is increasing for each successive gamble. For example, in the first gamble, both outcomes are identical. If you select it, in both HIGH and LOW, you get Rs. 25. If on the other hand, you had selected gamble no. 2, your payoff could be Rs. 22 or Rs. 48.

	Outcome	Payoff	Chance	Gamble selected
1	High	25	50%	
	Low	25	50%	
2	High	22	50%	
	Low	48	50%	
3	High	20	50%	
	Low	60	50%	
4	High	15	50%	
	Low	75	50%	
5	High	5	50%	
	Low	95	50%	
6	High	0	50%	
	Low	100	50%	

32. Collected only during the endline.

Household Roster

Member ID	Relationship to HH	Age	Gender	Primary employment	Marital status	Education
1						
2						
3						
4						
...						

Days of work/school missed due to illness/injury in past month	Arsenic symptoms	Healthcare treatment?	Smoker?	Migrated in the last year?	Diarrhea in past month?

Relationship to HH	Primary employment	Arsenic symptoms (pick multiple)
1. Self 2. Spouse 3. Own child 4. Step-child 5. Parent 6. Sibling 7. Grandparent 8. Grandchild 9. Cousin 10. Nephew/Niece 11. Son/dau-in-law 12. Bro/sis-in-law 13. Parent-in-law 14. Aunt/Uncle	1. Self-employed (agri) 2. Self-employed (non-agri) 3. Agricultural labor 4. Non-agriculture labor 5. Independent/skilled work 6. Own shop/business 7. Household work 8. Pension 9. Rental income 10. Regular wage/salary 11. Student 12. Does not work	1. Hyperkeratosis in palm and sole 2. Melanosis in palm and trunk 3. Other skin problem - irritation 4. Anemia 5. Gastritis 6. Liver problem 7. Constipation 8. Loss of appetite 9. Infertility 10. Irregular menstrual cycle 11. Asthma,or Bronchitis 12. Cancer 13. None

Beliefs

Statements:	0-100
1. I want you to imagine a village with 100 people. How many people out of 100, do you think believe it is OK to eat meat?	
2. I want you to imagine a village with 100 people. How many people out of 100, do you think believe that it is important to wash your hands after using the bathroom?	
3. I want you to imagine a village with 100 people. How many people out of 100, do you think are concerned about tiger conservation?	
4. I want you to imagine a village with 100 people. How many people out of 100, do you think believe clean water to be important for good health?	
5. I want you to imagine a village with 100 people. How many people out of 100, do you think believe that people with access to clean water should be willing to share their water with neighbors?	
6. I want you to imagine a village with 100 people. How many people out of 100, do you think believe it is easy to access surface water and clean it?	
7. I want you to imagine a village with 100 people. How many people out of 100, do you think believe that treated surface water can be a clean water source?	
8. I want you to imagine a village with 100 people. How many people out of 100, do you think believe that people with no money have no other choice than to drink from their current water source, even if it is bad for their health?	
9. I want you to imagine a village with 100 people. How many people out of 100, do you think believe that digging a deeper tubewell is too expensive?	
10. I want you to imagine a village with 100 people. How many people out of 100, do you think believe that one should avoid all contact with people having skin diseases?	
11. I want you to imagine a village with 100 people. How many people out of 100, do you think believe tubewells to be a clean and safe water source?	
12. I want you to imagine a village with 100 people. How many people out of 100, do you think believe that drinking dirty water is part of village life?	
13. I want you to imagine a village with 100 people. How many people out of 100, do you think believe that small investments for better health pays off in the long-run?	
14. I want you to imagine a village with 100 people. How many people out of 100, do you think believe that water that has been used for a long time without people getting sick is a good water source?	
15. I want you to imagine a village with 100 people. How many people out of 100, do you think believe that it's important to test if the drinking water is clean?	

Arsenic knowledge

Arsenic is an element that occurs naturally. It is found in drinking water, food, and air. If you ingest more than a certain amount of arsenic, it is toxic for the human body.
Now we will ask you some questions about arsenic. We only want to understand how much you know about it. You will not be getting a prize for this section, so please answer only what you know.

1. Do you have any knowledge about arsenic?	Yes/No
2. Many people in Bihar die from drinking arsenic in water	Yes/No/Don't know
3. Arsenic in the drinking water is visible	Yes/No/Don't know
4. It's possible to taste arsenic in drinking water	Yes/No/Don't know
5. Digging a deeper tubewell decreases arsenic exposure	Yes/No/Don't know
6. If you leave arsenic water overnight the top half become potable	Yes/No/Don't know
7. You should always boil water you use for drinking or cooking	Yes/No/Don't know
8. When you have arsenic in you tubewell, switching to another well is always a good option	Yes/No/Don't know
9. Tubewell water with arsenic is often healthier than treater surface water	Yes/No/Don't know
10. Using arsenic water can cause cancer and lung diseases	Yes/No/Don't know
11. Skin diseases caused by arsenic are contagious	Yes/No/Don't know

Water usage

1. Have you ever seen a public or NGO campaign about arsenic in the groundwater?	Yes/No/Not sure
2. Does the household own a tubewell or is there one within the compound?	Yes/No/Not sure
3. How deep is the tubewell? (feet)	
4. Has the tubewell been tested for arsenic?	Yes/No/Not sure
5. Was it considered safe?	Yes/No
6. Cooking and Drinking water *(same questions asked for each)*	
a. What is your primary source of cooking water?	○Pond/river/surface water ○Tubewell ○Piped water ○Well ○Waterfall/spring ○Rain water ○Buy bottled water ○Borewell ○Other
b. Has you HH changed primary cooking water source in the past 2 years?	Yes/No/Not sure
c. Do you know if there is arsenic in the primary cooking water?	○It is arsenic free ○Yes, it has arsenic ○Don't know
d. Do you know if there is iron in the primary cooking water	○It is iron free ○Yes, it has iron ○Don't know
e. Has primary cooking water been tested for arsenic?	Yes/No/Not sure
f. Do you treat the cooking water in any way before using it?	○No ○Boil it ○Filter with candle filter ○Chlorinate ○Filter with RO ○Filter with cloth ○Other
g. How frequently do you do this treatment?	○Always ○Usually ○Sometimes ○Rarely

h. Do you think your cooking water is safe?	Yes/No/Not sure
i. If you had an answer for the last question, how certain are you of this?	○Not certain ○Somewhat certain ○Very certain
j. Why do you think so?	○Seen the test/label (red) ○Everyone knows it ○Someone told me ○Close to other such sources ○Tubewell is deep ○From experience ○Water pot turns red ○Don't remember ○Other
k. Color of your cooking water	Clear/Brown/Yellow
l. How far is your primary cooking water source?	
7. Do you use the same drinking source for irrigation and animal feeding?	Yes/No/Not sure/Other
8. Would you consider getting an RO if you don't have one installed?	Yes/No/Not sure/Has RO
9. Do you know anyone that has arsenic in their primary drinking water?	Yes/No/Not sure
10. Do you know of anyone who has become sick due to dirty drinking water?	Yes/No/Not sure
11. Do you know anyone who has got a skin disease due to drinking water?	Yes/No/Not sure
12. How willing are you to change your primary drinking water source?	○Not willing ○Somewhat willing ○Very willing
13. How much water does the household use on an everyday basis?	○0-10 liters ○11-20 liters ○21-30 liters ○31-40 liters ○41-50 liters ○Above 50 liters
14. Do you know of a communal arsenic free water source in your village?	Yes/No

Preferences: Time and Risk

1. Please tell me, in general, **how willing or unwilling you are to take risks.** Please use a scale from 0 to 10, where 0 means you are ”completely unwilling to take risks” and a 10 means you are ”very willing to take risks”. You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

0 = Completely unwilling to take risks *Very willing to take risks = 10*

○	○	○	○	○	○	○	○	○	○	○
0	1	2	3	4	5	6	7	8	9	10

2. **How willing are you to give up something that is beneficial for you today in order to benefit more from that in the future?** Please again indicate your answer on a scale from 0 to 10, where 0 means you are “completely unwilling to do so” and a 10 means you are “very willing to do so”. You can also use any numbers between 0 and 10 to indicate where you fall on the scale, like 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

0 = Completely unwilling to do so *Very willing to do so = 10*

○	○	○	○	○	○	○	○	○	○	○
0	1	2	3	4	5	6	7	8	9	10

Connectivity

1. How many personal phone calls do you make on a daily basis? .....

Wealth/Asset Index

Now I will ask you about a few things, and you have to tell me whether you have them in your house or not.

	Have	Don't have
1. Mobile?	○	○
2. Electricity?	○	○
3. Radio?	○	○
4. Television?	○	○
5. Fan?	○	○
6. Mosquito net?	○	○
7. Bicycle?	○	○
8. Motorcycle/scooter?	○	○
9. Car?	○	○
10. Pair of shoes for everyone (sandals for women)?	○	○
11. Chair?	○	○
12. Gas stove?	○	○
13. Pressure cooker?	○	○
14. Pacca kitchen?	○	○
15. Pacca bathroom?	○	○
16. Antodaya card?	○	○

Savings

Member ID	Currently has an MFI loan? (Yes/No)	Amount of MFI Loan	Saves in other ways? (Yes/No)	Savings mechanism
1				
2				
3				
4				
...				

Savings mechanisms
1. Post bank
2. Village bank
3. SHG
4. Friend
5. Family member
6. Coworker
7. Employer
8. Commercial bank
9. Microfinance institution
10. At home
11. Moneylender
12. Other

Mental Health

A. *Patient Health Questionnaire (PHQ-9)* Over the last two weeks, how often have you been bothered by any of the following problems:

Options: Not all days/Several days/ More than half the days/ Nearly everyday

- Little interest or pleasure in doing things?
- Feeling down, depressed, or hopeless?
- Trouble falling or staying asleep, or sleeping too much?
- Feeling tired or having little energy?
- Poor appetite or overeating?
- Feeling bad about yourself - or that you are a failure or have let yourself or your family down?
- Trouble concentrating on things, such as reading the newspaper or watching television?
- Moving or speaking so slowly that other people could have noticed? Or the opposite - being so fidgety or restless that you have been moving around a lot more than usual?
- Thoughts that you would be better off dead,or of hurting yourself in some way?

B. *Loneliness*

Options: Yes/No/Don't know

During the past few weeks, did you ever feel very lonely or remote from other people?

Well-being and Trust

1. Some people believe that individuals can decide their own destiny, while others think that it is impossible to escape a predetermined fate. **Do you believe you can decide your own destiny?** Please tell me which comes closest to your view on this scale. 0 = “everything in life is determined by fate", 10 = “people shape their fate themselves".

0 = Everything in life is determined by fate										*People shape their fate themselves = 10*
○	○	○	○	○	○	○	○	○	○	○
0	1	2	3	4	5	6	7	8	9	10

2. How happy are you?

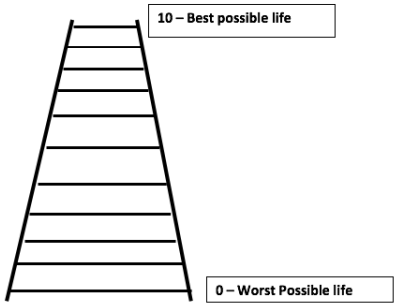
Very happy	Quite happy	Not very happy	Not at all happy
○	○	○	○

3. Can most people be trusted?

Most people can be trusted	You need to be very careful when dealing with people
○	○

4. Please imagine a ladder with steps numbered from 0 at the bottom to 10 at the top. Suppose we say that the top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. If the top step is 10 and the bottom step is 0, **on which step do you feel you personally stand at the present time**? 0 = “Worst possible life", 10 = “best possible life".

5. **On which step do you think you will stand about five years from now?**



Volume of conversation

1. In the past 30 days, did you speak about arsenic in the groundwater?	○Yes	○No
2. In how many of them did you approach other people so that you could discuss arsenic in the groundwater?		
3. In how many of them did someone else seek you out so that you could discuss arsenic in groundwater?		

Control group

The audio visual is shown after the respondent has completed the questionnaire. After watching the audio-visual, the respondent answers the following three questions:

Figure 1.E.1. Control - tiger conservation AV

1. How much did you like the video?

0 = Did not like at all *Liked very much = 10*

○	○	○	○	○	○	○	○	○	○	○
0	1	2	3	4	5	6	7	8	9	10

2. Did you relate to the video?

0 = Did not relate at all *Related very much = 10*

○	○	○	○	○	○	○	○	○	○	○
0	1	2	3	4	5	6	7	8	9	10

3. Did you learn anything new from the video?

0 = Did not learn anything new *Learned a lot of new things = 10*

○	○	○	○	○	○	○	○	○	○	○
0	1	2	3	4	5	6	7	8	9	10

Treatment groups

The audio visual is shown after the respondent has completed the questionnaire. After watching the audio-visual, the respondent answers the following three questions:

Figure 1.E.2. Treatment - arsenic AV

1. How much did you like the video?

   0 = Did not like at all ... *Liked very much = 10*

   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

   0 1 2 3 4 5 6 7 8 9 10

2. Did you relate to the video?

   0 = Did not relate at all ... *Related very much = 10*

   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

   0 1 2 3 4 5 6 7 8 9 10

3. Did you learn anything new from the video?

   0 = Did not learn anything new ... *Learned a lot of new things = 10*

   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

   0 1 2 3 4 5 6 7 8 9 10

Drinking water arsenic test

Arsenic tests are conducted following the standard procedure provided by ITS Econo-Quick test kit.

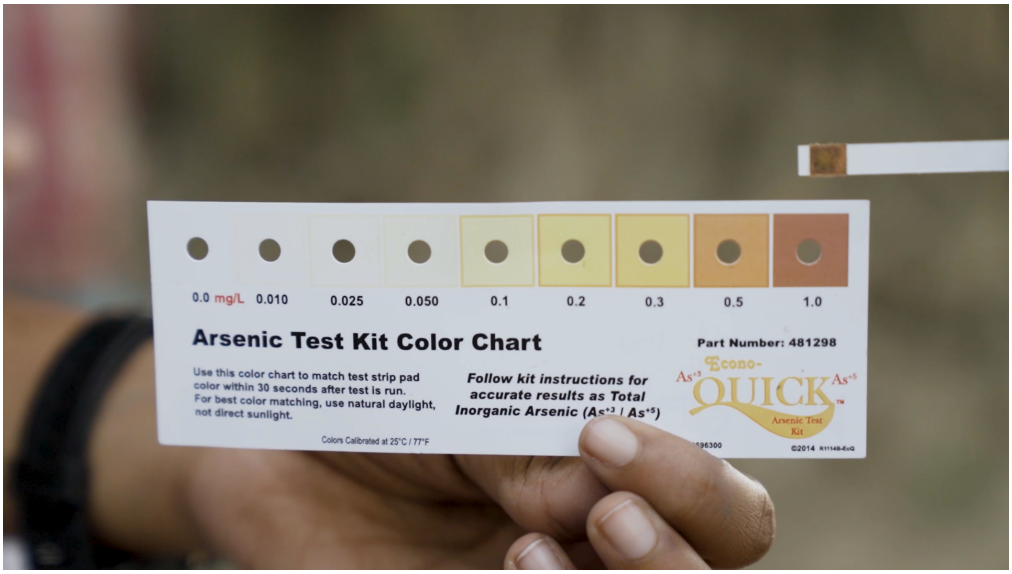


Figure 1.E.3. Arsenic scale

Arsenic quantity measured:

○	○	○	○	○	○	○	○	○
0	0.01	0.025	0.050	0.1	0.2	0.3	0.5	1

Conclusion

I have now completed your drinking water test and the test shows that the arsenic level is .... The limit of safe water in India is 10 μg/liter arsenic, more than that arsenic is considered dangerous.... μg/liter is present in your water drinking water. (show scale). It is above/below the safe limit. Water that contains any arsenic must be cleaned properly before consumption. This is the conclusion of the survey. Thank you for your time and have a nice day.

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Chapter 2

Trust in Government and Expectations about the COVID-19 Pandemic

2.1 Introduction

The COVID-19 pandemic gained international attention in the early days of 2020 when it was still in its nascent stages. Over the following weeks, nearly every country had to take federal action to protect their citizens and curb the spread of SARS-COV-2, the virus that causes COVID-19. The events of an epidemic at this scale were unprecedented and were underestimated in the initial days. The uncertainty of the situation could be seen in the actions of individual people and of policymakers alike.

This study uses the background of the COVID-19 pandemic to study trust in government actions and how that might influence expectations that one may have about the end of the pandemic. The policies instituted at the beginning of the pandemic presented a form of Knightian uncertainty[1] to the citizens of the world. While the federal governments of countries provided a loose end-date to the restrictions they had in place, it was hard to gauge when the situation would revert to a "business as usual" status. Within this structure of real-life events, this study is designed to understand how the changing public policies would impact the trust that citizens had towards their federal administrative bodies, and how this would further shape their expectations about conditions going back to normal.

1. The inability of institutions or individuals to effectively judge the riskiness of situations is termed Knightian uncertainty, which is distinguished from *risk* as it lacks any quantifiable knowledge about some possible future state. The concept is similar to *ambiguity* where the decision maker does not have sufficient information to objectively quantify the nature of the problem, but distinguishes itself as it presents a state where the nature of the problem is so complex that all states are not known and decision making is subjective, based on intuition and judgement (Langlois and Cosgel, 1993).

The rules implemented in the initial days of the panic created by COVID-19, more than anything else, focused on social distancing and self-quarantine. However, in democratic societies these measures can be difficult to implement by coercion (Allcott, Boxell, Conway, Gentzkow, Thaler, et al., 2020). Studies from previous epidemics suggest that it could be extremely important to observe how trust in government develops over time to ensure that individuals comply with rules (Blendon, Koonin, Benson, Cetron, Pollard, et al., 2008). When information is provisional or ambiguous, trust in officials is crucial, yet it can be difficult to maintain if there are too many contradictory statements (Holmes, 2008). When citizens trust communication during a pandemic, it increases motivation and intention to adopt or maintain the recommended self-protective efforts (Leavitt, 2003). Considering social distancing is the prime method to slow the spread of the disease, the return to pre-COVID conditions can therefore be sped up by adhering to the regulations. Shaping trust in the policies they implement can thus be significant for governments.

Forming trust in government's actions is important in democratic nations because the citizens of these countries will be more resistant to the use of force. It is therefore even more important for the authorities in these countries that the citizens have trust in them. For this study, the aim was to compare the pandemic reactions of two democratic governments, India and the USA, and how they were received by their citizens. It so happened that these countries went on to become the two most infected with COVID-19 in 2020 and 2021, but even before the pandemic they differed in how they trusted their federal authorities. According to the Edelman Trust Barometer (2019), the Indian government was among the "trusted" category with a score of 74 points, while the USA was in the "distrusted" category with a score of 39 points.

The study uses the different policies of these countries to understand public expectations and efforts. The study is divided into two broad sections, one taking place early on in the pandemic and the other extending outwards. In the first section we try to compare trust and expectations before and after the first deadline of regulation removal in India and the USA, when the USA decided to not extend it while India decided to extend the federal regulations. Phases 1 and 2 of data collection, took place to exploit the variation in these policies between the two countries at the beginning of the pandemic. This part of the study uses the difference in policies as a natural experimental setup. In this case, the setting renders itself to shifting reference points, by moving reopening dates. Under the uncertain conditions created by the pandemic, these reference points could impact trust in government. The findings of the study suggest that showing an ability to adapt to the uncertain conditions of the pandemic might have helped increase trust towards authorities in India. This increase in trust was coupled with a decline in positive beliefs about how well other people adhered to COVID-19 regulations. This could have led to diminishing efforts and expectations in India as compared to the USA.

In the second section, the results from the next phases of data collection are pre-

sented. These are follow-ups at specific time intervals to examine how trust, beliefs in other people's actions, and personal actions of individuals changed over time as the pandemic entered different waves in both countries. With the results in this section, it can be seen that trust in government continued to increase in India, while positive beliefs about others kept declining. The acts of individuals as conditional cooperators, who also had diminishing returns to following COVID-19 regulations, could have been a contributor to India's massive second wave of the pandemic in 2021.

The setup of this study took advantage of the changing current events in a pandemic that is continuing to evolve at the time this is being written. The findings can be directly used to evaluate the current situation. The insights can also be applied more generally to other scenarios with high-grade uncertainty for citizens, and a requirement for trust in governments to set expectations, for example climate change or other natural disasters. The results from the two countries should not be treated as representative of the general population of the countries,[2] but they still provide indications of how the factors at play could be modelled.

2.2 Firm government decision under uncertain conditions

Reference points and expectations have been shown to influence decisions. As per prospect theory (Kahneman and Tversky, 1979), individuals value the outcome of decisions based on internal reference points. By manipulating reference points endogenously, expectations and behaviors can be altered.[3] In a variety of settings, one can find effort being influenced by reference points, including physical activity (Allen, Dechow, Pope, and Wu, 2017), buying decisions (Kőszegi and Rabin, 2006), and charitable giving (Exley and Terry, 2019). Public policy at the beginning of the COVID-19 pandemic can be used as a natural setting where the reference point, i.e. the end of lockdown measures, was being altered in some cases but not in others.

When the COVID-19 pandemic reached a global influence in March 2020, governments of several countries implemented lockdown or related[4] measures. In both India and the USA, the government measures were implemented with a

2. However, the samples from the two countries may be considered comparable to each other as they are both similarly educated, with more than 15 years of education in both countries across the phases.

3. Abeler, Falk, Goette, and Huffman (2011) and Camerer, Babcock, Loewenstein, and Thaler (1997) have shown how higher expectations can act as nudges for influencing higher effort and outcomes.

4. In India there was a hard lockdown in place from March 24th, 2020 onward, initially for 21 days. In the USA, there was a COVID-19-based national emergency from March 13th, 2021 onward.

specific end date, May 31st, 2020,[5] but there was continued uncertainty about the damage that the pandemic could cause and when all the measures would be lifted. The high level of uncertainty caused by the pandemic could have had different effects on public perception of government actions as they decided to extend the deadline for the removal of COVID-19 regulations. While it can increase the sense of severity of the crisis, thereby improving compliance to the rules, it can also heighten anxiety or fatalism, thus potentially reducing respect for the rules (Briscese, Lacetera, Macis, and Tonin, 2020).[6] Higher trust in government actions could cause complacency in personal efforts towards following COVID-19 distancing rules.

Firmness in communication, and sticking to a particular date for reopening and lifting lockdown measures could indicate to the public that the situation related to the pandemic is under control. However, studies conducted in the initial days of the pandemic lockdowns showed increasing worries, mental health issues, and declining government trust (Fetzer, Witte, Hensel, Jachimowicz, Haushofer, et al., 2020) possibly due to the highly uncertain conditions. This leads to the assumption that government actions that show that they are willing to continue to work hard even in uncertain situations could increase trust in government as compared to ending COVID-19 regulations prematurely.

The end of the COVID-19 crisis has been fraught with uncertainties. Strict enforcement of social distancing rules was costly, and for a large part, ensuring compliance with the norms was voluntary. In this case, reducing the impact of transmissions by having individuals voluntarily comply with regulations becomes of critical importance for the government (Watanabe and Yabu, 2021). It thus, becomes crucial to understand what could motivate higher effort provision towards following COVID-19 regulations. It could be particularly challenging for people to comply with rules when it is difficult to internalize the negative effects that their behavior might have on other people, especially under changing government rules. This part of the study is an attempt to examine the removal of lockdown measures at the beginning of the pandemic and its links with trust towards the government, beliefs about what others were doing, personal effort towards following COVID-19 regulations and the expectations about the return to pre-COVID-19 normality.

There exists strong evidence in psychological literature to suggest that humans are uncertainty averse (Al-Najjar and Weinstein, 2009; Zeckhauser, 2010), and even ready to pay to reduce uncertainty (Lovallo and Kahneman, 2000). Events of high uncertainty can be perceived as more threatening (Slovic, 1987), but people may rely on trust towards the government to ameliorate the impact of

5. After the initial extension of lockdown measures on April 15th, 2021, this was the second time the Indian government was extending lockdown rules.

6. Brooks, Webster, Smith, Woodland, Wessely, et al. (2020) found negative short term psychological impacts of lockdowns, including anxiety and PTSD.

this threat (Lalot, Abrams, and Travaglino, 2021). This trust can act as a way to increase compliance with regulations (Levi and Stoker, 2000). Therefore, fewer changes in government rules might prompt more trust in government, so long as the overall uncertainty of the crisis is low. When the uncertainty related to the COVID-19 crisis is high, as it was in the initial stages of the pandemic, not changing regulations could be viewed as an inability of the government to adapt to the uncertain conditions. Trust towards the government would then increase with the modification of COVID-19-related rules as needed. In the sections below, the analysis looks at whether the removal of COVID-19 regulations in May 2020 impacted the trust in government actions in the USA as compared to India where the regulations were extended.

In the pandemic, following social restrictions is costly in the short-run and marginal benefits are harder to realize. The perceived costs can be higher if one feels that others are not contributing to public good, i.e. following COVID-19 regulations, in the same manner. Free riding by not adhering to the rules can be easy. People might act as conditional cooperators (Fischbacher, Gächter, and Fehr, 2001) and observe regulations only when they perceive that others are following them as well. On the other hand, it may be difficult to accurately gauge the behavior of others in a lockdown. Therefore an assumption of inactivity on the part of others could induce individuals to expend less effort towards following COVID-19 regulations. During the beginning of the pandemic, misperception about others' behavior was found to be increasing (Fetzer et al., 2020). This means, under decreasing positive beliefs about others and increasing trust towards the government, following distancing norms could have decreasing returns for individuals and they may become more lax about it.

In this study, this provision of effort is examined by looking at expectations towards a return to pre-COVID-19 normality. As per the "goal-gradient" effect,[7] exerting effort to reach a goal could make it seem closer (Bonezzi, Brendl, and De Angelis, 2011; Cryder, Loewenstein, and Seltman, 2013). To assess the effort made by individuals, the analysis looks at how soon they state the situation in their countries will return to normal. It is expected that higher effort towards adhering to the COVID-19 regulations would make the "goal" seem closer.

The analysis in the following sections compares survey data from India and the United States before and after the date of the intended end of federal restrictions[8] for COVID-19. The first phase of data was collected in the week of April 15th, 2020. At this point, there were federal regulations in both of the countries that were scheduled to end by April 30th, 2020. On the date of the expiration, where

7. The goal-gradient effect states that the further a person is to a goal, the less likely they are to exert effort to achieve it.

8. It should be noted that the US federal government had given the responsibility of maintaining the pandemic restrictions to the state governments. The local rules were different in each state.

the United States refrained from renewing the end date for the regulations, the Indian federal government extended the rules by two more weeks. The second phase of data was collected to study the impact of this change. This last-minute change is treated as a shifting of reference points under uncertainty in the context of this study. The impact of the USA's decision to stick to the date on government trust is compared to that of India's decision of not doing so. It is seen that government trust in India increases as a result of the rule change. Then we find that the survey participants in the USA expect the return to normality to be faster than the participants in India. Since we see no significant changes in government trust in the USA, but declining beliefs in others, the more positive expectations could be a result of higher effort provision towards the COVID-19 rules.

2.2.1 Conceptual Framework

As per the "goal-gradient" effect, higher effort is associated with expectation of more positive outcomes. In this case, the more positive outcome will be getting to a state where there is no threat of COVID-19, i.e. the individual would want the regulations to be lifted and situations to return to a pre-COVID-19 status. This means that the more effort the individual makes towards following COVID-19 regulations, the sooner they would expect the situations to return to normal.

The transition towards normality also depends on how others behave. Moreover, because individuals are conditional cooperators, the behavior of others, or the correct or incorrect beliefs they have about the behaviors of others, will determine their level of cooperation on effort provision towards COVID-19 rules. This is why there is a direct relationship between effort provision and beliefs about others. The expected utility from rule-following can be represented by:

$$U(x_i) = \begin{array}{c} \textit{Trust in government} + \\ \textit{Beliefs about others} + \\ \textit{Personal effort provision} \end{array} \tag{2.2.1}$$

Let X be the gain from increasing effort towards COVID-19 regulations. Then

$$X_{iT} = |L_d \times \delta Z_{iT} + \theta Y_{iT} - k| \tag{2.2.2}$$

Here δ is the coefficient of change in trust in government, θ is the coefficient of change in beliefs about others and k is a constant. The absolute values of the equation shows the gain from the change in government trust and belief about others, represented by Z_i and Y_i. L_d is the decision of the government to extend the lockdown period. Estimation of X_{iT} can show us how effort may change over time

period T, subject to the following assumptions.

Assumption 1: $Z_{t0} = Y_{t0}$
This indicates that in time period 0 the trust in government and beliefs about others will be the same. In our context, we can extrapolate that in the time before the COVID-19 crisis, trust in government and beliefs about others would be equal and unrelated as there is no exogenous shock otherwise.

Assumption 2: $Z_{it} + Y_{it} \leq k$
Because there are three components to utility for effort provision, the sum of government trust and beliefs about others cannot exceed the constant k.

Assumption 3: $\theta < 1$
In our case, we are assuming that positive beliefs about others decreases over time. This means that respondents feel that fewer and fewer of other people are following COVID-19 regulations. This could be the case as under isolation, it is hard to observe the behaviors of others which may cause sampling bias and decreasing beliefs. The decreasing positive beliefs about others in the COVID-19 era is also seen in Fetzer et al. (2020).

Given the pandemic conditions, Z_{iT} is a function of uncertainty caused by COVID-19. It is hypothesized that Z_{iT} is impacted by δ due to government decision making, L_d. The decision of the government, L_1 is a state where lockdown is extended and L_0 is a state where the lockdown is not extended. Then δ changes as,

$$d \in \begin{cases} 0 & \Rightarrow \delta \leq 1 \\ 1 & \Rightarrow \delta > 1 \end{cases} \tag{2.2.3}$$

In our case L_1 represents India and L_0 represents the USA. Trust increases with change in reference points or government decisions about lockdown when there is high uncertainty. This goes to say that in situations where there is high uncertainty, such as the initial days of COVID-19, no shift of reference points can indicate government inaction.

As trust in government increases, as in L_1, and beliefs about the actions of others decreases, for individual i the marginal gain from increasing effort will be low, while the marginal gain in L_0 will be higher in comparison as per equation 2.2.2. The model is represented in Appendix 2.B for ten time periods. It is further hypothesized that the higher gains from effort provisions will lead to expectations about a faster return to normality.

2.2.2 Data Collection and Methodology

The data was collected online for participants from India and the USA. At the start of the pandemic, India was slow to have a surge in COVID-19 cases, while the USA showed the highest number of infections. The data was collected at different time periods during which India and the USA became the top two countries with the highest number of COVID-19 infections.

Timeline. The survey was conducted over Amazon mTurk employing participants from India and the United States. For the results presented in this section, we are using only the data collected in the first (April 15th, 2020) and second phase (May 1st, 2020). There were two additional phases of data collection for which the results will be presented in subsequent sections. The third phase was scheduled on November 15th, 2020, which marked the furthest date for when the second phase participants indicated the return to pre-COVID-19 normality. The fourth phase took place on April 15th, 2021, which marked a one-year follow-up of the study and corresponded with the beginning of a second-wave of COVID-19 in India.

Survey measures. The survey was conducted online where participants were remunerated for their time answering the survey questions. In this survey they answered questions about their personal characteristics, expectations about reopening, government trust, beliefs and perceptions. More information about the survey measures and the questions are provided in Appendix 2.B.

Expectations about reopening: This module asked the participants to indicate dates on a calendar for when they expect different events to restart after COVID-19. This included items such as “removal of government lockdown measure”, “reopening of in-person schools”, and “return to a pre-COVID-19 state”. To calculate the measure, the number of days between the indicated date and the date of the survey was counted. The higher the number of days, the longer they expected the effects of the pandemic to last.

Government trust: A battery of questions was administered to measure the participants’ trust towards the government on a Likert scale where participants reacted to how much they trusted the actions of the federal government. The responses to these questions are standardized over each wave and used in the analysis separately. They are also combined into an index of the five questions. The index was standardized to a mean of zero and standard deviation of one over each phase of data collection to make up the government trust index.

Beliefs and Misperception: Second-order beliefs are measured by asking the participants “Out of 100 people in your country, how many… ” indulge in a particular behavior, which included “following government regulations”, “regularly washing hands for more than 20 seconds”, “refraining from social gathering”, etc. The participants were asked if they indulged personally in those behaviors, to calculate their actual actions. Individual level misperception is calculated as the difference

between the second-order beliefs about action of others in the community and the within-country mean of the personal actions of the participants in the survey. The difference was calculated separately for each item and then combined into an index which was standardized to a mean of zero and standard deviation of one over each phase of data collection.

2.2.3 Sample Characteristics

In addition to the survey modules mentioned above, personal characteristics of the participants were collected in each of the phases to be used as controls. A summary of the participant characteristics can be found in Table 2.2.1. In the latter phases, other COVID-19-related details were collected for the participants which could only be observed as the infection rates grew.

The data shows that there were more males in the Indian sample, about 75 percent, as compared to the US sample of about 55 percent. Both the samples had participants in their mid- to late-thirties across the waves and had about the same years of education. The sample in India contained more people who were married as compared to the US sample, which is consistent with the population statistics of the two countries.[9]

In the latter phases of data collection we also find that Indians were less

Table 2.2.1. Summary of participant characteristics

	Phase 1		Phase 2		Phase 3		Phase 4		Min	Max
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	India	USA	India	USA	India	USA	India	USA		
Male	0.75	0.55	0.73	0.63	0.75	0.51	0.73	0.49	0	1
	(0.43)	(0.50)	(0.45)	(0.48)	(0.43)	(0.50)	(0.45)	(0.50)		
Age	34.22	39.53	33.51	40.12	33.45	38.04	33.73	39.73	18	86
	(8.10)	(12.20)	(7.86)	(13.38)	(8.16)	(11.07)	(7.68)	(12.66)		
Years of education	15.74	15.38	15.66	15.52	15.77	15.73	15.78	15.72	11	19
	(1.25)	(1.88)	(1.23)	(1.76)	(1.20)	(1.70)	(1.30)	(1.85)		
Married	0.74	0.58	0.74	0.67	0.68	0.75	0.76	0.64	0	1
	(0.44)	(0.49)	(0.44)	(0.47)	(0.50)	(0.43)	(0.43)	(0.48)		
COVID Fatigue					0.55	0.64	0.57	0.69	0	1
					(0.50)	(0.48)	(0.50)	(0.46)		
Got COVID-19					0.2	0.19	0.19	0.14	0	1
					(0.40)	(0.40)	(0.39)	(0.35)		
Vaccinated							0.23	0.58	0	1
							(0.42)	(0.49)		
Observations	632	493	433	467	666	757	495	630		

Note: The table shows summary statistics of participants in the four phases of the study.

9. The data contains more married people than the national average for the age group in the USA (about 39 percent), according to CPS Census 2018, and fewer people than the national average for the age group in India (about 94 percent) according to Census 2011. The low number in India could be caused by the high literacy rate of the survey population selected by mTurk.

COVID fatigued, which could be because of regulations and behaviors becoming more relaxed over time. COVID fatigue is measured using a binary question. It is expected that if the COVID-19 regulations are in place for a long time restricting the actions of people, eventually they will start to grow tired of them. A similar proportion of our sample had a positive COVID-19 infection,[10] but we find that the level of vaccination in the USA, at about 60 percent, was vastly different from India where only about 23 percent of the population was vaccinated.[11]

2.2.4 Empirical Strategy

In this section of the study we are trying to answer two questions (1) if sticking to the reference point affected trust in government, and (2) if it caused positive expectations about future outcomes. Analyses are conducted by estimating the following OLS regression model:

$$G_i = \alpha + \beta * NoExt + \boldsymbol{W_i} + \varepsilon_i \tag{2.2.4}$$

Here G_i are the different components of government trust and beliefs about others, *NoExt* is the interaction of the dummy variable for phase 2, where the no extension decision was made and the dummy variable for the country which decided to reopen, which is the USA, $\boldsymbol{W_i}$ is the vector of personal characteristics of the respondent and E_i is the error term.

The second question examines if the decision to not move the reference point affected the expectations about future reopening of the country and a return to normality. Analyses are conducted by estimation following the OLS regression model:

$$Y_i = \alpha + \beta * NoExt + \boldsymbol{P_i} + \boldsymbol{W_i} + \varepsilon_i \tag{2.2.5}$$

Here Y_i are the outcomes of expectations, $\boldsymbol{P_i}$ is the vector of trust and misperception indices. All other components of the model remain the same as equation 2.2.4.

2.2.5 Results: Trust and Expectations

Decline in government trust upon not extending federal COVID-19 regulations. Table 2.2.2 shows results for how different aspects of government trust changes in the USA in the second phase of data collection. There is a 21 percent of a standard

10. With the exception of the USA in phase 4, where only 14 percent of the sample was ever COVID positive.

11. At the point of the fourth phase of data collection, only 7.42 percent of the India population was vaccinated with at least one dose. The high proportion of vaccination is because of oversampling in southern states of India where the vaccination rates were higher.

deviation decrease ($p<0.01$) in appropriateness of government reaction. A possible explanation for the 25 percent of a standard deviation increase in government truthfulness ($p<0.05$) could be the fast rising number of daily COVID-19 infections in the USA. While there was clarity about the number of people being infected in the USA, the infection rates in India still remained low. The regulations kept getting more stringent, nonetheless. This could have led to skepticism about the information that was being revealed. This result is in line with the model and hypothesis presented in the section above, which stated that trust in government would go up with the decision to extend the lockdown measures.

Increased personal effort and expectations of early return to pre-COVID-19 states. In Table 2.2.3 the outcomes of the OLS regressions contain the dependent variable indicating the number of days it would take to reopen different parts of society from the date the survey was conducted. It is seen here that in several dimensions, the removal of lockdown in the USA decreased the number of days until the return to normality, with schools reopening 20 days earlier ($p<0.01$), shops reopening about eight days earlier ($p<0.01$), and public transportation and domestic travel functioning normally about ten days earlier ($p<0.01$). Perhaps most notably, the return to pre-COVID-19 conditions is placed at about 43 days earlier in the USA ($p<0.01$). While this might seem counterintuitive at first given our earlier result of declining trust in government, this finding is in line with our model, which indicates that under uncertain conditions, lack of trust might prompt an increase in personal effort and thereby an expectation of a faster return to normality. This is further strengthened by the outcome in column (1), which is related directly to government actions and not personal efforts. In the table we do not see a significant relationship for this outcome, possibly because the removal of COVID-19 restrictions by the government could not be sped up by individuals exerting more effort to take precautions.

The results presented in Table 2.2.4 provide possible reasoning for the increase in personal effort in the USA. It can be seen in Table 2.2.4 that the decrease in beliefs about other's efforts is significant in the case of India. According to the utility function presented in equation 2.2.1, trust in government should increase for the utility to remain constant. The results presented in the government trust panel point in this very direction. In the panel indicating results for the USA, we find weak and not significant differences in trust towards government, but decrease in beliefs about others. To remain consistent with the model, there would be a need for an increase in personal effort. Extrapolating from the expectations of faster return to normality seen in the US, it can be said that increased effort provision existed in this population as compared to India's.

Table 2.2.2. Effect of not extending lockdown measures on components of government trust

	(1) Appropriate government reaction	(2) Truthfulness	(3) Appropriate punishments	(4) Trust to take care of citizens	(5) Less worried about family's health
No extension * USA	-0.21**	0.25**	-0.07	-0.16	0.02
	(0.09)	(0.10)	(0.09)	(0.10)	(0.04)
No extension	0.19***	-0.17***	0.09	0.19***	-0.03
	(0.06)	(0.06)	(0.06)	(0.07)	(0.02)
USA	0.45***	-0.85***	0.08	0.85***	0.28***
	(0.06)	(0.07)	(0.06)	(0.07)	(0.03)
Observations	2025	2025	2025	2025	2025
R^2	0.05	0.14	0.01	0.14	0.14
Mean for Ctrl grp	2.80	3.99	2.84	2.41	1.19
SD for Ctrl grp	0.97	1.10	0.94	1.22	0.40

Note: OLS estimates shown here for different components of government trust. The rows show the coefficients for no extension of federal lockdown measures as of May 1st 2020, the sample from the USA, and the interaction between the two. All columns show results with respondent level controls (gender, age, marital status, and years of education). Standard errors shown in parentheses.
Significance at * p <0.10, ** p <0.05, *** p <0.01.

Table 2.2.3. Effect of not extending lockdown measures on expectations of reopening - number of days

	(1) End of lockdown	(2) Schools reopen	(3) Shops reopen	(4) Public transport reopens	(5) Domestic travel normal	(6) International travel normal	(7) Pre-COVID-19 state
No ext * USA	-4.22	-20.15***	-8.01***	-10.14***	-12.35***	-11.18*	-42.95***
	(4.01)	(4.47)	(2.32)	(3.11)	(4.31)	(6.27)	(13.23)
No extension	3.71*	16.68***	2.05	10.04***	11.47***	16.38***	30.26***
	(2.00)	(2.49)	(1.34)	(1.80)	(2.40)	(3.60)	(6.63)
USA	27.81***	51.32***	22.30***	22.53***	34.27***	45.98***	117.91***
	(2.76)	(3.08)	(1.61)	(2.12)	(2.95)	(4.31)	(9.25)
Gov trust	1.54	2.93***	1.07*	1.38*	1.78*	3.68**	18.51***
	(1.00)	(1.10)	(0.60)	(0.76)	(1.02)	(1.50)	(3.26)
Misperception	0.65	0.57	-0.38	0.73	0.51	2.28	14.73***
	(1.08)	(1.23)	(0.61)	(0.79)	(1.11)	(1.61)	(3.29)
Observations	1733	2025	2025	2025	2025	2025	2025
R^2	0.12	0.25	0.13	0.10	0.12	0.12	0.20
Mean for Ctrl grp	25.84	51.10	22.30	30.75	36.02	55.16	79.97
SD for Ctrl grp	26.41	29.19	19.76	24.86	32.10	53.87	97.29

Note: OLS estimates shown here for number of days from the day of the survey that the respondents expect different parts of the society to revert to functioning normally. The rows show the coefficients for no extension of federal lockdown measures as of May 1st 2020, the sample from the USA, and the interaction between the two. All columns show results with respondent level controls (gender, age, marital status, and years of education). Standard errors shown in parentheses.
Significance at * p <0.10, ** p <0.05, *** p <0.01.

Table 2.2.4. Differences in mean of components of trust in government and beliefs in other between phases 1 and 2

	India		USA	
	(1)	(2)	(3)	(4)
Trust in government	Diff (T<t)	tstat	Diff (T<t)	tstat
Appropriate government reaction towards lockdowns	-0.232 ***	-4.024	0.063	1.011
Truthfulness of government about COVID-19	0.152	2.473	-0.123 *	-1.614
Appropriate government reaction wrt fines/punishments	-0.087 **	-1.56	0	0.002
Trust in government to take care of citizens	-0.210 ***	-2.99	0.013	0.19
Government capable of managing COVID-19	0.015	0.692	-0.005	-0.17
Beliefs about others	Diff (T>t)	tstat	Diff (T>t)	tstat
Following government's orders related to COVID-19	6.540 ***	5.326	3.822 ***	3.034
Regularly wash hands for at least 20 seconds	5.008 ***	3.436	1.111	0.767
Refrain from participation in social gathering	5.895 ***	4.211	2.558 **	1.93
Will consult a doctor upon symptoms	6.442 ***	4.497	2.517 **	1.846
Will face job-related difficulties	1.238	0.798	0.106	0.07

Note: The table shows differences in overall mean of different components between phases 1 and 2. Columns (1) and (2) mention results from India, and columns (3) and (4) mention results from the USA. Difference in mean significant as per one-sample t-Test.
Significance at * p <0.10, ** p <0.05, *** p <0.01.

2.3 Trust and beliefs about others over time

The situations related to COVID-19 in both India and the USA changed dramatically in the months following the initial phases of the surveys outlined in section 2.2. In order to study how the beliefs of the population in the two countries evolved over time, two additional phases of data collection took place in November 2020 and in April 2021. In the second phase of data collection, on average the participants from India denoted August 15th 2020 as the date of return to pre-COVD-19 conditions, and the participants from the USA indicated that the date would be November 15th, 2020. To conduct the third phase of data collection, the week of November 15th, 2020 was selected as the more-conservative limit. In the months after the third phase of data collection, several changes in COVID-19 situations occurred in India and the USA. The rate of vaccinations increased steadily in the USA.[12] While infections were on the decline for the latter part of 2020 in India,[13] it started rising dramatically in March 2021, leading to another wave of COVID-19, which included the proliferation of a stronger variant. A last phase of data collection starting April 15th, 2021 marked a one-year follow-up of the study and also examined how the changing conditions impacted the outcomes.

12. The USA started vaccinating all people on December 21s,t 2020

13. The daily COVID-19 infections peaked in India during October 2020, for its first wave and was on a steady decline thereafter until mid-March 2021 when it peaked again.

Using the background of the changing situations in both countries, this section attempts to explore if government trust and beliefs about others changed at different points in the COVID-19 cycle and if they can be used to explain the COVID-19 public reactions.

2.3.1 Description of background

These phases of data were collected in a similar set-up as the previous phases, with the exception that it did not look to exploit policy changes. At this time, given that there were more localized policies being implemented in areas, different aspects of society had adapted to the changed situation. Moreover, November 2020 marked a change of federal government for the USA, when a different party was elected. However, in our data we still do not find significant changes in government trust in the USA in phase 3 possibly because the regulations were still being handled by the previous government for the time being.

2.3.2 Results: Follow-up

Government trust increases over time in India. Following up from phases 1 and 2, the data in phases 3 and 4 show that the index of government trust is on an upward trend over time in India, while it remains about stable in the USA as can be seen in Figure 2.3.2. On accounts like capability in managing COVID-19 (diff=-0.178, $p<0.01$), and caring for citizens (diff=-0.340, $p< 0.01$), the Indian government's actions were seen favorably by the population. This is most likely a reflection of the declining COVID-19 infections in India during that period.[14] The fall in COVID-19 infection numbers could also be seen with some form of skepticism about the numbers being reported, thus we see an indication of a decline in truthfulness of the government during phase 3, but the difference is not significant, as can be seen in Table 2.3.1.

In the USA, government trust is not statistically different in phase 3 as compared to phase 2. The survey period of phase 3 corresponded with a continued rising trend of COVID-19 infections in the USA, where the daily infections were the highest they had ever been, with a seven-day moving average of 145,810. In the period between phase 3 and 4, there was very rapid action from the government, to the extent that a major portion of the population was being quickly vaccinated and infections were on a steady decline. In the data we see a decline in appropriateness of government action during the last phase (diff = 0.115, p-val<0.05).

14. On November 15th 2020, the seven-day moving average for COVID-19 infections in India was 43,832, which was similar to the levels at the end of July 2020.

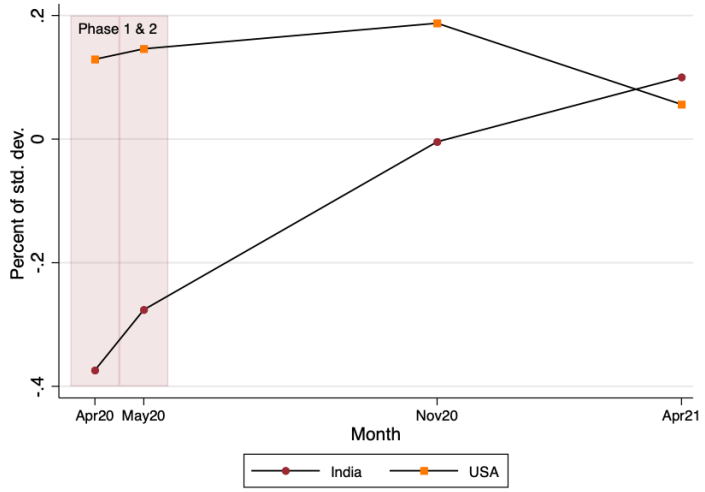

Figure 2.3.1. Government trust index over four phases

Note: The figure shows the progression of the full government trust index in the two countries over the course of one year from April 2020 to April 2021. Phases 1 and 2 where the data was collected for the firm government policy part of the study (Section 2.2) is shaded.

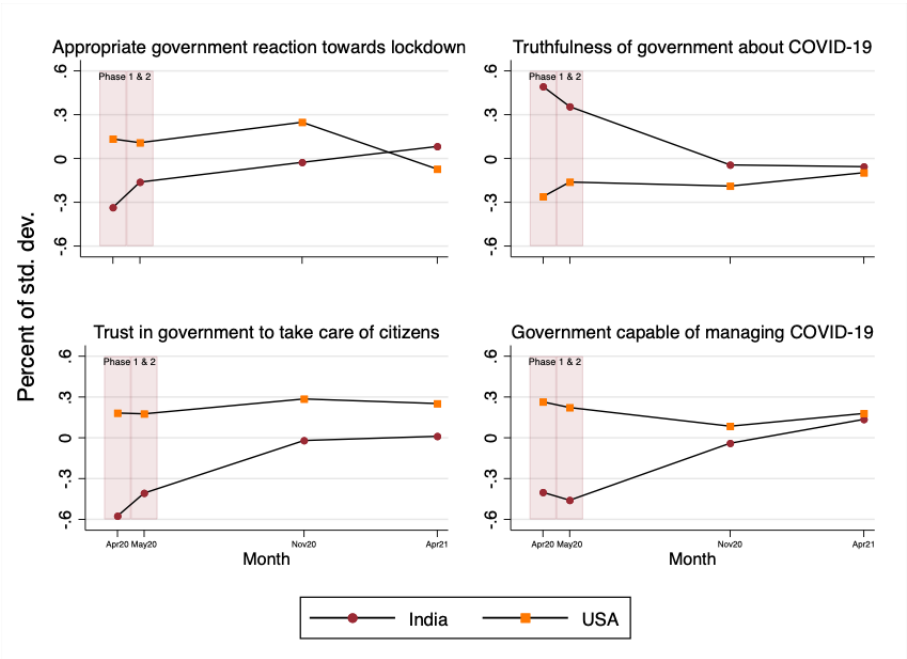

Figure 2.3.2. Government trust components over four phases

Note: The figure shows the progression of a subset of the components of the government trust index in the two countries over the course of one year from April 2020 to April 2021. Phases 1 and 2 where the data was collected for the firm government policy part of the study (Section 2.2) is shaded.

Beliefs about others declines in both countries for phase 3. With the passage of time in November 2020 the beliefs about others in both countries decline, which goes to say that fewer people in phase 3 believed that others were behaving positively to follow COVID-19 regulations. This change was smaller in the USA as compared to India. Particularly for regular hand-washing, the decline in the USA was about five fewer people ($p<0.01$), whereas the decline in India was about 12 fewer people out of 100 ($p<0.01$). On other parameters, such as refraining from social gathering, following government orders, and consulting doctors, the participants from India showed far less positive beliefs than those in the USA, as can be seen in Table 2.3.1.

Table 2.3.1. Differences in mean of components of trust in government and beliefs in other between phase 2 and 3

	India		USA	
	(1)	(2)	(3)	(4)
Trust in government	Diff (T<t)	tstat	Diff (T<t)	tstat
Appropriate government reaction towards lockdowns	-0.051	-0.892	-0.115 **	-1.918
Truthfulness of government about COVID-19	0.459	7.371	-0.066	-0.979
Appropriate government reaction wrt fines/punishments	-0.063	-1.147	-0.052	-0.895
Trust in government to take care of citizens	-0.340 ***	-5.083	-0.075	-1.258
Government capable of managing COVID-19	-0.178 ***	-7.029	0.121	4.468
Beliefs in others	Diff (T>t)	tstat	Diff (T>t)	tstat
Following government's orders related to COVID-19	12.380 ***	8.979	5.474 ***	4.447
Regularly wash hands for at least 20 seconds	10.522 ***	6.777	3.050 **	2.325
Refrain from participation in social gathering	13.611 ***	9.395	7.591 ***	6.028
Will consult a doctor upon symptoms	8.344 ***	5.726	3.781 **	3.089
Will face job-related difficulties	3.782 ***	2.458	0.246	0.17

Note: The table shows differences in overall mean of different components between phases 1 and 2. Columns (1) and (2) mention results from India, and columns (3) and (4) mention results from the USA. Difference in mean significant as per one-sample t-Test.
Significance at * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

These results follow a similar trend to the results in previous sections, where there is declining beliefs about others and rising trust in government in India, and declining beliefs about others, but no change in trust towards the government in the USA. In India's case, if it were to inspire personal inaction, despite the falling COVID-19 cases, the expectations of a return to normality would be later than the USA. It is further seen in Table 2.3.2, that in phase 3, the USA has more positive expectations about a return to pre-COVID-19 states (β=-49.13, $p<0.01$) as compared to India. This can be indicative of higher degrees of personal effort in the country. Additionally, they are also less worried about their own and their family's health because of these positive expectations.

It can further be said that the lack of personal effort towards following COVID-19 regulations could have been a contributing factor in the rise of the second wave

of COVID-19 in the country, which started in March 2021. The occurrence of the second wave is the likely reason for beliefs about others to rise again in phase 4 in India, but continue to decline in the USA as seen in Figure 2.A.1 and Figure 2.A.2.

Table 2.3.2. Expectations during November 2020 compared to May 2020

	(1) Days to pre-COVID-19 state	(2) Less worried about health	(3) Less worried about family's health
Nov 2020 * USA	-49.13***	0.27***	0.37***
	(13.50)	(0.10)	(0.10)
Nov 2020	35.37***	-0.31***	-0.39***
	(8.65)	(0.07)	(0.08)
USA	72.04***	0.03	0.04
	(10.22)	(0.08)	(0.09)
Gov trust	14.15***	-0.01	-0.09***
	(3.41)	(0.03)	(0.03)
Misperception	34.16***	0.06**	0.03
	(3.59)	(0.03)	(0.03)
Observations	2323	2323	2323
R^2	0.12	0.02	0.03
Mean for Ctrl grp	108.60	2.88	2.46
SD for Ctrl grp	110.98	1.20	1.28

Note: OLS estimates shown here for different outcomes collected in November 2020 (phase 3 of data collection). They are being compared to the outcome collected in May 2020. The rows show the coefficients for phase 3 of data collection in November 2020, the sample from the USA, and the interaction between the two. All columns show results with respondent level controls (gender, age, marital status, and years of education). Standard errors shown in parentheses.
Significance at * p <0.10, ** p <0.05, *** p <0.01.

2.4 Conclusion

The COVID-19 pandemic presented a situation that was novel and unanticipated to most of the world's population. The likely shocks from the changes caused by the pandemic were inevitable. Using this unlikely natural change as the background, this project aims to understand better how trust in government, beliefs about others, and personal actions were linked. This chapter uses data collected online from India and the USA to examine how these outcomes develop over time with the COVID-19 pandemic. We create a model to show that rise in government trust and fall in positive beliefs about others, when overall environmental situations are uncertain, could be factors linked to decreased personal actions as reflected in expectations about the future. In addition to the results presented in the sections above, the data also renders itself to training of a model to predict personal efforts to get vaccinated based on simple input variables. This model further justifies the hypotheses in this chap-

ter stating higher trust might be negatively correlated with personal efforts (model presented in Appendix 2.C). The findings from this study and could be applied to the continually changing nature of policy during the pandemic.

The scope of the chapter is limited by the nature of the data, which was collected from an online panel. It would be more beneficial to track changes in the variables studied here with a repeated sample. Under the limitations of the data collection, the high attrition rate could not be mitigated and each phase had to be re-sampled. Nonetheless, it elucidates areas where further research in this domain can take place.

As the ongoing pandemic still presents a situation of uncertainty, using the background of this study further research can look into development of dynamic models to predict public actions based on their trust, beliefs, and expectations. Outside the scope of the COVID-19 pandemic, the policy changes in relation to climate change could also be an interesting avenue to study personal effort provision and trust in government.

Appendix 2.A Additional Results

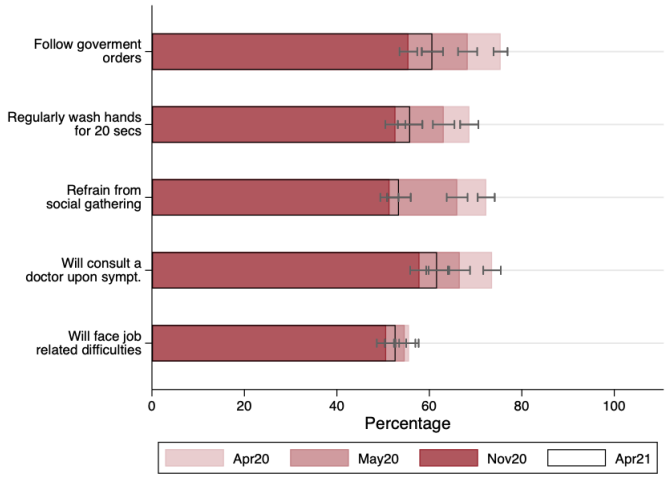

Figure 2.A.1. Beliefs about others over four phases (India)

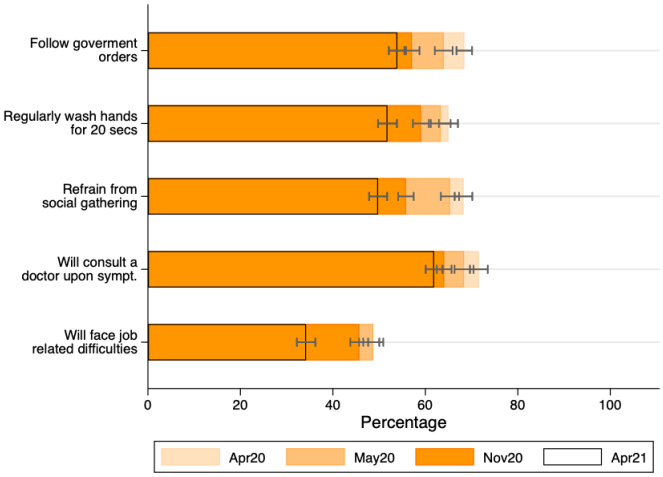

Figure 2.A.2. Beliefs about others over four phases (USA)

Note: Figures 2.A.1 and 2.A.2 show the progression of different components of beliefs about others over four phases of data collection from April 2020 to April 2021. Higher values indicate more positive beliefs about others.

2.A.1 Progression of COVID-19 in India and the USA

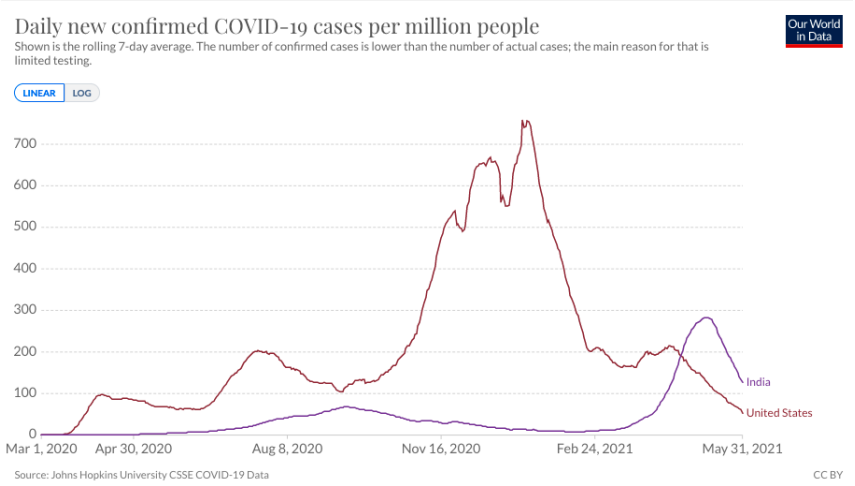

Figure 2.A.3. Daily new confirmed COVID-19 cases per million people

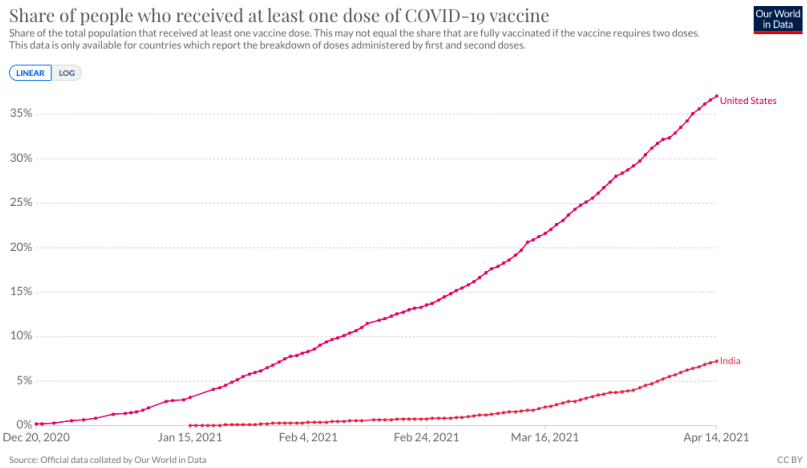

Figure 2.A.4. Share of people who received at least one dose of COVID-19 vaccine

The figures above are sourced from Our World in Data. They show how the number of COVID-19 cases and vaccinations in the two countries changed over time. When looking at these figures, the different populations of India and the USA should be kept in mind. At the peak of the daily infections in the USA, the total number of new cases was 300,777 (January 8th, 2021). In India, the number was 414,188 (May 6th, 2021).
(Weblink - https://ourworldindata.org/)

Appendix 2.B Model Representation

The figure below relates to the conceptual framework presented in section 2.2.1. The model expressed in equation 2.2.2 presents two situation where the government decides to extend or revoke the federal lockdown regulations and how that could impact the gains from increasing efforts. Under uncertain conditions, e.g., the COVID-19 pandemic, with an increase in trust towards the government and a decrease in beliefs about the actions of others, the marginal gain from increasing effort will be low. The marginal gains will be higher in comparison when trust in government does not increase.

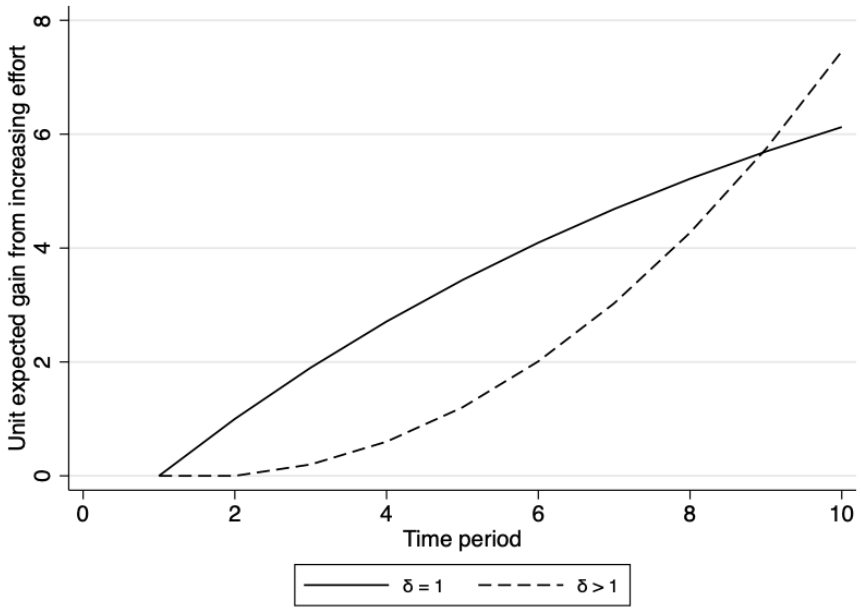

Figure 2.B.1. Gains from increasing efforts over time

Note: In the figure above, $\delta = 1$ represents the situation in the USA where trust in government is not expected to change, and $\delta > 1$ represents the situation in India where trust in government increases over time.

Appendix 2.C Training Model for Out of Sample Predictions

The model and data presented in the chapter speak of the associations that beliefs and trust can have on personal effort for COVID-19 precautions. Using the data collected, we try to model personal effort measured by decisions to get vaccinated. Considering the next challenge in curbing the pandemic is to motivate as many people as possible to get themselves vaccinated, policymakers are currently facing the problem of supply surpassing demand when it comes to vaccinations. The model presented here can be used to figure out the characteristics of the people who might be more resistant to getting vaccinated. This could be important in figuring out which population group the policymakers should focus their attentions on to have the highest number of people vaccinated as quickly as possible.

In this section we first show that beliefs about others and government trust have predictive power over who chooses to get vaccinated. Using the specific variables, we train a model using k-fold validation and XGBoost classifier to predict the likelihood of vaccinating. The model has an accuracy of about 68 percent for India and 62 percent for the USA. In addition to this, this model is used on data from Fetzer et al. (2020) to make out of sample predictions for India and the USA where we try to determine what percentage of the data presented in the paper is likely to get vaccinated. The summary statistics for the characteristics of the individuals the model predicts have lower likelihood of getting the vaccine is presented in Table 2.C.4. The model is an exploratory approach, and because the data it is trained on comes from April 2021, when the vaccine and pandemic situations were slightly different from where they stand now, the results presented should be treated as indicative. However, it points to the importance of government trust and beliefs about others in the current situation. The model can be tweaked as per new data to provide real-time results with few input variables, and thus can also be applied to a multitude of other situations.

2.C.0.1 Model for likelihood of getting vaccinated

Table 2.C.1 provides the summary of how different characteristics of the respondents might affect their decision to get vaccinated. In India it is seen that trust in government to take care of citizens is negatively correlated with the decision to get vaccinated. Truthfulness of government about the pandemic is positively correlated with the decision at 11 percent of a standard deviation in India and eight percent in the USA. It is also seen that vaccinated Indians are strongly in favor of another lockdown in India, which is likely due to the rise in COVID-19 infections at the time of data collection.

Using this information, we train models for out of sample predictions for the likelihood of getting vaccinated. The models use k-fold validation with 10 folds and

the results for accuracy and precision of the models are presented in Table 2.C.2. We split the data randomly in 80:20 for training and testing the model, and used 10 folds to minimise the root mean square error of both models to 30 percent. The accuracy of the model is affected due to the small number of observations on which it is trained.

When this model is used for prediction on data from Fetzer et al. (2020), it is seen that 30 percent of their sample of 11,602 from the USA is predicted to have a low likelihood of getting vaccinated. This is in contrast to about 63 percent of the Indian sample of 1,011 from their data set that have lower likelihood for vaccination decisions. This data set dates to April 2020 where trust in government was higher in India, while the likelihood of effort was low. This could further validate the model presented in this paper wherein in the case of India, higher government trust led to decreased personal efforts by individuals.

Table 2.C.1. Predictive power of respondent characteristics on their decision to be vaccinated in phase 4

	India		USA	
	(1) OLS	(2) Logit	(1) OLS	(2) Logit
Trust in government to take care of citizens	-0.04**	-0.19*	0.00	0.02
	(0.02)	(0.11)	(0.02)	(0.09)
Truthfulness of government	0.11***	0.59***	0.08***	0.38***
	(0.02)	(0.12)	(0.02)	(0.09)
Belief about others refraining from participation in social gathering	0.09***	0.48***	-0.02	-0.09
	(0.02)	(0.11)	(0.02)	(0.09)
Do you think there should be a new lockdown?	0.12***	0.65***	0.03*	0.15*
	(0.02)	(0.11)	(0.02)	(0.09)
Male =1	0.06	0.35	0.04	0.19
	(0.04)	(0.22)	(0.04)	(0.16)
Age	0.00	0.00	0.01***	0.03***
	(0.00)	(0.02)	(0.00)	(0.01)
Years of education	-0.02	-0.13*	0.04***	0.18***
	(0.01)	(0.07)	(0.01)	(0.05)
Married = 1	-0.13***	-0.64***	0.08**	0.34*
	(0.05)	(0.25)	(0.04)	(0.17)
Observations	590	590	697	697
R^2	0.19	0.17	0.1	0.08

Note: OLS and logit estimates shown here for dummy variable for having been vaccinated and different characteristics of respondents of phase 4 from India and the USA. Anyone who is not vaccinated is coded as 0 and anyone who has at least one dose of vaccine is coded as 1. Standard errors shown in parentheses.
Significance at * p <0.10, ** p <0.05, *** p <0.01.

Table 2.C.2. Details of k-fold validation model

	India	USA
Folds	10	10
Accuracy	0.6844	0.6231
Precision	0.4444	0.7766

Table 2.C.3. Predicted values of likelihood of vaccinations from Fetzer et al. (2020)

	(1)	(2)
Predicted vaccination	India	USA
FALSE	635	3,497
	62.81%	30.14%
TRUE	376	8,105
	37.19%	69.86%
Observations	1,011	11,602

Table 2.C.4. Summary of characteristics of participants from Fetzer et al. (2020) with low likelihood of vaccination decision

	India		USA			
	(1)	(2)	(3)	(4)	(5)	(6)
	Mean	SD	Mean	SD	Min	Max
Trust in government to take care of citizens	3.32	(1.32)	1.50	(1.02)	1	5
Truthfulness of government	3.27	(1.32)	1.50	(0.99)	1	5
Belief about others refraining from participation in social gathering	63.54	(21.94)	60.30	(16.98)	0	100
Do you think there should be a new lockdown?	0.93	(0.26)	0.71	(0.46)	0	1
Male =1	0.60	(0.49)	0.38	(0.49)	0	1
Age	35.25	(11.43)	35.77	(9.34)	18	108
Years of education	18.26	(3.56)	16.10	(5.22)	0	25
Married = 1	1.50	(0.50)	1.43	(0.49)	1	2
Observations	635		3,497			

Note: Mean and standard deviations mentioned for the subset of the respondents who showed low likelihood of vaccination as per the model from the data from Fetzer et al. (2020).

Appendix 2.D Survey Measures

Participants in the survey were recruited over Amazon mTurk from India and the USA. As qualifying conditions for the participants, they had to have over 95 percent HIIT completion rate. They were remunerated with a standard rate of 0.10 USD for every minute they spent on the survey. They were asked questions on the following dimensions.

Expectations about reopening: In order to measure the expectations the respondents had about how soon conditions would become normal, they were asked to indicate a date on the calendar when they believed different parts of society would start functioning as they usually would. In the first two phases, this module included more questions, because more sections of the economy remained closed. As the months progressed, there was variation in closures across areas, hence this section was limited to asking about when the respondents expected situations to return to a pre-COVID-19 condition. In all phases, the distance of date mentioned was calculated from the date the survey was completed to compound the measure. Higher number of days indicates more negative expectations.

Beliefs about actions of others: This module aimed to capture what the respondents thought about those around them. Using a slider from 0 to 100, the respondents had to indicate “out of 100 people in their country, how many..." indulged in a particular behavior. Higher numbers indicates more positive beliefs.

Government trust: The respondents’ trust in their federal government was measured using an index of five questions. The responses were then coded to indicate higher trust with larger values of the government trust index. The components are also used individually in the analysis.

Misperception: The respondents were asked about their own actions during the pandemic, which is treated as their first order beliefs. Misperception is calculated as the difference between the average of personal actions across the phase and country, and the corresponding second order beliefs (about others). The measure is standardized to mean of zero and standard deviation of one.

Personal characteristics: The respondents also answered questions about their personal characteristics to be used as controls for analyses.

Attention check: Since the survey was being conducted online, there was a lot of scope for respondents clicking through the questions without actually understanding or internalizing any of them. This is the reason the survey contained a question for attention check in the middle of the survey. Only participants who passed this attention check were allowed to move forward and get paid for their time.

Appendix 2.E Survey

General Information

Language

The survey is made available in Hindi for participants from India.[15]

Consent

This short survey is an assessment of how people trust the actions of their citizens and governments during the coronavirus crisis. It also asks some questions about your personal behaviors and sociodemographics.

The survey will take about 8 minutes to complete. The data will only be used for research purposes. There is an attention check question, you will be compensated for the survey if you respond correctly to this. You will not be compensated if you fill in logically unsound responses to questions regarding dates and numbers.

All the data will remain confidential, and you are allowed to stop at any point you want. You have to be over 18 years old to participate.

15. No participants from India answered the survey in Hindi.

Expectations

When do you think ...
All dates to be indicated on a calendar

1. ...government issued lockdown/closures directives will be over across your country?
2. ...we will revert back to a pre-corona state across your country?
3. ...schools will reopen across your country?
4. ...markets/shops will reopen across your country?
5. ...public transportation will function normally across your country?
6. ...domestic travel will resume normally across your country?
7. ...international travel will resume normally across your country?

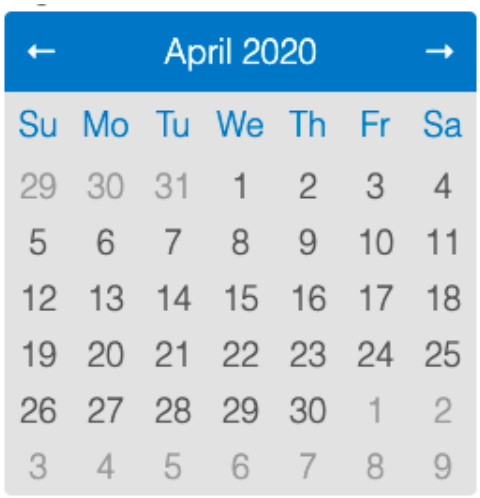

Figure 2.E.1. Example of calendar on the online survey

Beliefs

Out of 100 people in your country, how many do you think...
To be indicated on a slider from 0 to 100

1. Always follow government's orders regarding coronavirus?
2. Regularly wash their hands for at least 20 seconds?
3. Refrain from participation in social gathering?
4. Will consult a doctor if they show symptoms of coronavirus?
5. Will lose their jobs because of coronavirus within the next year?
6. Have become really fatigued (tired) of coronavirus?
7. Think there should be a new nation-wide lockdown?
8. Are skeptical about the effectiveness of the vaccine?

Government trust

1. Do you think your government's reaction regarding the lockdown/closures in your country is appropriate?

- ○Reaction is much too extreme
- ○Reaction is somewhat extreme
- ○Reaction is appropriate
- ○Reaction is somewhat insufficient
- ○Reaction is not at all sufficient

2. Do you think your government has been truthful about the coronavirus conditions in your country?

- ○Very untruthful
- ○Somewhat untruthful
- ○Neither truthful nor untruthful
- ○Somewhat truthful
- ○Very truthful

3. Do you think the government reaction with fines-punishments or imprisonments of people who break the social distancing rules is appropriate?

- ○Reaction is much too extreme
- ○Reaction is somewhat extreme
- ○Reaction is appropriate
- ○Reaction is somewhat insufficient
- ○Reaction is not at all sufficient

4. How much do you trust your country's government to take care of its citizens?

- ○A great deal
- ○A lot
- ○A moderate amount
- ○A little
- ○Very little

5. Do you think your government is capable of managing the coronavirus pandemic on its own?

- ○Yes
- ○No

Personal actions

1. I always follow government regulations around coronavirus

○Applies to me
○Does not apply to me

2. I will consult a doctor if I show coronavirus symptoms?

○Applies to me
○Does not apply to me

3. I regularly wash my hand for more than 20 seconds

○Applies to me
○Does not apply to me

4. I left the house in the past 7 days for things other than grocery/pharmacy shopping?

○Applies to me
○Does not apply to me

5. My work-life/employment has been disrupted due to coronavirus

○Disrupted a lot
○Somewhat disrupted
○Neutral
○Somewhat undisrupted
○Not disrupted at all

6. Are you worried about your health?

○Very worried
○Somewhat worried
○Neutral
○Somewhat not worried
○Not worried

7. Are you worried about your family's health?

○Very worried
○Somewhat worried
○Neutral
○Somewhat not worried
○Not worried

8. Have you been vaccinated/do you plan to get vaccinated against COVID-19?

○Yes
○No, do not plan to get vaccinated
○No, plan to get vaccinated

Personal information

1. What gender do you identify with?

   ○Male

   ○Female

   ○Other

2. Year of Birth
3. Years of Education
4. Marital status

   ○Married/cohabitating

   ○Single/divorced

5. State you live in
6. What is your monthly household income, before taxes?

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Chapter 3

Economic Preferences and Behavior of Children

Joint with Laura Breitkopf, Shyamal Chowdhury, Hannah Schildberg-Hörisch, and Matthias Sutter

3.1 Introduction

Preferences are a key concept in economic theory, and empirical research largely supports their predictive power for major life outcomes and behaviors. While the corresponding evidence is comprehensive for adults,[1] much less is known about their relevance for the behavior of children and adolescents. In childhood and adolescence, preferences emerge before they become more stable in adulthood (Heckman, 2007; Schildberg-Hörisch, 2018). Recently, our understanding of the formation of preferences in childhood and their measurement in incentivized experiments has made

1. Time preferences are linked to criminal behavior, educational attainment, occupational success, income, wealth, and health outcomes (see, e.g., Fuchs, 1982; Bickel, Odum, and Madden, 1999; Kirby, Petry, and Bickel, 1999; Ventura, 2003; Kirby and Petry, 2004; DellaVigna and Paserman, 2005; Eckel, Johnson, and Montmarquette, 2005; Chabris, Laibson, Morris, Schuldt, and Taubinsky, 2008; Golsteyn, Grönqvist, and Lindahl, 2014; Cadena and Keys, 2015; Åkerlund, Golsteyn, Grönqvist, and Lindahl, 2016; Dohmen, Enke, Falk, Huffman, and Sunde, 2018). Risk preferences are associated with labor market success, health outcomes, investment decisions, addictive behaviors, and migration (Barsky, Juster, Kimball, and Shapiro, 1997; Hong, Kubik, and Stein, 2004; Bonin, Dohmen, Falk, Huffman, and Sunde, 2007; Anderson and Mellor, 2008; Kimball, Sahm, and Shapiro, 2008; Jaeger, Dohmen, Falk, Huffman, Sunde, et al., 2010; Dohmen and Falk, 2011; Dohmen, Falk, Huffman, Sunde, Schupp, et al., 2011; Von Gaudecker, van Soest, and Wengström, 2011; Becker, Deckers, Dohmen, Falk, and Kosse, 2012; Dawson and Henley, 2015; Hsieh, Parker, and van Praag, 2017). Social preferences are related to cooperative behaviors, e.g., at the workplace, donations, repayment of loans, and management of common pool resources (Karlan, 2005; Dohmen, Falk, Huffman, and Sunde, 2009; Rustagi, Engel, and Kosfeld, 2010; Carpenter and Seki, 2011; Becker, Deckers, Dohmen, Falk, and Kosse, 2012; Burks, Nosenzo, Anderson, Bombyk, Ganzhorn, et al., 2016; Deming, 2017).

significant progress (see, e.g., Heckman, 2007; Sutter, Kocher, Glätzle-Rützler, and Trautmann, 2013; Doepke and Zilibotti, 2017; Alan and Ertac, 2018; Cappelen, List, Samek, and Tungodden, 2020; Kosse, Deckers, Pinger, Schildberg-Hörisch, and Falk, 2020). We can therefore move forward and start investigating the link between children's preferences and outcomes.

First evidence points to a relation between economic preferences of children and adolescents and how they act. Impatience is associated with drinking and smoking behavior, health outcomes such as a higher body mass index, a lower propensity to save, and worse school performance (Castillo, Ferraro, Jordan, and Petrie, 2011; Sutter, Kocher, Glätzle-Rützler, and Trautmann, 2013; Castillo, Jordan, and Petrie, 2019). Risk averse teenagers are less likely to be overweight (Sutter, Kocher, Glätzle-Rützler, and Trautmann, 2013), behave better at school, and are more likely to complete high school (Castillo, Jordan, and Petrie, 2018). Importantly, measures of economic preferences in childhood or adolescence and have also been shown to predict adult outcomes (Borghans, Weel, and Weinberg, 2008; Golsteyn, Grönqvist, and Lindahl, 2014).[2] However, it is not yet clear how robust these associations are and what exactly they reflect, especially given the still-malleable and emerging nature of children's preferences.

This project contributes to a better understanding of the link between children's and adolescents' preferences and their field behaviors, and goes beyond previous evidence in several respects. To begin with, we jointly elicit time preferences, risk preferences, and social preferences in incentivized experiments. This is relevant as decisions typically involve more than one preference dimension. For example, addictive behaviors such as smoking, drinking or gambling involve risk considerations, but also a trade-off between immediate and delayed gratification (Ida and Goto, 2009; Sutter, Kocher, Glätzle-Rützler, and Trautmann, 2013). Moreover, our novel data covers nearly 6,000 children and their parents, of which about 4,900 participants are used in our current analyses. We combine comprehensive measures of preferences with wide ranging information on child outcomes (study attitude, risky behaviors, prosociality, emotional health, and behavioral problems) and household environment. Children and adolescents in our sample are between the ages six and 16, so we cover early elementary school age up to the end of adolescence. This unique data set allows us to study — within a unified framework — whether preferences at a young age translate into observable behavior for many outcome dimensions at once.

2. A related literature on childhood temperament in psychology documents that childhood temperament does not only predict functioning in childhood, but that early childhood differences in temperament are also systematically related to a broad range of adult outcomes, possibly due to the existence of some continuity in temperament development from early childhood to early adulthood (Caspi, 2000; Caspi, Harrington, Milne, Amell, Theodore, et al., 2003; Moffitt, Arseneault, Belsky, Dickson, Hancox, et al., 2011).

The most exceptional feature of our data is that we elicit preferences and behaviors of whole families. What sets our project apart from previous studies is our estimation of specifications that control for many characteristics of the household environment, such as parental preferences and parenting styles. We hence take a step forward towards a more comprehensive interpretation of the link between child preferences and outcomes. Many facets of household environment may be important for both preference formation and field behavior, among them socioeconomic status (Dohmen, Falk, Huffman, and Sunde, 2012; Kosse and Pfeiffer, 2012; Bauer, Chytilová, and Pertold-Gebicka, 2014; Almås, Cappelen, Salvanes, Sørensen, and Tungodden, 2016; Brenøe and Epper, 2019; Falk, Kosse, Pinger, Schildberg-Hörisch, and Deckers, 2021), family structure (Detlefsen, Friedl, Lima de Miranda, Schmidt, and Sutter, 2018), parents' economic preferences (Bisin and Verdier, 2000; Dohmen, Falk, Huffman, and Sunde, 2012; Kosse and Pfeiffer, 2012; Bauer, Chytilová, and Pertold-Gebicka, 2014; Almås, Cappelen, Salvanes, Sørensen, and Tungodden, 2016; Alan, Baydar, Boneva, Crossley, and Ertac, 2017; Campos-Vazquez, 2018; Brenøe and Epper, 2019; Chowdhury, Sutter, and Zimmermann, 2020), parenting style, parental time, monetary and further investments in their children (Cunha and Heckman, 2007; Guryan, Hurst, and Kearney, 2008; Heckman, 2008; Heckman and Mosso, 2014; Falk and Kosse, 2016; Doyle, Harmon, Heckman, Logue, and Moon, 2017; Cobb-Clark, Salamanca, and Zhu, 2019), parental values and religiosity (see, e.g., Brañas-Garza, Espın, and Neuman (2014)), genetic contributions (e.g., Cesarini, Dawes, Johannesson, Lichtenstein, and Wallace (2009) and Zyphur, Narayanan, Arvey, and Alexander (2009)), and exposure to stress at the household level (e.g., Starcke and Brand (2012), Buchanan and Preston (2014), Haushofer and Fehr (2014), and Ceccato, Kettner, Kudielka, Schwieren, and Voss (2018)). For example, if, on the one hand, higher socioeconomic status of a family translates into children being more patient, and on the other hand has an independent effect on their success in school as parents provide more support with homework, explanations, or extra tutoring, it is not clear how to interpret an observed correlation between children's patience and educational attainment.

In the first step of our analysis, we use cross-sectional regression models comparable to those applied in previous work. Our results confirm and add to our knowledge on the predictive power of child preferences on outcomes. For example, we find that time-consistent children study harder. Risk averse children engage in fewer risky behaviors, but have lower emotional health. We are the first to provide evidence on the predictive power of children's social preferences and observe that spiteful children have a worse study attitude, more-pronounced behavioral problems and score lower on prosociality than egalitarian, altruistic, or selfish children. In the outcome dimension, our results extend the predictive power of child preferences to domains such as emotional health and behavioral problems that have not been studied before.

In the second step, we further exploit our rich data to add information on a fam-

ily's socioeconomic status, family structure, religion, parental preferences and IQ, and parenting style as explicit control variables in the baseline specifications. When adding these extensive control variables to replicate the household environment, the predictive power of preferences for outcomes attenuates, but remains significant.

Our findings have important implications. First, they inform the debate on how (much) children's preferences are related to their field behaviors (Castillo, Ferraro, Jordan, and Petrie, 2011; Sutter, Kocher, Glätzle-Rützler, and Trautmann, 2013; Castillo, Jordan, and Petrie, 2018, 2019). This debate is only in its infancy and we contribute with novel data on about 4,900 children that are exceptionally broad both with respect to preference and outcome measures.

This chapter is organized as follows. Section 3.2 discusses the sampling and data. Hypotheses are outlined in section 3.3. Section 3.4 illustrates our empirical strategy and section 4.4 presents results. The implications of the findings are discussed in the conclusion in section 3.6.

3.2 Data

Data collection took place in rural areas in Bangladesh. With around 161 million inhabitants, Bangladesh is the world's eighth-most-populous country. 63 percent of the population live in rural areas.[3] In the past two decades, Bangladesh has made notable progress in reducing poverty and has reduced the percentage of people living below the income poverty line of USD 1.90 a day to 14.8 percent.[4] Sustained economic growth has enabled Bangladesh to reach lower middle-income status in 2015, according to the World Bank classification (second lowest out of four categories: GNI per capita between USD 1,026 and USD 3,995).[5]

3.2.1 Sampling procedure and data collection

Data was collected in the four rural districts Netrokona, Sunamganj, Chandpur and Gopalganj from March to May 2018 with the help of a local, specialized survey firm. These districts represent four of the eight administrative divisions of the country. In the course of a previous survey that was conducted in 2014 and 2016, nine sub-districts were chosen based on the availability of NGOs willing to collaborate. 150 villages were randomly drawn from the nine sub-districts. In each of those 150 villages, a primary school was selected and from the selected school,

3. Data from 2018. See United Nations Human Development Report: http://hdr.undp.org/en/countries/profiles/BGD. Accessed May 7, 2020.

4. In international prices. Data from 2016. See World Bank country profile: https://data.worldbank.org/country/bangladesh. Accessed May 7, 2020.

5. See World Bank country overview: https://www.worldbank.org/en/country/bangladesh/overview. Accessed May 7, 2020.

20 students were chosen across grades two to five using a simple random sampling procedure in 2018.[6] We surveyed the 3,000 new households of these students from 2018 onwards, along with 1,001 households already sampled and interviewed in 2014/16 (see Chowdhury, Guiteras, and Zimmermann, 2014; Chowdhury, Sutter, and Zimmermann, 2020). Appendix section 3.A contains further details on the sampling.

The aim of our data collection was to establish a large sample of families in which we measure both children's and parents' skills as comprehensively as possible. We therefore elicited economic preferences (time, risk, and social preferences), personality traits, and cognitive skills via paper-and-pencil interviewing for up to four household members (one or two children aged six to 16 and their parents). In particular, we were able to elicit preferences for 5,989 children from 3,771 households. Due to some missing controls, here we have provided results from 4,913 of those participants.[7]

We complement this extraordinarily rich data on skills of whole families with a questionnaire that mothers answered about their children and a general household survey. We used computer-assisted personal interviews (CAPI) to collect quantitative survey data during the household survey. The comprehensive, structured questionnaire covered sociodemographics, income, expenditures, employment, land ownership, credits and savings, assets, health, and shocks. It was answered by either the household head or his/her spouse (whoever was the most knowledgeable person for the respective part). The mother questionnaire — a paper-and-pencil interview — covered information on parenting style.[8] Moreover, mothers assessed their children's strengths and difficulties as well as personality traits (for children up to age 13).

3.2.2 Experiments: Time, risk, and social preferences

Children participated in a sequence of experiments designed to measure the three core dimensions of economic preferences: time, risk, and social preferences. Experimentally elicited preference measures have important advantages. On top of being incentivized, they are constructed from revealed preferences in well-defined and controlled contexts. This gives them a readily interpretable metric and allows for a straightforward comparison across individuals.

To elicit preferences, we relied on well-established measurement tools that, in the case of time and risk preferences, have been used in developing countries

6. Typically, there was one school per village, and five students per grade were sampled randomly from class lists. For more details see Appendix 3.A.2.

7. In the case of the study attitude outcome, we have 5,076 samples.

8. For a detailed description of the parenting styles measure as well as a complete list of items, see Appendix 3.D.

before. We still carefully pre-tested all items in our context and adapted them to the children's ages. We used standardized control questions to verify that participating children understood the instructions. [9]

The order of the experiments was randomly determined by rolling a die. Children were able to earn money or stars which were transformed into money after the experiments using age-specific exchange rates (proportional to pocket money). Each child (and adult) received one star as a show-up fee. All experiments took place in one-on-one settings in the families' homes and the interviewers ensured that members from the same household could not influence each other's decisions. Detailed instructions can be found in Appendix 3.F in the appendix.

Time preferences for children. In order to measure time preferences, we followed a simple choice list approach, used by, Bauer, Chytilová, and Morduch (2012) in a similar form for adults in rural India. Each child had to make six choices consisting of trade-offs between smaller-sooner and larger-later rewards (see Table 3.2.1). The six choices were grouped in three choice sets, each consisting of two choices with the same time horizon. The early payment took place either tomorrow (choice sets 1 and 2) or in a month (choice set 3), the later payment in three weeks (choice set 1), three months (choice set 2), or four months (choice set 3), respectively. The choice sets were ordered randomly.

For our analysis, we use the total number of patient choices (variable *patience*) as well as a dummy variable *time consistent*. The variable *patience* is a simple count of the larger, but later reward choices among all six choices and ranges from 0 to 6. Children are classified as time-consistent if they make identical choices for choice sets 2 and 3 with the same three-month delay, implying that their current and future discount rates are equal, and time-inconsistent otherwise. Additionally, to disentangle time consistency from extreme impatience, we do not count children as time-consistent if they make the impatient choice in all choice sets.

The preference distributions for our estimation sample can be found in the appendix (section 3.B). Figure 3.B.1, which displays the distribution of the number of patient choices. About a third of children never made a patient choice. 64 percent of children are classified as time consistent.

Our findings on time consistency are in line with comparable previous findings among children. Alan and Ertac (2018) observe that about half of the children

9. Understanding of games is controlled by interviewers asking children in between (four times for the time preferences game, once for the risk preferences game, and once for the social preferences game) to repeat explanations. Each time, the interviewer notes down whether the child understood the game after the first, second or third explanation or whether they did not understand the game at this point.

Table 3.2.1. Time preferences experiments for children

Choice Set 1	2 stars tomorrow	vs.	3 stars in 3 weeks
	2 stars tomorrow	vs.	4 stars in 3 weeks
Choice Set 2	2 stars tomorrow	vs.	3 stars in 3 months
	2 stars tomorrow	vs.	4 stars in 3 months
Choice Set 3	2 stars in 1 month	vs.	3 stars in 4 months
	2 stars in 1 month	vs.	4 stars in 4 months

in their sample make time-consistent choices in a convex time budget task.[10] Regarding patience, results for our sample are hard to compare to previous studies due to different interest rates. As in Sutter, Kocher, Glätzle-Rützler, and Trautmann (2013), who elicit time preferences for ten- to 18-year-old Austrian children using choice lists, our children are, on average, impatient. Falk, Kosse, Pinger, Schildberg-Hörisch, and Deckers (2021), in contrast, observe more patient choices among their samples of German primary school children. They measure patience by letting children decide how much of their initial endowment they want to put in a piggy bank paying out double the amount one week after the experiment. About a third of children save all their coins in the piggy bank. In another study by Alan and Ertac (2018), children aged nine to ten years in Turkey also display substantially more patience (measured by multiple choice list as well as a convex time budget task).[11]

Risk preferences for children. For the elicitation of risk preferences we applied a setup originally designed by Binswanger (1980) and widely used in developing countries, e.g., by Bauer, Chytilová, and Morduch (2012) in India. Each child had to choose one out of six gambles that yielded either a high or a low payoff with equal probability (see Table 3.2.2). The low payoff was decreasing and the high payoff was increasing for each successive gamble. In gambles 1 to 5, the expected value increased jointly with the variance, and in gamble 6 the variance increases in comparison to gamble 5, meaning that choices of higher gamble numbers were associated with a higher willingness to take risks.

For our analysis, we use a dummy (dummy variable *risk averse*) for being risk

10. As with our definition, time inconsistency includes both present- and future-biased preferences.

11. For a recent overview of economic behavior and experimental economics results of children and adolescents, especially with respect to the influence of age and gender, see Sutter, Zoller, and Glätzle-Rützler, 2019.

averse (choosing one of the first four gambles) in contrast to being (close to) risk neutral or risk seeking in the case of choosing gamble number 5 or 6.

Table 3.2.2. Risk preferences experiments for children (example for age 10 to 11)

Age 10 to 11	Low amount (50% chance)	High amount (50% chance)
Gamble 1	25	25
Gamble 2	22	48
Gamble 3	20	60
Gamble 4	15	75
Gamble 5	5	95
Gamble 6	0	100

Figure 3.B.2 in the appendix shows that 41 percent of children in our estimation sample are risk averse. The other 59 percent are evenly distributed across being risk neutral and risk seeking. This distribution closely resembles what Castillo (2019) finds when eliciting risk preferences in a similar manner among eight-year-old Peruvian children and what Falk, Kosse, Pinger, Schildberg-Hörisch, and Deckers (2021) find among seven- to nine-year-old German children (using a different risk preferences game, however). In line with age trends in risk attitudes (Sutter, Zoller, and Glätzle-Rützler, 2019), our sample children are much less risk averse than samples of high school students and young adults from the US (see Ball, Eckel, and Heracleous, 2010, and Eckel, Grossman, Johnson, Oliveira, Rojas, et al., 2012, who use experimental setups similar to ours).

Social preferences for children. We followed an experimental protocol inspired by Fehr, Bernhard, and Rockenbach (2008) which was extended by Bauer, Chytilová, and Pertold-Gebicka (2014) to assess social preferences. Children had to make four allocation choices dividing stars between themselves (x) and another child (y) of the same gender and roughly the same age, but unknown and unrelated (see Table 3.2.3). In each of the four choices (x,y), one option was always the allocation (1,1), while the alternative allocation was designed to classify different social preference types. From the four choices, one can create four mutually exclusive social preference types: Children are classified as egalitarian if they always minimize the difference in payoffs for themselves and the recipient. They are categorized as altruistic if they maximize the recipient's payoff in all four choices and as spiteful if they always minimize the recipient's payoff. Children are classified as selfish if they maximize their own payoff in the first and the fourth choice (the payoff of the decision maker is the same in both options in the other two choices). Children who do not follow any of these patterns are subsumed in a residual category.

For our analysis, we use the four dummy variables *egalitarian, altruistic, selfish* and *mixed* with "mixed" being the residual category and "spiteful" being the (extreme) base category.

Table 3.2.3. Social preferences experiments for children

(a) Games

Costly prosocial game	1 star for me 1 star for the other child (1,1)	**vs.**	2 stars for me 0 stars for the other child (2,0)
Costless prosocial game	1 star for me 1 star for the other child (1,1)	**vs.**	1 star for me 0 stars for the other child (1,0)
Costless envy game	1 star for me 1 star for the other child (1,1)	**vs.**	1 star for me 2 stars for the other child (1,2)
Costly envy game	1 star for me 1 star for the other child (1,1)	**vs.**	2 stars for me 3 stars for the other child (2,3)

(b) Classification of children based on games

	Costly prosocial game (1,1) vs. (2,0)	**Costless prosocial game** (1,1) vs. (1,0)	**Costless envy game** (1,1) vs. (1,2)	**Costly envy game** (1,1) vs. (2,3)
Egalitarian	(1,1)	(1,1)	(1,1)	(1,1)
Altruistic	(1,1)	(1,1)	(1,2)	(2,3)
Spiteful	(2,0)	(1,0)	(1,1)	(1,1)
Selfish	(2,0)	(1,1) or (1,0)	(1,1) or (1,2)	(2,3)

Figure 3.B.3 in the appendix displays the distribution of social preferences for our estimation sample. A large fraction (38 percent) of children are categorized as being selfish. Still nearly a fifth are egalitarian whereas only seven to eight percent are either spiteful or altruistic. Nearly 30 percent of children fall into the residual category "mixed".[12]

The observed pattern is similar to what Bauer, Chytilová, and Pertold-Gebicka (2014) find among four- to 12-year-old Czech children (only the fractions of altruistic and egalitarian children are reversed). Comparisons across different types

12. Yet, note that the four social preference types account for more than 70 percent of subjects although those four types are based on only seven out of 16 (38 percent) choice patterns.

of social preferences games, however, are difficult.

Preference measures for adults. While children's preferences are at the core of our analysis, we additionally measured parents' preferences to grasp children's everyday household environment as comprehensively as possible. Elicitation of preferences for adults followed similar or identical protocols as for children. Details and instructions can be found in the appendix (Appendix 3.C and 3.F).

3.2.3 IQ

For children and adults, we elicited one measure of crystallized IQ and one of fluid IQ, which together form overall IQ (Cattell, 1971). We measured fluid IQ using the matrix test of the well-established Wechsler Intelligence Scale for Children (WISC-IV) or the Wechsler Adult Intelligence Scale (WAIS-IV), respectively (Wechsler, 2003). For crystallized IQ, we used the vocabulary test for children and the corresponding word meaning test for adults that are both subtests of the respective Wechsler Intelligence Scales, adapted to the specific context of Bangladesh.[13] IQ is normalized to a mean of zero and standard deviation of one across our final estimation children sample or their parents, respectively.

3.2.4 Child outcome variables

For adults, preferences have been shown to predict key life outcomes such as educational attainment, labor market success, cooperative behaviors, health status and health-related behaviors as well as life satisfaction (see footnote 1). Due to their young age, it is, however, not feasible to use exactly the same outcomes for children and adolescents as is typically done for adults. We therefore decided to collect related and equally multifaceted information on child outcomes and behaviors, spanning attitudes and conduct related to education, risk taking, prosocial behavior as well as emotional and behavioral symptoms that have been shown to be highly predictive of later adult outcomes (Clark and Lepinteur, 2019; Layard, Clark, Cornaglia, Powdthavee, and Vernoit, 2019). To further diversify our measurement approach, some of the child outcomes are reported by children themselves, others by their mothers.

Study attitude. To measure study attitude that should positively relate to educational success in the long run, children rated the following statement on a five-point Likert scale: "By working very hard, one can succeed at each area in life, for example

13. We worked with local academics with expertise in the adaptation and use of WISC version IV. In particular, Salim Hossain of the Department of Psychology, Dhaka University, and his team have adapted both WISC and WAIS.

at school or at work."[14] The variable is normalized to a mean of zero and standard deviation of one across our final estimation children sample.

Risky behaviors. Children answered 16 questions related to behaviors considered to be risky in Bangladesh, e.g., "Do you jump from tree/bridge to river or canal?" or "Do you often get into physical fights?". Section 3.E.1 in the appendix contains the list of all items regarding risky behaviors. The set of questions was developed in focus group discussions with respondents similar to our respondents. The questions were also pre-tested in villages similar to our study villages. Using standard questions from western countries is often not appropriate or meaningful. We did include, for example, the question "Do you smoke?" as a frequently used measure of risk taking behavior, but almost 100 percent of children and adolescents answered "no". Drinking alcohol, another popular indicator for risk seeking behavior, is forbidden due to religious reasons. For our analysis, we use the fraction of questions related to engaging in risky behaviors answered with "yes", conditional on being answered. Risky behaviors are closely related to health status. For example, Eaton, Kann, Kinchen, Shanklin, Flint, et al. (2012) monitor six categories of health-risk behaviors among youth and young adults including behaviors that contribute to unintentional injuries and violence or substance abuse. Sutter, Kocher, Glätzle-Rützler, and Trautmann (2013) document a link between risk attitudes and obesity. The variable is normalized to a mean of zero and standard deviation of one across our final estimation children sample.

Prosociality. We make use of the prosociality scale of the well-established and widely used Strengths and Difficulties Questionnaire (SDQ) to measure the extent to which children behave prosocially, i.e., interact with others in a positive and cooperative way in their daily routine. Mothers rated five items related to their children's prosocial behavior on a three-point scale such as "Considerate of other people's feelings" or "Shares readily with other children (treats, toys, pencils, etc.)". For a complete list of the prosociality items see Appendix 3.E.2. Answers are combined with equal weighting into one scale. The variable is normalized to a mean of zero and standard deviation of one across our final estimation children sample.

Emotional and behavioral difficulties. Moreover, we use a two-scale division of the total difficulties score based on the Strengths and Difficulties Questionnaire (SDQ). The SDQ score captures emotional and behavioral difficulties and was originally developed by psychologists as a brief screening tool for mental health problems.[15] In recent times, economists have frequently used the SDQ (Gupta and Simonsen, 2010; Flèche, 2017; Cornelissen and Dustmann, 2019; Attanasio, Blundell,

14. This is an item from Rotter's locus of control questionnaire (Rotter, 1966).

15. Its reliability and validity has been examined and confirmed in a number of studies across Europe, Asia, Australia, and South America (see, e.g., Hoosen, Davids, de Vries, and Shung-King, 2018, for an extensive overview). Bangladesh received special attention as data collected in its capital city

Conti, and Mason, 2020; Briole, Le Forner, and Lepinteur, 2020; Kühnle and Oberfichtner, 2020). Its predictive power for child psychiatric disorders (known to be interfering with social and educational development)[16] as well as adult outcomes such as educational attainment, unemployment, mental health and life satisfaction (Clark and Lepinteur, 2019; Layard, Clark, Cornaglia, Powdthavee, and Vernoit, 2019) makes it a valuable outcome dimension.

The full SDQ score comprises the four subscores "emotional symptoms", "peer problems", "hyperactivity" and "conduct problems" and was elicited by asking mothers about their children. For each subscore, mothers rated five items on a three-point scale. Questions are referring to whether children are easily worried, often nervous or unhappy, how well they are socially embedded, how well children can concentrate, and whether they tend to have temper tantrums, lie, cheat, or steal (see Appendix 3.E.3 for a complete list of items). Answers are combined with equal weighting into the four subscores. According to Goodman, Lamping, and Ploubidis (2010), for low-risk samples it can be advisable to split the full SDQ score into two broader dimensions, grouping the emotional and peer items into an "internalizing" subscale to measure emotional or mental health, and the hyperactivity and conduct items into an "externalizing" subscale which is referring to conspicuous behaviors. As Briole, Le Forner, and Lepinteur (2020), we are following this approach to allow for a more differentiated mapping of preferences into emotional health and behavioral problems.

Like prosociality, the variables are normalized to a mean of zero and standard deviation of one across our final regressions. Note that higher values indicate more emotional or behavioral problems and hence a more negative outcome.

3.2.5 Sample characteristics

The table presented in Appendix 3.B display basic descriptives and household characteristics for the children sample that participated in the experiments to elicit time, risk, and social preferences. The number of observations differs across variables depending on the survey part and availability of household members to be interviewed. Since a large number of households was sampled via primary schools, the mean age of child participants is ten years and more than 95 percent are able to read and

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Dhaka has played a particularly important role in showing that the SDQ can be purposefully applied and interpreted in different cultural settings. Its inventor conducted multiple tests to explore the suitability of the questionnaire as a cheap and effective method for detecting child psychiatric problems in the developing world (Goodman, Renfrew, and Mullick, 2000; Mullick and Goodman, 2001).

16. Academic achievement is among the most thoroughly studied repercussions of mental health problems (McLeod, Uemura, and Rohrman, 2012). Rothon, Head, Clark, Klineberg, Cattell, et al. (2009), e.g., conduct a longitudinal study in Great Britain, suggesting that psychological distress as measured by the SDQ is associated with educational achievement. Minkkinen, Lindfors, Kinnunen, Finell, Vainikainen, et al. (2017) examine a similar setup in Finland.

write. The sample is well-balanced in terms of gender with only slightly more girls than boys.

3.3 Hypotheses

Reflecting the three core dimensions of economic preferences, our hypotheses link time, risk, and social preferences with outcomes in childhood and adolescence. We thus analyze whether our experimental preference measures for children and adolescents are significant predictors of contemporaneous outcomes, i.e., of field behavior already at an early stage in life. In the following, we state our main hypotheses, each of them followed by a brief discussion of the relevant literature that backs up the hypothesis.

Hypothesis 1. *More patient and time consistent children are more diligent and have a better study attitude.*

In a wide range of studies from many disciplines, researchers have established an association between non-cognitive skills and academic outcomes for adults (Bowles and Gintis, 2002; Farkas, 2003; Heckman, Stixrud, and Urzua, 2006; Lleras, 2008). Patience and self-control have attracted particular attention regarding educational outcomes. Golsteyn, Grönqvist, and Lindahl (2014), for example, link adolescent time preferences to school performance. Castillo, Jordan, and Petrie (2019) show that higher discount rates go hand in hand with a lower probability of graduating from high school. Further indirect links have been established with children's time preferences being related to future disciplinary referrals (Castillo, Ferraro, Jordan, and Petrie, 2011; Alan and Ertac, 2018) which in turn predict high school graduation (Rumberger, 1995; Alexander, Entwisle, and Horsey, 1997).

Hypothesis 2. *More-risk-averse children engage in fewer risky behaviors.*

It is straightforward to assume that more-risk-averse children are more likely to refrain from risky behaviors. There is not much empirical evidence, however, linking children's risk preferences and their actual field behavior. Sutter, Kocher, Glätzle-Rützler, and Trautmann (2013) show that for Austrian adolescents, risk aversion is connected to health behavior (body mass index) but do not find a significant association of risk attitude and smoking, alcohol consumption, saving behavior or conduct at school. Using data on eighth graders from the US, Castillo, Jordan, and Petrie (2018) find that more-risk-averse children are less likely to have future disciplinary referrals and more likely to complete high school.

Hypothesis 3. *Compared to spiteful children, egalitarian, altruistic, and selfish children behave more prosocially.*

It is also intuitive to hypothesize that children who exhibit fewer antisocial preferences than spiteful ones behave more prosocially in their everyday life. We are not aware, however, of any empirical evidence linking experimentally elicited other-regarding preferences of children and adolescents and their field behavior. For adults, social preferences have been shown to be predictive of prosocial behaviors and outcomes such as donating, volunteering time, assisting strangers, helping friends and relatives, or family ties (Falk, Becker, Dohmen, Enke, Huffman, et al., 2018).

Hypothesis 4. *All economic preferences have predictive power for emotional and behavioral difficulties. More-patient and time-consistent children exhibit fewer behavioral difficulties measured by the SDQ externalizing subscale. More-risk-averse children have fewer conduct problems (like lying and cheating picked up by the externalizing subscale) but more emotional problems (like being worried and scared captured by the internalizing subscale) as they require risky interactions. Compared to spiteful individuals, egalitarian, altruistic, and selfish children exhibit fewer difficulties both with respect to the internalizing and externalizing dimension of the SDQ.*

Regarding emotional and behavioral difficulties, different preferences are likely to affect distinct dimensions of the SDQ as represented by the two subscales, internalizing and externalizing behavior, possibly differently. Since more patient and time-consistent individuals are known to possess higher self-control, we expect them to have fewer difficulties (Moffitt et al., 2011). This could presumably be driven by the externalizing subscale, with children exhibiting less hyperactivity, suffering less from hot tempers and making fewer myopic decisions such as cheating or stealing. Studies linking impatience to criminal behavior or poor school conduct (e.g., Castillo, Ferraro, Jordan, and Petrie, 2011; Åkerlund, Golsteyn, Grönqvist, and Lindahl, 2016) support this notion. For risk preferences, expectations are ambiguous. Following the idea that risk-averse individuals are less likely to get into conflict with rules and other children (as the study by Castillo, Jordan, and Petrie, 2018, suggests), they should also score lower on the externalizing subscale of the SDQ, i.e., display fewer behavioral problems. However, risk aversion might also go hand-in-hand with emotional symptoms (being worried, nervous, easily losing confidence, easily being scared), leading to higher values on the internalizing subscale. Finally, we expect more prosocial individuals to exhibit less difficulties, both with respect to the internalizing and externalizing dimension of the SDQ. Peer problems (being solitary, not being liked, being picked on or bullied) and conduct problems (being disobedient, fighting with or bullying other children, lying, cheating or stealing) are both less likely for more egalitarian, altruistic or selfish children than for spiteful ones.

3.4 Empirical Strategy

The following equation shows the OLS model that is estimated for the analysis of results:

$$y_{ij} = \alpha + \boldsymbol{\beta_P P_{ij}} + \beta_C C_{ij} + \boldsymbol{\beta_X X_{ij}} + \boldsymbol{\beta_H H_j} + \varepsilon_{ij} \tag{3.4.1}$$

where y_{ij} is the outcome of individual i in family j (study attitude, risky behaviors, prosociality or emotional and behavioral difficulties), $\boldsymbol{P_{ij}}$ is the vector of time, risk, and social preferences, C_{ij} captures cognitive skills, i.e., IQ, $\boldsymbol{X_{ij}}$ is a vector of control variables (gender, age fixed effects) and ε_{ij} is the error term. $\boldsymbol{H_j}$ is a vector of household environment variables that we include in some specifications but omit in the baseline specifications. It comprises household sociodemographics (number of siblings, income, parents' age and literacy, whether the household has an electricity connection, whether a senior (grandparent) is living in the household, whether it is a Muslim household), parents' preferences (time, risk, and social preferences, analogous to children's preferences), parents' IQ and parenting styles (six dimensions: emotional warmth, inconsistent parenting, monitoring, negative communication, psychological control, strict control). For all specifications, standard errors are clustered at the village level.

In the first step, we follow previous work and run regressions of child outcomes on preferences as well as IQ, gender, age, and age squared to establish the predictive power of children's preferences for their field behavior.

We then go beyond existing work by including household environment variables in our specifications, exploiting the fact that our exceptionally rich data encompasses measures of preferences and cognitive skills *both* for children and their parents as well as extensive information on a family's socioeconomic status, family structure, religion, and parenting styles.

3.5 Results

This section presents the results of our analysis regarding the link between child preferences and the five outcome variables: study attitude, risky behaviors, prosociality, and SDQ (split into an internalizing and externalizing subscale for emotional and behavioral problems). Using OLS regressions, we first examine the predictive power of child preferences in sparse baseline regressions. We then proceed by controlling for an extensive set of measurable facets of the household environment. The inclusion of these controls leads to small attenuation tendencies yet the predictive power of children's preferences for outcomes remains significant.

3.5.1 Baseline specifications

Results of the baseline specifications are displayed in Columns (1) and (3) of Table 3.5.1 and (1), (3), and (5) of Table 3.5.2. They contain OLS regressions of the

Table 3.5.1. Adding household environment variables (HH env) to regressions of child outcomes on preferences—Study attitude and risky behaviors

	Study attitude†		Risky behaviors†	
	(1) Baseline	(2) HH env	(3) Baseline	(4) HH env
Preferences†				
Patience	**-0.015**	**-0.010**	0.031**	0.024
	(0.011)	(0.012)	(0.014)	(0.015)
Time consistent	**0.087****	**0.055**	-0.015	-0.016
	(0.041)	(0.043)	(0.044)	(0.045)
Impatient	-0.026	-0.032	-0.040	0.001
	(0.056)	(0.062)	(0.075)	(0.082)
Risk averse	0.005	-0.000	**-0.061***	**-0.047**
	(0.027)	(0.030)	(0.035)	(0.036)
Egalitarian	0.315***	0.217***	-0.180*	-0.100
	(0.065)	(0.067)	(0.098)	(0.091)
Altruistic	0.277***	0.182**	-0.245**	-0.104
	(0.086)	(0.079)	(0.112)	(0.114)
Selfish	0.319***	0.179***	-0.144	-0.058
	(0.071)	(0.064)	(0.096)	(0.091)
Mixed	0.272***	0.172**	-0.135	-0.055
	(0.069)	(0.066)	(0.095)	(0.092)
p-value joint significance				
Time preferences	0.023	0.491	0.001	0.105
Social preferences	0.000	0.034	0.198	0.767
All preferences	0.000	0.126	0.000	0.123
Cognitive skills†				
IQ	0.108***	0.065***	-0.138***	-0.093***
	(0.018)	(0.020)	(0.026)	(0.025)
Control variables: Gender & age (FE)‡				
Female	0.032	0.037	-0.829***	-0.850***
age 6	base	base		
age 7	0.105	0.090		
age 8	0.104	0.074		
age 9	0.245***	0.233***		
age 10	0.352***	0.313***	base	base
age 11	0.330***	0.287***	-0.065	-0.024
age 12	0.419***	0.397***	-0.127**	-0.139**
age 13	0.394***	0.311***	-0.188***	-0.103**
age 14	0.507***	0.482***	-0.343***	-0.299***
age 15	0.608***	0.555***	-0.432***	-0.387***
age 16	0.535***	0.452***	-0.522***	-0.416***
Household environment††				
Sociodemographics		✓		✓
p-value joint significance		0.061		0.068
Parents' preferences		✓		✓
p-value joint significance		0.000		0.060
Parents' IQ		✓		✓
p-value joint significance		0.096		0.007
Parenting styles		✓		✓
p-value joint significance		0.000		0.000
Constant				
constant	-0.575***	0.160	0.688***	0.351
Observations	5,076	4,134	2,968	2,367
R^2	0.037	0.085	0.219	0.306
adj. R^2	0.033	0.073	0.214	0.290
F	8.982	7.813	53.252	24.678

Notes: Standard errors (in parentheses) are clustered at the village level for all specifications. †Study attitude, risky behaviors, preferences, and cognitive skills measures are defined as described in sections 3.2.2-3.2.4. Study attitude, risky behaviors, and IQ are normalized to a mean of zero and standard deviation of one across all available observations in our children sample. ‡Female is an indicator for being a girl, age is measured in years. ††Household (HH) sociodemographics comprise the number of siblings in HH, HH income, parents' age and literacy, whether the HH has an electricity connection, whether a senior is living in the HH, and religion; parents' preferences and IQ comprise variables analogous to children's measures (see sections 3.2.2 and 3.2.3); parenting styles comprise the six dimensions emotional warmth, inconsistent parenting, monitoring (intensity), negative communication, psychological control, and strict control as described in appendix section 3.D. All columns display OLS regressions. Coefficients of main explanatory variables of interest for each outcome (cf. section 3.3 on hypotheses) are printed in bold. Significance at $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 3.5.2. Adding household environment variables (HH env) to regressions of child outcomes on preferences—Prosociality and SDQ internalizing (emotional symptoms & peer problems) and externalizing (hyperactivity & conduct problems) subscales

	Prosociality†		SDQ internalizing scale†		SDQ externalizing scale†	
	(1) Baseline	(2) HH env	(3) Baseline	(4) HH env	(5) Baseline	(6) HH env
Preferences†						
Patience	0.019	0.026**	0.000	-0.011	**0.022***	**0.008**
	(0.012)	(0.012)	(0.013)	(0.012)	(0.013)	(0.012)
Time consistent	0.013	-0.006	-0.091**	-0.055	**-0.068***	**-0.052**
	(0.041)	(0.042)	(0.046)	(0.049)	(0.041)	(0.041)
Impatient	0.011	-0.016	-0.062	-0.063	0.045	0.051
	(0.067)	(0.070)	(0.066)	(0.072)	(0.064)	(0.067)
Risk averse	0.118***	0.079***	**0.060***	**0.047**	**0.007**	**0.007**
	(0.031)	(0.028)	(0.032)	(0.030)	(0.027)	(0.029)
Egalitarian	**0.267*****	**0.283*****	**-0.349*****	**-0.222*****	**-0.410*****	**-0.311*****
	(0.068)	(0.069)	(0.075)	(0.067)	(0.071)	(0.067)
Altruistic	**0.201****	**0.162***	**-0.239****	**-0.104**	**-0.232****	**-0.111**
	(0.084)	(0.084)	(0.097)	(0.083)	(0.094)	(0.072)
Selfish	**0.194*****	**0.161****	**-0.398*****	**-0.183*****	**-0.350*****	**-0.158****
	(0.065)	(0.065)	(0.081)	(0.064)	(0.076)	(0.062)
Mixed	0.135**	0.112	-0.241***	-0.117*	-0.281***	-0.159**
	(0.066)	(0.069)	(0.080)	(0.064)	(0.073)	(0.062)
p-value joint significance						
Time preferences	0.257	0.006	0.004	0.067	0.100	0.628
Social preferences	0.001	0.000	0.000	0.008	0.000	0.000
All preferences	0.000	0.000	0.000	0.002	0.000	0.000
Cognitive skills†						
IQ	0.128***	0.036*	-0.143***	-0.061**	-0.115***	-0.041**
	(0.022)	(0.020)	(0.024)	(0.025)	(0.021)	(0.020)
Control variables: Gender & age‡						
Female	0.108***	0.119***	0.017	0.020	-0.230***	-0.231***
age 6	base	base	base	base	base	base
age 7	0.230***	0.091	-0.111	0.018	-0.298***	-0.174**
age 8	0.298***	0.167**	-0.047	0.005	-0.227***	-0.152**
age 9	0.282***	0.137*	-0.123*	-0.004	-0.261***	-0.147*
age 10	0.377***	0.263***	-0.134	-0.017	-0.339***	-0.254***
age 11	0.433***	0.310***	-0.259***	-0.101	-0.436***	-0.311***
age 12	0.506***	0.328***	-0.305***	-0.141*	-0.507***	-0.375***
age 13	0.536***	0.337***	-0.314***	-0.131	-0.510***	-0.351***
age 14	0.639***	0.459***	-0.466***	-0.262***	-0.759***	-0.596***
age 15	0.652***	0.470***	-0.388***	-0.214**	-0.733***	-0.604***
age 16	0.630***	0.472***	-0.385***	-0.115	-0.734***	-0.589***
Household environment††						
Sociodemographics		✓		✓		✓
p-value joint significance		0.097		0.295		0.000
Parents' preferences		✓		✓		✓
p-value joint significance		0.000		0.000		0.000
Parents' IQ		✓		✓		✓
p-value joint significance		0.009		0.468		0.555
Parenting styles		✓		✓		✓
p-value joint significance		0.000		0.000		0.000
Constant						
constant	-0.727***	-0.164	0.561***	0.153	0.805***	0.313
Observations	4,913	4,072	4,913	4,072	4,913	4,072
R^2	0.038	0.197	0.040	0.257	0.060	0.245
adj. R^2	0.034	0.186	0.036	0.246	0.056	0.235
F	8.763	13.428	8.035	14.842	18.421	15.979

Notes: Standard errors (in parentheses) are clustered at village level for all specifications. †Prosociality, SDQ internalizing and externalizing subscales, preferences, and cognitive skills measures are defined as described in sections 3.2.5-3.2.4. Prosociality, SDQ subscales, patience and IQ are normalized to a mean of zero and standard deviation of one across all available observations in our children sample. ‡Female is an indicator for being a girl, age is measured in years. ††Household (HH) sociodemographics comprise the number of siblings in HH, HH income, parents' age and literacy, whether the HH has an electricity connection, whether a senior is living in the HH, and religion; parents' preferences and IQ comprise variables analogous to children's measures (see sections 3.2.2 and 3.2.3); parenting styles comprise the six dimensions emotional warmth, inconsistent parenting, monitoring (intensity), negative communication, psychological control, and strict control as described in appendix section 3.D. All columns display OLS regressions. Coefficients of main explanatory variables of interest for each outcome (cf. section 3.3 on hypotheses) are printed in bold.
Significance at $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

five outcomes on our key explanatory variables: time, risk, and social preferences.[17] Additionally, we are controlling for cognitive skills (IQ) as well as basic exogenous variables that are unrelated to the household environment (gender and age; including age squared to allow for varying functional forms[18]).

In the baseline specifications, preferences have significant predictive power. In particular, time preferences map into study attitude, risky behaviors, as well as emotional and behavioral difficulties; risk preferences map into risky behaviors, prosociality, as well as emotional health; and social preferences map into prosociality, study attitude, as well as emotional and behavioral difficulties. Tests of joint significance for groups of preference coefficients confirm this.

Being time-consistent is associated with an eight percent of a standard deviation increase in study attitude, i.e., higher valuation of working diligently as a prerequisite to being successful at school. Surprisingly, patience is negatively associated with study attitude. This somewhat counterintuitive result becomes more plausible if our patience measure also captures some type of risk preferences. Given the institutional setting of a developing country and families in our sample being poor, waiting for money might be perceived as being inherently risky, that notion thereby overriding actual time preferences. Observing that patience is predictive of risk taking behavior, with a one standard deviation increase in patience coming along with a three percent of a standard deviation increase in risky behaviors provides some suggestive evidence for this notion. Additionally, weaker results for study attitude and time preferences may be due to the fact that our data does not contain a more direct measure of educational attainment than attitude towards learning that is usually found to be connected with patience.[19]

Being risk averse instead of risk neutral or risk seeking comes along with a six percent of a standard deviation reduction in the fraction of risky behaviors children engage in. Thus, risk aversion as measured by our experimental procedures is accompanied by lower risk-taking behavior in everyday life. This adds to the rather scarce and mixed empirical evidence linking children's risk preferences and field behavior. Castillo, Jordan, and Petrie (2018) find risk-averse teenagers tend to behave better at school whereas Sutter, Kocher, Glätzle-Rützler, and Trautmann (2013) cannot establish a link between risk aversion and risky behaviors such as smoking, alcohol consumption, or conduct at school. In our data, also, risk-averse children score significantly higher on the internalizing SDQ scale (a 0.06 standard

17. Coefficients of main the explanatory variables of interest for each outcome (cf. section 3.3 on hypotheses) are printed in bold.

18. Including age-fixed effects instead does not change our results.

19. Adolescents' time preferences have been linked to school performance with more patient teenagers having higher educational attainment (Golsteyn, Grönqvist, and Lindahl, 2014) and being more likely to graduate from high school (Castillo, Jordan, and Petrie, 2019). Falk, Kosse, Pinger, Schildberg-Hörisch, and Deckers (2021) show that IQ, patience, risk aversion, and altruism map positively into success in school (measured by grades).

deviations increase) than risk-neutral or risk-seeking children, and thus show more emotional struggles.

Besides providing novel results on the relation between preferences and emotional and behavioral problems, we are the first to connect social preferences and field behavior of children and adolescents. Spiteful children exhibit a less diligent study attitude than egalitarian, altruistic, or selfish children, scoring between 0.28 and 0.31 standard deviations less on the respective scale. Being egalitarian as opposed to spiteful is associated with a 0.27 standard deviations higher prosociality score. Being altruistic or selfish instead of spiteful still increases prosociality by 0.2 standard deviations.

In a similar vein, egalitarian children exhibit 0.34 and 0.41 standard deviations lower SDQ scores in the internalizing and externalizing dimension, i.e., fewer emotional and behavioral problems, than spiteful children. Compared to spiteful children, altruistic children show 0.23 standard deviations lower scores both on the internalizing and externalizing subscale. Selfish instead of spiteful children have 0.39 and 0.35 standard deviations lower internalizing and externalizing SDQ scores.

Most results are in line with our hypotheses. Risk and social preferences map into their respective outcome counterparts: risky behaviors and prosociality. Social preferences also seem predictive of emotional and behavioral difficulties. Being risk averse is associated with more emotional problems in terms of being fearful or easily worried (captured by the internalizing SDQ score), but not with better conduct (SDQ externalizing score). Interestingly, time consistency is related to better emotional health as measured by the SDQ internalizing subscale whereas a higher degree of patience is associated with both more emotional problems as well as behavioral difficulties.

Moreover, IQ is predictive of all outcome measures and higher IQ scores are associated with more favorable outcomes throughout. Based on a highly standardized test, the Wechsler Intelligence Scale for Children is known to capture cognitive skills in different cultural contexts—always being a strong indicator for a variety of outcomes such as school performance (Reynolds, Temple, and Ou, 2010; Almlund, Duckworth, Heckman, and Kautz, 2011) or later adult life outcomes (Strenze, 2007; Borghans, Weel, and Weinberg, 2008; Golsteyn, Grönqvist, and Lindahl, 2014).

In sum, in the standard specifications child preferences have predictive power for a broad range of outcomes. Our results thus extend the scarce existing results on the link between children's preferences and outcomes to a much broader set of outcomes than those studied previously, using a large sample of children that covers elementary school age to late adolescence. Since we comprehensively measure all three main domains of economic preferences, we are the first to add evidence regarding the predictive power of children's social preferences. They turn out to be associated with manifold outcome dimensions that range from study attitudes and

behavioral problems to measures of emotional health and prosociality.

3.5.2 Replicating household environment

As a next step, exploiting our comprehensive data set, we proceed by presenting suggestive evidence that household environment variables have suggestive power in shaping preferences of children. This is true despite the fact that we are able to include exceptionally broad measures of the household environment that are designed to capture social facets and interactions beyond economic setups. Including them in the standard specifications moves coefficients in the same direction as the baseline specifications, yet to a much smaller extent, which indicates that many household characteristics are captured also in the preference measurements.

Tables 3.5.1 and 3.5.2, again, display comparisons of regression specifications for all five outcome measures of interest. Columns (2) and (4) in Table 3.5.1 and columns (2), (4), and (6) in Table 3.5.2 contain the sparse regressions of child outcomes on preferences and IQ as well as gender and age extended by adding control variables for family structure, socioeconomic status, living conditions, religion, parental preferences[20] and IQ as well as parenting styles. Reduced numbers of observations in columns (2) and (4) and (6) are due to missing values in single control variables added to describe the household environment.

For study attitude, including household environment variables renders the coefficient of time consistency slightly smaller and insignificant. Looking at risky behaviors, adding the full set of control variables makes a small difference in risk aversion in children. In the prosociality specifications, most social preferences measures' coefficients decrease in size when adding household environment variables as controls. Yet, focusing for example on egalitarianism as a strong predictor of prosociality, controlling for a limited set of household facets marginally increases the dummy variable's predictive power. Effects for emotional and behavioral problems (SDQ) show that joint significance of groups of preferences and parenting styles can be controlled for to decrease the coefficient sizes for social preferences on these outcomes.

Across all outcome measures, parenting styles are highly predictive, often

20. Within our sample, we do not have complete parental preferences for all children. For 4,177 cases, fathers were present for data collection, for 5,356 cases mothers were present. This reflects that often the father is away for work while the mother is the main caretaker at home. In order to not lose those observations, we applied the missing-indicator method: Adding an indicator for the missing father values and setting the respective missing values to zero. We are aware that this might introduce (additional) bias into our estimations (see, e.g., Groenwold, White, Donders, Carpenter, Altman, et al., 2012). However, replicating the household environment is merely suggestive evidence and facing the trade-off between a loss of data and precision and some more uncertainty regarding results, we decided to increase statistical power.

much more than sociodemographics or parental IQ and preferences. Depending on the outcome measure, a change in a single parenting style dimension by one standard deviation can have an impact three times as high as a one standard deviation change in child IQ.[21] Assuming that the household environment shapes a child's personality and behavior, it is plausible that parenting styles, i.e., the atmosphere and direct reactions to attitudes and actions, are of great importance for children's and adolescents' behavior. This facet is further explored in Chapter 4. A child's socioeconomic status (his or her parents' income and education) is mostly insignificant for internalizing SDQ measures and only slightly affects study attitude and risky behaviors. Parental IQ does not predict a child's degree of emotional and behavioral difficulties, but the parents' social preferences do. The father's IQ has an effect similar to the child's IQ on his or her study attitude, risky behaviors, and prosociality, a mother's IQ is only predictive of the latter. Maternal preferences are predictive of a child's prosociality, yet the father's preferences are not. A mother's risk aversion is related to her child's risky behaviors just as much as the child's own risk attitude.

3.6 Conclusion

This study provides several important insights for a better understanding of the relation between preferences and outcomes of children and adolescents. Using standard cross-sectional specifications, we first confirm and extend previous findings that establish the predictive power of children's preferences for their field behavior. We thereby rely on novel data, covering the whole age range from elementary school age to the end of adolescence. Our data encompasses incentivized experimental measures of time, risk, and social preferences as well as manifold outcome measures. In contrast to earlier studies, this allows for a comprehensive investigation of the link between all key preference dimensions and various major child outcomes within a unified framework. Our findings confirm that children's time preferences predict educational outcomes and risk preferences predict risky behaviors. In addition, we provide the first evidence on the predictive power of children's social preferences. In particular, we find that non-spiteful children have a better study attitude, behave in a more prosocial manner and display fewer behavioral problems, both with regard to internalizing and externalizing behaviors.

We proceed by exploiting another exceptional feature of our data, using outcomes from parental preferences and household-level variables. In the models'

21. For example, a one standard deviation increase in emotional warmth increases a child's emotional health by nearly 0.2 standard deviations (SDQ internalizing subscale). Increasing psychological control by one standard deviation reduces emotional health by 0.33 standard deviations. A one standard deviation higher IQ, as a comparison, increases emotional health by 0.1 standard deviations.

control for these household environment variables, we find that the explanatory power of childhood preferences attenuates. Our comprehensive perspective reveals that this attenuation tendency affects time, risk, and social preferences to a similarly strong extent. Importantly, this finding suggests that measures of preferences in childhood and adolescence, to some extent, capture the household environment.

Our findings hold broad significance. Previous research has shown that household environment matters for both preference formation (Delaney and Doyle, 2012; Bauer, Chytilová, and Pertold-Gebicka, 2014; Angerer, Glätzle-Rützler, Lergetporer, and Sutter, 2015; Alan, Baydar, Boneva, Crossley, and Ertac, 2017; Doepke and Zilibotti, 2017; Cobb-Clark, Salamanca, and Zhu, 2019; Kosse, Deckers, Pinger, Schildberg-Hörisch, and Falk, 2020; Falk, Kosse, Pinger, Schildberg-Hörisch, and Deckers, 2021) and child outcomes (Currie, 2001; Bradley and Corwyn, 2002; Case, Lubotsky, and Paxson, 2002; Currie and Moretti, 2003; Ruhm and Waldfogel, 2012; Aizer and Currie, 2014; Heckman and Mosso, 2014). In that sense, our results that the predictive power of childhood preferences decreases when controlling for environment are no surprise. Recent evidence also points out that additionally social environment beyond the family plays a significant role in shaping children's preferences.[22] Further research in this domain can help expand on how factors outside the household might affect formation of children's preferences in the Bangladeshi context.

More generally, our findings on the importance of household and family environment for the formation of preferences relates to previous evidence on the malleability of preferences in childhood. The finding that the predictive power of IQ also attenuates when controlling for household environment is akin to the literature showing that non-cognitive traits are more easily malleable than cognitive traits in response to early childhood environment (see, e.g., Heckman, Moon, Pinto, Savelyev, and Yavitz, 2010; Heckman, Pinto, and Savelyev, 2013, although these papers do not focus specifically on the development of economic preferences). Our findings thus relate to the literature on skill formation (see, e.g., Cunha and Heckman, 2007) that highlights childhood as a critical and sensitive period for the formation of personality traits and preferences.

We also contribute to the growing body of research trying to disentangle determinants and consequences of differences in preferences. Knowing that family environment is connected to both children's preferences and behaviors underlines findings such as the importance of socioeconomic status regarding

22. For recent contributions, see Alan and Ertac (2018) for a school-based intervention that boosted patience, Kosse, Deckers, Pinger, Schildberg-Hörisch, and Falk (2020) for the effect of an out-of-school mentoring program and Cappelen, List, Samek, and Tungodden (2020) for the effect of early education on social preferences. Rodrìguez-Planas (2012) and Kautz, Heckman, Diris, Weel, and Borghans (2014) provide overviews on mentoring programs and childhood interventions and their impact on children's non-cognitive skills.

children's skills and contributes to the debate on how (much) children's preferences are related to their field behaviors (Castillo, Ferraro, Jordan, and Petrie, 2011; Sutter, Kocher, Glätzle-Rützler, and Trautmann, 2013; Castillo, Jordan, and Petrie, 2018, 2019). In contrast to the malleable and still-emerging preferences of children and adolescents, adult preferences are assumed to be largely stable (Schildberg-Hörisch, 2018) and less responsive to family and social environment. It would thus be interesting to investigate in future research to what extent the predictive power of adult preferences for life outcomes decreases when controlling for household and social environment in a similarly comprehensive manner.

Appendix 3.A Sampling

The data in Chapter 3 and Chapter 4 come from the same survey. The components of the survey are outlined together in this section.

3.A.1 Covered households

2014/16. In 2014, 4,500 randomly drawn households from the 150 selected villages were surveyed (general household survey). Among those 4,500 households, 1,500 were randomly selected for further data collection regarding cognitive and non-cognitive skills (i.e., experimental measures of time, risk, and social preferences, survey measures of personality traits as well as IQ tests) in 2014 and 2016. Out of these 1,500 households, 1,001 had children aged 6 to 16 years. These households were chosen to be re-interviewed from 2018 onwards.

In the original survey, four members were selected for the elicitation of cognitive and non-cognitive skills from each of the 1,001 survey households: The household heads and their spouses as well as children aged 6 to 16. The lower age bound was set to ensure that children are able to understand the survey questions and all experiments. If there were two or fewer children aged 6 to 16 in a household, all children were interviewed. Otherwise, only the youngest and the oldest child in the respective age range were interviewed.

2018. Due to the sampling procedure via local schools, each household added in 2018 had at least one child at primary school age. If there was more than one child aged 6 to 16 years, a second child was randomly selected for the experimental survey. Additionally, two adults, typically mother and father of the selected children, from each of the newly sampled households took part in the data collection.[23] Other constellations comprise grandparents or other relatives taking part in the experiments in case parents were not available. Typically, if only the mother participated, fathers were living and working abroad or outside the study area to earn the family's living. Cf. footnote 20.

In 2018, as before, we elicited preferences using experiments, personality traits applying validated scales, and IQ relying on well-established tests. Additionally, we collected anthropometric data besides the general household survey.

Total. 93 percent (928 out of 1,001) households from 2014/16 were successfully re-interviewed in 2018. Some of the remaining households had migrated, some refused to cooperate and some were unavailable. In total, we interviewed 928+3,000+7=3,935 households in 2018 (see Table 3.A.1).

23. For all children aged 6 to 16 who participated in the experiments, both mother and father of the chosen child participated in the experiments in 72 percent of cases. Only the mother participated in 22 percent of cases, only the father in 2 percent of cases.

Table 3.A.1. Total study sample size 2018

District	Subdistrict	Number of Villages	Targeted Sample		Sample Covered		Additional (Split HH)
			2014/16	2018	2014/16	2018	
Netrokona	Kalmakanda	17	116	340	98	340	0
	Durgapur	11	75	220	70	220	0
	Atpara	14	141	280	131	280	0
	Mohanganj	19	88	380	80	380	0
Chandpur	Kachua	16	103	320	99	320	3
	Hajiganj	18	117	360	110	360	2
Sunamganj	Sunamganj Sadar	11	97	220	87	220	0
	Dakkhin Sunamganj	3	34	60	33	60	0
Gopalganj	Gopalganj Sadar	16	79	320	76	320	0
	Muksudpur	13	60	260	56	260	0
	Kotwalipara	12	91	240	88	240	2
Total		**150**	**1,001**	**3,000**	**928**	**3,000**	**7**

Note: Split households are cases in which a member of a sample household founded or joined a new household.

3.A.2 2018 sampling procedure via primary schools

Selection of primary schools. In 2018, the given 150 villages were visited and a primary school suitable for the selection of school-going children was chosen. However, a 1:1 village-school matching was not always possible, leading to a lower number of sample schools than villages. Some villages do not have their own primary school such that children attend a school in a neighboring village. Hence, some schools serve multiple villages. In these cases, the school the children from the original sample village attend got selected. In other cases, villages have multiple schools. Here, the school with the majority of students from the village and situated at the village center was selected. This resulted in a selection of 135 primary schools forming the basis for the following sampling procedure.

Sampling procedure. Taking the 135 selected schools as a starting point, in general five students from each of the grades 2 to 5 (i.e., 20 students in total) were selected. If from any grade there couldn't be found five students from the connected sample villages, they got replaced by students from neighboring villages (leading to a higher number of villages than originally selected, with 53 additional villages but always only a few children from those villages). If still there couldn't be found enough students from a particular grade, the remaining children got selected from other grades.

Appendix 3.B Additional Results

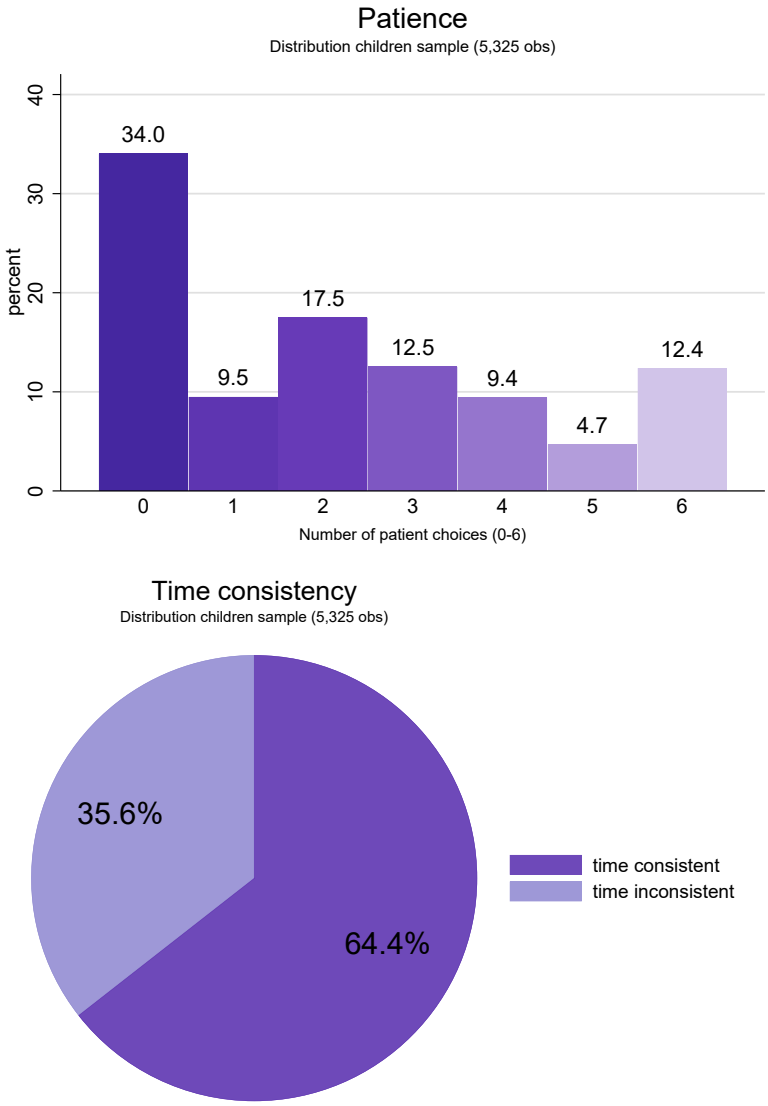


Figure 3.B.1. Distribution of time preferences

Note: In our sample (5,989 children) we have 5,325 observations for time preferences, i.e., 5,325 children who understood the time preferences games.

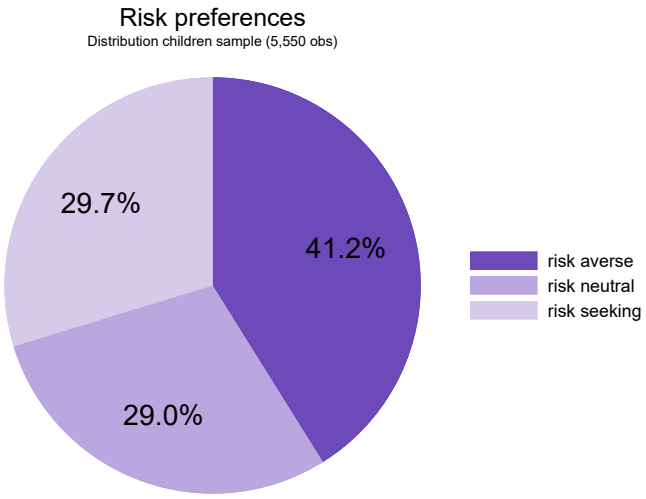


Figure 3.B.2. Distribution of risk preferences

Note: In our sample (5,989 children) we have 5,550 observations for risk preferences, i.e., 5,550 children who understood the risk preferences games.

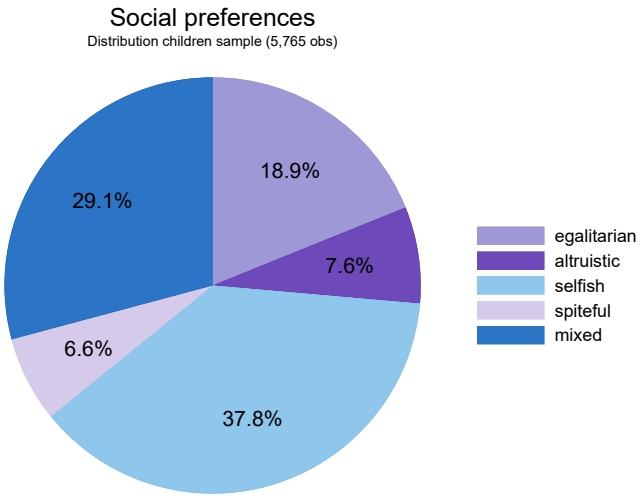


Figure 3.B.3. Distribution of social preferences

Note: In our sample (5,989 children) we have 5,765 observations for social preferences, i.e., 5,765 children who understood the social preferences games.

Table 3.B.1. Summary statistics for children sample

	Mean	Std. dev.	Min	Max	Obs.
Preferences					
Patience					
score	2.175	2.081	0	6	5,325
standardized†	0	1	-1.045	1.838	5,325
Time consistent	0.644		0	1	5,325
Cond. time consistent	0.239		0	1	5,325
Risk averse	0.412		0	1	5,550
Egalitarian	0.189		0	1	5,765
Altruistic	0.076		0	1	5,765
Selfish	0.378		0	1	5,765
Spiteful	0.066		0	1	5,765
Mixed	0.291		0	1	5,765
Cognitive skills					
IQ†					
score	44.689	4.108	40	70	5,989
standardized†	0	1	-1.142	6.162	5,989
Gender & age					
Female	0.521		0	1	5,989
Age	10.30	2.640	6	16	5,989
Outcomes					
Study attitude					
score	4.434	0.793	1	5	5,989
standardized†	0	1	-4.331	0.714	5,989
Risky behaviors					
fraction (0–1)	0.189	0.163	0	0.813	3,424
standardized†	0	1	-1.162	3.837	3,424
Prosociality					
score	6.481	2.266	0	10	5,793
standardized†	0	1	-2.860	1.553	5,793
SDQ internalizing subscale					
score	5.574	2.799	0	17	5,793
standardized†	0	1	-1.992	4.083	5,793
SDQ externalizing subscale					
score	5.945	3.259	0	19	5,793
standardized†	0	1	-1.824	4.006	5,793
SDQ full score					
score	11.52	5.242	1	32	5,793
standardized†	0	1	-2.007	3.907	5,793
Household environment					
Log income	11.54	1.950	0	16.15	5,964
Father literacy	0.549		0	1	5,624
Mother literacy	0.649		0	1	5,735
Father age	43.12	8.131	23	85	5,624
Mother age	35.95	6.293	15	67	5,735
Number of siblings	2.512	1.462	0	10	5,989
Senior in HH	0.200		0	1	5,989
Homestead area (in sqm)	392.5	404.8	4	4,400	5,969
Electricity	0.918		0	1	5,969
Muslim	0.822		0	1	5,975

Notes: †Reference group for standardization to a mean of zero and standard deviation of one is the sample of children participating in the experiments.

Table 3.B.2. Summary statistics for children sample, continued

	Mean	Std. dev.	Min	Max	Obs.
Parents' preferences					
Father patience					
score	5.446	5.993	0	18	4,177
standardized†	0	1	-0.909	2.095	4,177
Father cond. time consistent	0.261		0	1	4,177
Father risk averse	0.404		0	1	4,132
Father egalitarian	0.188		0	1	4,292
Father altruistic	0.070		0	1	4,292
Father selfish	0.398		0	1	4,292
Father spiteful	0.044		0	1	4,292
Father mixed	0.299		0	1	4,292
Mother patience					
score	5.439	5.796	0	18	5,141
standardized†	0	1	-0.938	2.167	5,141
Mother cond. time consistent	0.243		0	1	5,141
Mother risk averse	0.436		0	1	5,146
Mother egalitarian	0.197		0	1	5,356
Mother altruistic	0.075		0	1	5,356
Mother selfish	0.375		0	1	5,356
Mother spiteful	0.051		0	1	5,356
Mother mixed	0.302		0	1	5,356
Parents' IQ†					
Father IQ					
score	46.50	1.981	45	59	4,446
standardized†	0	1	-0.755	6.313	4,446
Mother IQ					
score	46.02	1.689	40	62	5,618
standardized†	0	1	-3.565	9.464	5,618
Parenting styles†					
Emotional warmth					
score	3.270	0.736	1	5	5,913
standardized†	0	1	-3.086	2.351	5,913
Incons. parenting					
score	2.918	1.094	1	5	5,913
standardized†	0	1	-1.754	1.903	5,913
Monitoring					
score	2.871	0.664	1	5	5,913
standardized†	0	1	-2.819	3.206	5,913
Negative communication					
score	2.491	0.625	1	5	5,913
standardized†	0	1	-2.386	4.013	5,913
Psych. control					
score	2.141	0.676	1	5	5,913
standardized†	0	1	-1.689	4.232	5,913
Strict control					
score	2.519	0.692	1	5	5,913
standardized†	0	1	-2.193	3.584	5,913

Notes: †Reference groups for standardization to a mean of zero and standard deviation of one are the sample of children participating in the experiments and the sample of these children's parents, respectively. Note that standardization for fathers' and mothers' measures is done jointly.

Appendix 3.C Preference Measures for Adults

For the elicitation of time preferences, adults had to make 18 choices (three choice sets with six choices each) between smaller-sooner and larger-later rewards. All choice sets had three-month time horizons with different starting points: "Tomorrow", "After 1 month", "After 1 year". Within each choice set, participants had to choose between two options, A and B, with increasing annual interest rates (see Table 3.C.1). For our analysis, we also use the total number of patient choices which is a simple count of the larger, but later reward in all 18 choices (variable *patience* ranging from 0 to 18) as well as a dummy indicating whether adults are time consistent (dummy *time consistent*) conditional on making at least one patient choice. In order to match the child data, adults making identical choices for sets 1 and 2—the two choice sets with three-month delay starting tomorrow and in one month—are classified as conditionally time consistent.

Table 3.C.1. Time preferences experiments for adults

Payoff Alternative		**Payment Option A** (pays amount below)	**Payment Option B** (pays amount below)	**Annual Interest Rate**	**Choice:** A or B?
	Set 1:	**Tomorrow**	**After 3 Months**	in %	
	OR Set 2:	**After 1 Month**	**After 4 Months**		
	OR Set 3:	**After 1 Year**	**After 1 Year 3 Months**		
1		100	105	20	
2		100	110	40	
3		100	120	80	
4		100	125	100	
5		100	150	200	
6		100	200	400	

Regarding risk preferences we applied the same setup as for children and only adjusted the absolute amounts of money to be paid out (higher amounts than the age-specific payments for children). In our analysis, we again use a dummy for being risk averse (i.e., choosing one of the first four gambles, dummy *risk averse*).

Social preferences were also elicited in the same way for children and adults, except for the conversion rate of stars into Taka (Bangladeshi currency). In our regression specifications, we use the four dummy variables introduced above, *egalitarian, altruistic, selfish* and *mixed* with "mixed" being the residual category and "spiteful" as base category.

Appendix 3.D Parenting Styles

Mothers were rating 18 items on a five-point scale, stating the frequency of different actions when raising their children ("Never" to "Very frequently"). The questionnaire was answered once for each household, so values are identical for siblings. These items are combined into six scales (in general three items per scale), indicating for each mother how much parenting style is characterized by emotional warmth, inconsistent parenting, monitoring, negative communication, psychological control and strict control.

Emotional warmth encompassed the degree of affirmative attention and care in parenting. *Inconsistent parenting* points to inconsistencies in parents' behavior when bringing up their children. *Monitoring* refers to how well parents are informed about activities and social contacts of their children. *Negative communication* indicates the degree of negative behavior of parents towards their children. *Psychological control* assesses parents' negative intrusive thoughts, feelings, and behavior towards their children with parents potentially building up psychological pressure. *Strict control* encompasses how rigorously and harshly parents interact with their children. For an overview and a detailed description of the parenting style measures, see Thönnissen, Wilhelm, Alt, Greischel, and Walper (2019) and the references therein.

The variables are normalized to a mean of zero and standard deviation of one across our children sample.

Emotional warmth.
1. I use words and gestures to show my child that I love him/her.
2. I comfort my child when he/she feels sad.
3. I praise my child.

Inconsistent parenting.
1. I threaten my child with punishment, but don't actually follow through with it.
2. I reduce punishments or lift them ahead of time.
3. It is hard for me to be consistent in my childrearing.[24]

Monitoring.
1. I talk to my child about things he/she has done, seen, or experienced when he/she was out.
2. When my child is outside the home, I know exactly where he/she is.
3. I try to actively influence my child's circle of friends.

Negative communication.
1. I criticize my child.
2. I shout at my child when he/she did something wrong.
3. I scold my child when I am angry at him/her.

24. Due to a translation issue, the dimension "inconsistent parenting" is reduced to item number 3: "It is hard for me to be consistent in my childrearing." Translation of the other two items into Bengali did not properly convey the true meaning.

Psychological control.

1. I feel that my child is ungrateful because he/she disobeys.
2. I stop talking to my child for a while when he/she did something wrong.
3. I am disappointed and sad when my child misbehaves.

Strict control.

1. I punish my child when he/she was disobedient.
2. I tend to be strict with my child.
3. I make it clear to my child that he/she should not oppose orders and decisions.

Appendix 3.E Details on Outcome Measures

3.E.1 Risky behaviors

16 yes/no-questions referring to behaviors considered as risky in Bangladesh. The items were developed in cooperation with locals from villages similar to our sample villages.

1. Do you smoke?
2. Do you eat pan/jorda/supari?[25]
3. Do you gamble/bet/play lottery?
4. Do you play on the road with car tires?
5. Do you jump from tree/bridge/saqo/troller to river or canal?
6. Do you run behind the motorbike/car/trolley?
7. Do you play danguli?[26]
8. Do you get up in the tree or your house roof?
9. Do you play dive in pond/river?
10. Do you bring flowers or fruits without permission from someone else's garden?
11. Do you play somersault?
12. Do you blow fire-works?
13. Do you play ha-du-du?[27]
14. Do you use marijuana/ganja/hashish?
15. Do you drive a car/motorbike?
16. Do you often get into physical fights?

3.E.2 Prosociality score

Subscore of the Strengths and Difficulties Questionnaire (SDQ). Mothers were rating five items related to prosocial behavior on a three-point scale ("Not true", "Somewhat true", "Certainly true"): My child...

1. Is considerate of other people's feelings
2. Shares readily with other children (treats, toys, pencils, etc.)
3. Is helpful if someone is hurt, upset or feeling ill
4. Is kind to younger children
5. Often volunteers to help others (parents, teachers, children)

25. Quid to be chewed after eating that contains stimulating substances (betel nut) similar to tobacco and can cause health problems including oral cancers
26. Rough game played with sticks (a similar European game is called "tipcat")
27. National contact team sport in Bangladesh, also known as "Kabaddi"

3.E.3 SDQ score

The full SDQ (Strengths and Difficulties Questionnaire) score comprises the four subscores "emotional symptoms", "peer problems", "hyperactivity" and "conduct problems" and is elicited by asking mothers about their children. For each subscale, mothers were rating five items on a three-point scale ("Not true", "Somewhat true", "Certainly true"). Items for emotional symptoms and peer problems can be grouped into an internalizing subscale, items for hyperactivity and behavioral/conduct problems into an externalizing subscale.

Internalizing subscale

Emotional symptoms My child...

1. Often complains of headaches, stomach-ache or sickness
2. Has many worries, often seems worried
3. Is often unhappy, down-hearted or tearful
4. Is nervous or clingy in new situations, easily loses confidence
5. Has many fears, is easily scared

Peer problems My child...

1. Is rather solitary, tends to play alone
2. Has at least one good friend (*reversed*)
3. Is generally liked by other children (*reversed*)
4. Is picked on or bullied by other children
5. Gets on better with adults than with other children

Externalizing subscale

Hyperactivity My child...

1. Is restless, overactive, cannot stay still for long
2. Is constantly fidgeting or squirming
3. Is easily distracted, concentration wanders
4. Thinks things out before acting (*reversed*)
5. Sees tasks through to the end, good attention span (*reversed*)

Conduct problems My child...

1. Often has temper tantrums or hot tempers
2. Is generally obedient, usually does what adults request (*reversed*)
3. Often fights with other children or bullies them
4. Often lies or cheats
5. Steals from home, school or elsewhere

Appendix 3.F Experimental Instructions

3.F.1 Experimental questionnaire for children

General setting

- **Age:** Children aged 6 to 16 will participate in a sequence of three experiments:
  a. Time preferences
  b. Risk preferences
  c. Social preferences
- **Order:** The order of the experiments will be randomly determined by the administrators, which is explained at the beginning of the experiments.
- **Incentive:** Each child will receive a token (a star) as a show-up fee, which s/he will be able to convert into money at the end of the experiments. In addition, children can earn money during the experiment as all experiments are incentivized. However, for each child, only one of the experiments will be paid out. Which experiment will be paid will be determined through a lottery that will be explained soon.
- **Exchange rate for incentives:** The exchange rate between stars and money will be age-specific and will be communicated at the beginning of the experiment. The conversion table is included here.
- **Venue:** The experiments will take place in children's home; a male administrator will deal with boys and a female administrator will deal with girls.
- **Instructions:** All enumerators/instructors must memorize the instructions and explain the game to the child. While they will not read the text word by word, they will stick closely to the wording of the experimental instructions. In addition, the explanation will involve control questions to check for understanding.
- **Timing:** Members who belong to the same household will sit simultaneously in separate parallel sessions. It is an important task of the interviewer to ensure that the decisions of a household member truly reflect his/her own decision only and that other household members do not try to influence the decisions, e.g. place them back to back or in separate rooms.
- **Control questions that check children's understanding:** Children's understanding of the rules of the various experiments will be documented.

General instructions

My name is ... Today I have prepared three games for you. In these games, you can earn money. Before we start, I will explain the rules of our games. How much money you will earn depends mainly on your decisions. At the end, only one of the games will be paid. Which game will be paid will be determined randomly after playing all three games. You will roll a die to determine which of the three games gets paid. The rolled number will determine whether the first, second, or third game will be paid for. Each game is equally likely to be paid.

It is important that you understand the rules of all our games and play each of them carefully because each of them could be the one that is paid. Please listen carefully now. I will frequently stop during my explanation and allow you to ask questions. Therefore, please interrupt me anytime in case you have a question.

Are you okay so far? *Leave time for questions and answer them privately.*

1. Determine the sequence by rolling a die, and write the sequence in which experiments are conducted:

○1	=	risk, time, social
○2	=	risk, social, time
○3	=	time, risk, social
○4	=	time, social, risk
○5	=	social, time, risk
○6	=	social, risk, time

Time preferences

Let us start with this game. Before we start, let me explain the rules of our game. In this game you can earn stars, which you can convert into money. Each star is equal to Taka ... (*use the age appropriate exchange rate*). The more stars you earn, the more money you get. That's why it is important that you understand the rules of our game. Please interrupt me anytime in case you have a question.

Are you okay so far? *Leave time for questions and answer them privately.*

1. Determine the order of explanation by rolling a die (blue, green, yellow) and write it down:

○1	=	blue, green, yellow
○2	=	blue, yellow, green
○3	=	green, blue, yellow
○4	=	green, yellow, blue
○5	=	yellow, blue, green
○6	=	yellow, green, blue

Within each part (color) the order is fixed, i.e. always use blue sheet 1 before blue sheet 2, green sheet 1 before green sheet 2, yellow sheet 1 before yellow sheet 2.

The game works as follows:

The game consists of six parts. Two blue parts, two yellow parts and two green parts (*when mentioning the parts please point at the respective decision sheets*). In each part, you will need to make one decision. For example, in this green part you have to decide whether you prefer receiving 2 stars (*please point at the stars on the decision sheet*) tomorrow, in this case please tick THIS box (*point at the respective box*), or whether you prefer receiving 3 stars in 3 weeks, in that case please tick THAT box (point at the respective box). 3 weeks means 21 days and 21 nights. If you go for 2 stars tomorrow, you will get the money tomorrow. One of us will come to your home and deliver the money in an envelope with your name marked on it. If you wait, you will get money for 3 stars after 3 weeks. Again, one of us will come to your home and deliver the money in an envelope with your name marked on it.

In the second green part you have to decide whether you prefer receiving 2 stars (*please point at the stars on the decision sheet*) tomorrow, in this case please tick THIS box (*point at the respective box*), or whether you prefer receiving 4 stars in 3 weeks, in that case please tick THAT box (*point at the respective box*). If you go for 2 stars, you will get the money tomorrow. One of us will come to your home and deliver the money in an envelope with your name marked on it. If you wait, you

will get money for 4 stars after 3 weeks. Again, one of us will come to your home and deliver the money in an envelope with your name marked on it.

Could you please repeat the rules of the game? *If the child is unable to repeat, please explain the game again; the child has to be able to repeat the correct meaning of the game autonomously.*

2. Child understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

The yellow parts are very similar to the green part. Here you see one of the decision sheets for the blue part. Again, 2 stars on the left-hand side, and 3 stars on the right-hand side. If you prefer receiving 2 stars tomorrow, you need to tick the left box. However, now if you prefer receiving 3 stars in 3 months, you need to tick the right box. 3 months means that about 90 days and nights will pass before you will get the money. On the second yellow sheet, again 2 stars on the left-hand side, and 4 stars on the right-hand side. If you prefer receiving 2 stars tomorrow, you need to tick the left box. However, now if you prefer receiving 4 stars in 3 months, you need to tick the right box. What do you think will happen if you tick THIS box? (*Please point at the box with the immediate (tomorrow) reward.*) What do you think will happen if you tick THAT box? (*Please point at the box with the delayed reward of 3 stars; the child has to answer the questions correctly, otherwise the experimenter has to repeat the explanation.*)

3. Child understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

The blue parts are very similar to the green and yellow parts. Here you see the first decision sheet for the blue part. Again, 2 stars on the left-hand side, and 3 stars on the right-hand side. However, now the earlier payment takes place in 1 month, which means after 30 days and nights have passed. The later payment takes place in 4 months, which means after 120 days and nights have passed. If you decide to receive 2 stars, you need to wait 1 month, and if you decide to receive 3 stars, you need to wait 4 months. On the second blue sheet, again 2 stars on the left-hand side, and 4 stars on the right-hand side. If you prefer receiving 2 stars in 1 month, you need to tick the left box. However, if you prefer receiving 4 stars in 4 months, you need to tick the box on the right. What do you think will happen if you tick THIS box? (*Please point at the box with the reward in 1 month.*) What do you think will happen if you tick THAT box? (*Please point at the box with the delayed reward of 4 stars; the child has to an-*

swer the questions correctly, otherwise the experimenter has to repeat the explanation.)

4. Child understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

If this game is paid, only one of the six decisions counts. That means you will receive the stars for one of the six parts only. The decisions are numbered from 1 to 6. After your decisions, you will roll a die (*please demonstrate*). Assume that it shows number 5. Now decision sheet 5 (the first blue sheet) is played for real. If you have checked the box on the left-hand side, you will receive the money for 2 stars in one month. If you have checked the box on the right-hand side, you will receive money for 3 stars in 4 months. The other five sheets do not count in this case. However, you need to make a decision for each of the six sheets because you do not know yet which part will be drawn at the end of the game. Could you please repeat the last part? Will you receive the stars for all six sheets? Do you need to make a decision for each of the six sheets? If the child answers incorrectly then the experimenter has to repeat the explanation of this part.

5. Child understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

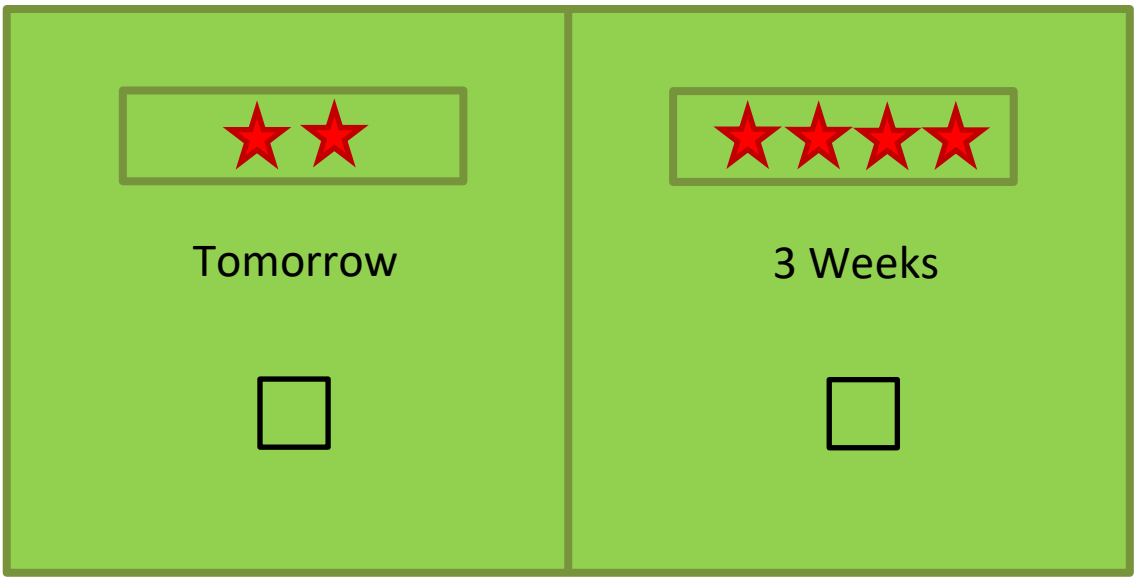
Please take your decision for each of the six sheets now (*place the decision sheets side by side on the table; the child should fill out the decision sheets from left to right*). Start with this part (*point at the first decision sheet (depending on the order of explanation)*) and continue with this part (*point at the second decision sheet*) and finally make your decision in this part (*point at the final decision sheet*). Take as much time as you need. In the meantime, I will turn around so that I do not disturb you. Just call me when you are done or have any questions.

Decision sheet 1

(Green sheet 1)

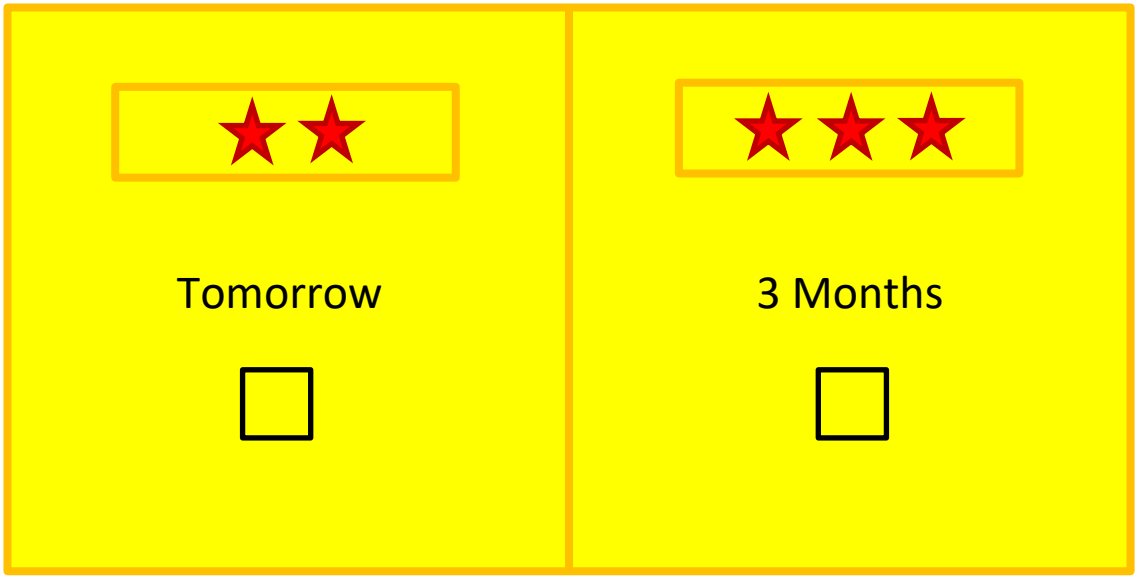
Decision sheet 2

(Green sheet 2)



Decision sheet 3

(Yellow sheet 1)

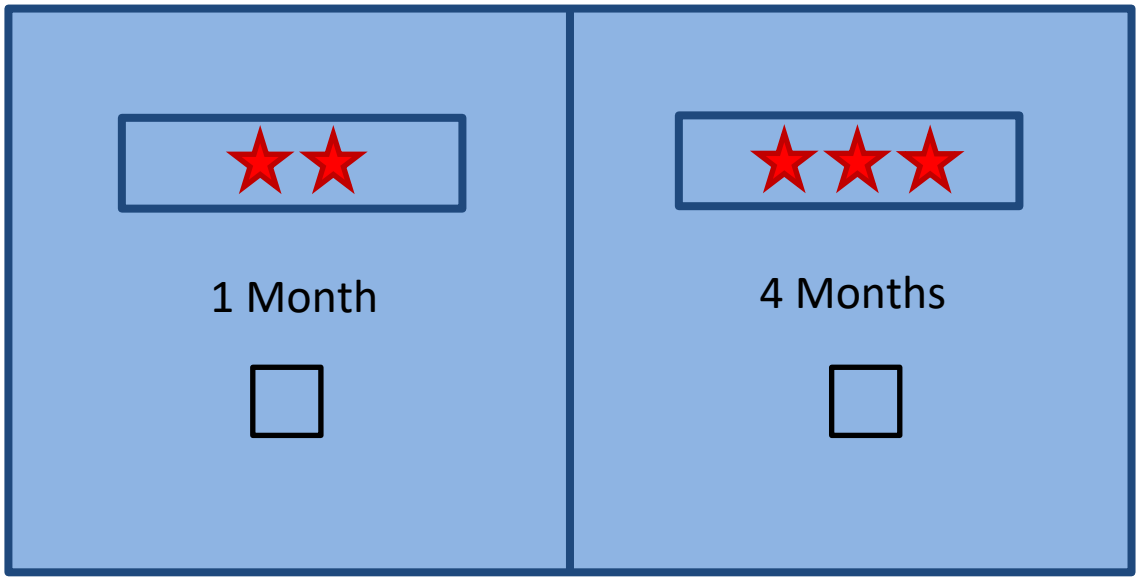


Decision sheet 4

(Yellow sheet 2)

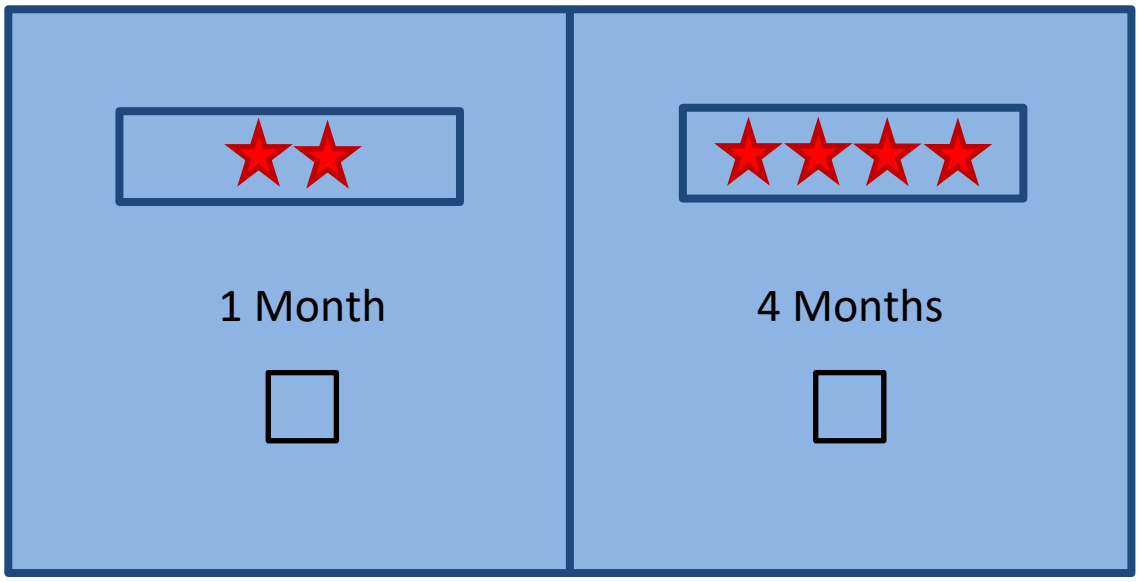
Decision sheet 5

(Blue sheet 1)



Decision sheet 6

(Blue sheet 2)



6.	Decision taken on Green sheet 1:	○	1 = tomorrow, 2 = 3 weeks
7.	Decision taken on Green sheet 2:	○	1 = tomorrow, 2 = 3 weeks
8.	Decision taken on Yellow sheet 1:	○	1 = tomorrow, 2 = 3 months
9.	Decision taken on Yellow sheet 2:	○	1 = tomorrow, 2 = 3 months
10.	Decision taken on Blue sheet 1:	○	1 = 1 month, 2 = 4 months
11.	Decision taken on Blue sheet 2:	○	1 = 1 month, 2 = 4 months

Roll a die to determine which decision sheet would be paid if this game got selected for payoff in the end.

Risk preferences

Let us start with this game. Before we start, I will explain the rules of our game. Similar to other games, you can earn money in this game as well. How much money you will earn depends mainly on your decisions. That's why it is important that you understand the rules of our game. Please listen carefully now. I will frequently stop during my explanation and allow you to ask questions. Please interrupt me anytime in case you have a question.

Are you okay so far? *Leave time for questions and answer them privately.*

In this game, you need to select the gamble you would like to play from among six different gambles, which are listed below. You must select one and only one of these gambles.

If this game is selected for payment, you will have a one in six chance of receiving the money. The selection will be made by rolling a six-sided die twice—first, you will roll the die to decide the gamble, and the second to decide the outcome of the particular gamble. For example, if you selected gamble number 4, then if the first roll of the die is 4, you would receive one of the payoffs of gamble number 4, which will be determined in the second roll. If the first roll of the die is not 4 and you have chosen gamble number 4, you would not receive any payments. Depending on the outcome of the first roll, the second roll would determine the outcome of the selected gamble. Each gamble has two possible outcomes—low and high. If 1, 2 or 3 is rolled, the outcome of the selected gamble is the low one, and if 4, 5 or 6 is rolled, the outcome of the gamble is the high one, and you would receive money accordingly.

Notice that the low outcome is decreasing and the high outcome is increasing for each successive gamble. For example, in the first gamble, both outcomes are identical. If you select it and then this number is rolled in the first roll, your payoff would be 25 (*please adjust for the appropriate age*) Taka. If on the other hand, you had selected gamble number 2, and if it is rolled on the first roll, your payoff could be 22 (*please adjust*) Taka or 48 (*please adjust*) Taka. In the second roll, if 1, 2 or 3 is rolled, you would receive 22 (*please adjust*) Taka, whereas if 4, 5 or 6 is rolled, you would receive 48 (*please adjust*) Taka.

Ask the child to repeat the game.

1. Child understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

Before you select the actual gamble involving money, we will have a practice session with candies. There are two gambles from which you need to select one:

	Outcome	Payoff	Chances	Your Selection
Gamble 1	LOW	1	50%	
	HIGH	1	50%	
Gamble 2	LOW	0	50%	
	HIGH	2	50%	

Both gambles have two outcomes. The first gamble pays 1 candy in both states, while the second gamble pays no (0) candy in the low state and 2 candies in high state. Which gamble would you like to play? Once you make your selection, you will first roll the die to decide the gamble, and then again roll the die to decide the outcome of the particular gamble. For example, if you selected gamble number 2, then if the first roll of the die is 2, you would receive one of the payoffs of gamble number 2, which will be determined in the second die roll. In the second die roll, if 1, 2 or 3 is rolled, the outcome of the selected gamble is the low one, which is 0 in gamble number 2. That means, you will not receive any candy. However, if 4, 5 or 6 is rolled, the outcome of the gamble is the high one, and you will receive 2 candies. Let us start this now.

Are you okay so far? *Leave time for questions and answer them privately.*

2. Gamble number picked involving candies: ○

Roll a die to determine whether gamble number 1 or gamble number 2 is payoff-relevant. If you have rolled a 1 or a 2, please roll the die a second time to determine whether the low or the high payoff is realized.

3. Select the table with the appropriate age:

○1 = age 6-7
○2 = age 8-9
○3 = age 10-11
○4 = age 12-13
○5 = age 14-15
○6 = age 16

Table 1: Age 6-7

Mark the gamble you like best with an X in the last column "Your Selection"
(mark only one of the six gambles):

	Outcome	Payoff	Chances	Your Selection
Gamble 1	LOW	13	50%	
	HIGH	13	50%	
Gamble 2	LOW	11	50%	
	HIGH	24	50%	
Gamble 3	LOW	10	50%	
	HIGH	30	50%	
Gamble 4	LOW	8	50%	
	HIGH	38	50%	
Gamble 5	LOW	3	50%	
	HIGH	48	50%	
Gamble 6	LOW	0	50%	
	HIGH	50	50%	

Table 2: Age 8-9

Mark the gamble you like best with an X in the last column "Your selection"
(mark only one of the six gambles):

	Outcome	Payoff	Chances	Your Selection
Gamble 1	LOW	19	50%	
	HIGH	19	50%	
Gamble 2	LOW	17	50%	
	HIGH	36	50%	
Gamble 3	LOW	15	50%	
	HIGH	45	50%	
Gamble 4	LOW	11	50%	
	HIGH	56	50%	
Gamble 5	LOW	4	50%	
	HIGH	71	50%	
Gamble 6	LOW	0	50%	
	HIGH	75	50%	

Table 3: Age 10-11

Mark the gamble you like best with an X in the last column "Your selection"
(mark only one of the six gambles):

	Outcome	Payoff	Chances	Your Selection
Gamble 1	LOW	25	50%	
	HIGH	25	50%	
Gamble 2	LOW	22	50%	
	HIGH	48	50%	
Gamble 3	LOW	20	50%	
	HIGH	60	50%	
Gamble 4	LOW	15	50%	
	HIGH	75	50%	
Gamble 5	LOW	5	50%	
	HIGH	95	50%	
Gamble 6	LOW	0	50%	
	HIGH	100	50%	

Table 4: Age 12-13

Mark the gamble you like best with an X in the last column "Your selection"
(mark only one of the six gambles):

	Outcome	Payoff	Chances	Your Selection
Gamble 1	LOW	38	50%	
	HIGH	38	50%	
Gamble 2	LOW	33	50%	
	HIGH	72	50%	
Gamble 3	LOW	30	50%	
	HIGH	90	50%	
Gamble 4	LOW	23	50%	
	HIGH	113	50%	
Gamble 5	LOW	8	50%	
	HIGH	143	50%	
Gamble 6	LOW	0	50%	
	HIGH	150	50%	

Table 5: Age 14-15

Mark the gamble you like best with an X in the last column "Your selection"
(mark only one of the six gambles):

	Outcome	Payoff	Chances	Your Selection
Gamble 1	LOW	44	50%	
	HIGH	44	50%	
Gamble 2	LOW	39	50%	
	HIGH	84	50%	
Gamble 3	LOW	35	50%	
	HIGH	105	50%	
Gamble 4	LOW	26	50%	
	HIGH	131	50%	
Gamble 5	LOW	9	50%	
	HIGH	166	50%	
Gamble 6	LOW	0	50%	
	HIGH	175	50%	

Table 6: Age 16

Mark the gamble you like best with an X in the last column "Your selection"
(mark only one of the six gambles):

	Outcome	Payoff	Chances	Your Selection
Gamble 1	LOW	63	50%	
	HIGH	63	50%	
Gamble 2	LOW	55	50%	
	HIGH	120	50%	
Gamble 3	LOW	50	50%	
	HIGH	150	50%	
Gamble 4	LOW	38	50%	
	HIGH	188	50%	
Gamble 5	LOW	13	50%	
	HIGH	238	50%	
Gamble 6	LOW	0	50%	
	HIGH	250	50%	

4. Gamble number picked: ○

Roll a die to determine whether gamble number 1 or gamble number 2 is payoff-relevant. If the outcome of the first die roll equals the gamble number picked (if 6. = 7.), please roll the die a second time to determine whether the low or the high payoff is realized.

Social preferences

In this game you can earn stars, which you can convert into money. Each star is equal to Taka ... (*use the age appropriate exchange rate*). The more stars you will earn, the more money you will get. That's why it is important that you understand the rules of our game. Please listen carefully now. I will frequently stop during my explanation and allow you to ask questions. Therefore, please interrupt me anytime in case you have a question.

Are you okay so far? *Leave time for questions and answer them privately.*

In this game you have to decide how to divide stars between yourself and another child similar to you but from a different village. You will never know who exactly the other child is and the other child will not get to know you. However, I will ensure that the other child does indeed receive the money that corresponds to the stars that you will give to him/her.

You will get four different decision sheets. You will need to decide how to divide stars between yourself and another child similar to you.

Are you okay so far? *Leave time for questions and answer them privately.*

There are two possible ways to allocate the stars: the option on the left-hand side and the option on the right-hand side.

Please look at the decision sheet. With option "left" you get 1 star and the child from another village gets 1 star. 1 star equals ... Taka (*depending on the age group*). With option "right" you get 2 stars and the child from another village gets 0 stars.

Are you okay so far? *Leave time for questions and answer them privately.*

Depending on which option you want to choose, you should check the box at the left- or the right-hand side. You can choose either option "left" or option "right". If you would like to divide the stars according to option "right", which box would you have to check? Right, the box at the "right" side.

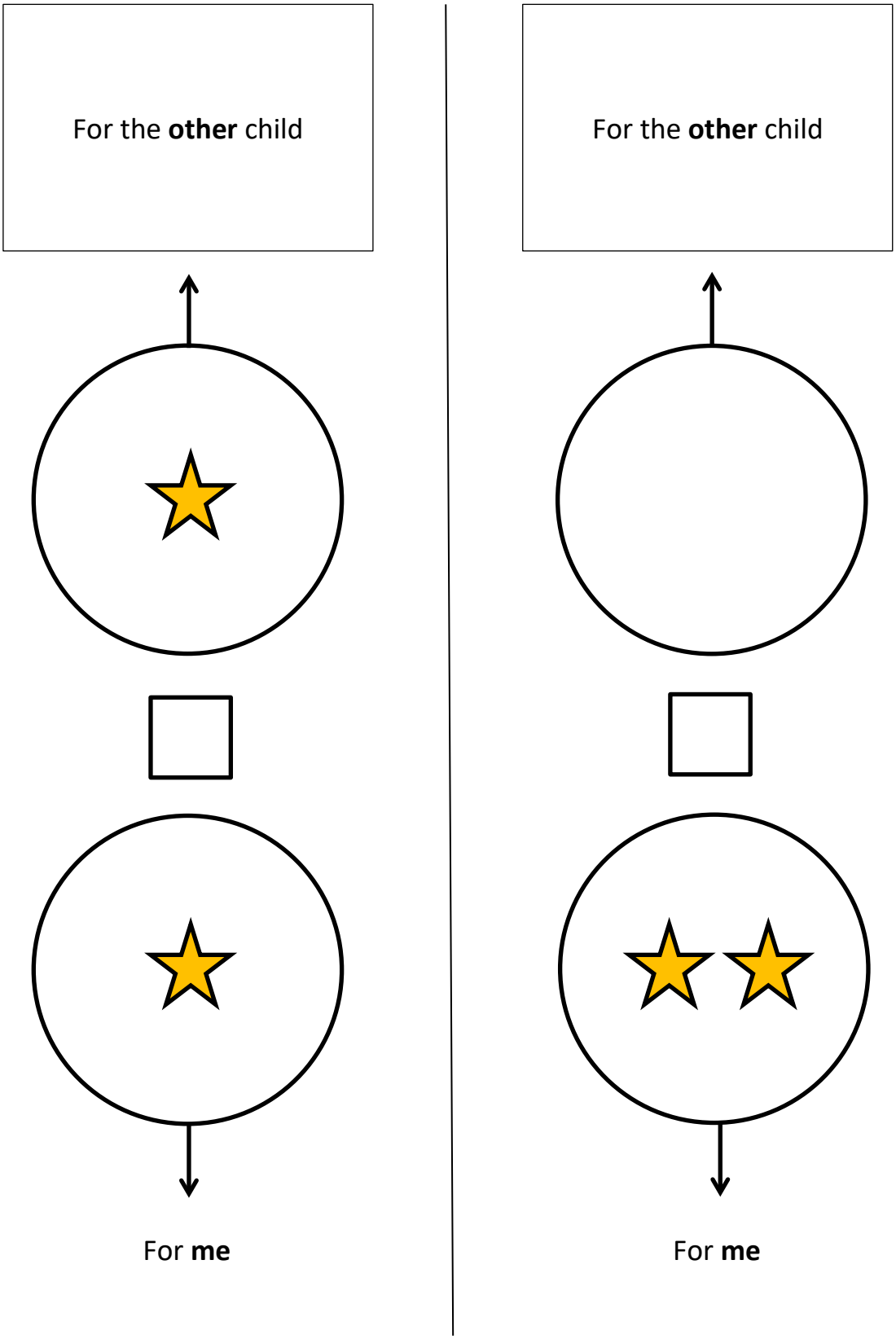
How much would you earn and how much would the child from the other village with whom you are randomly matched earn in this case? Right, you would get ... Taka (*depending on the age group*) and the other child similar to you would get nothing.

1. Child understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

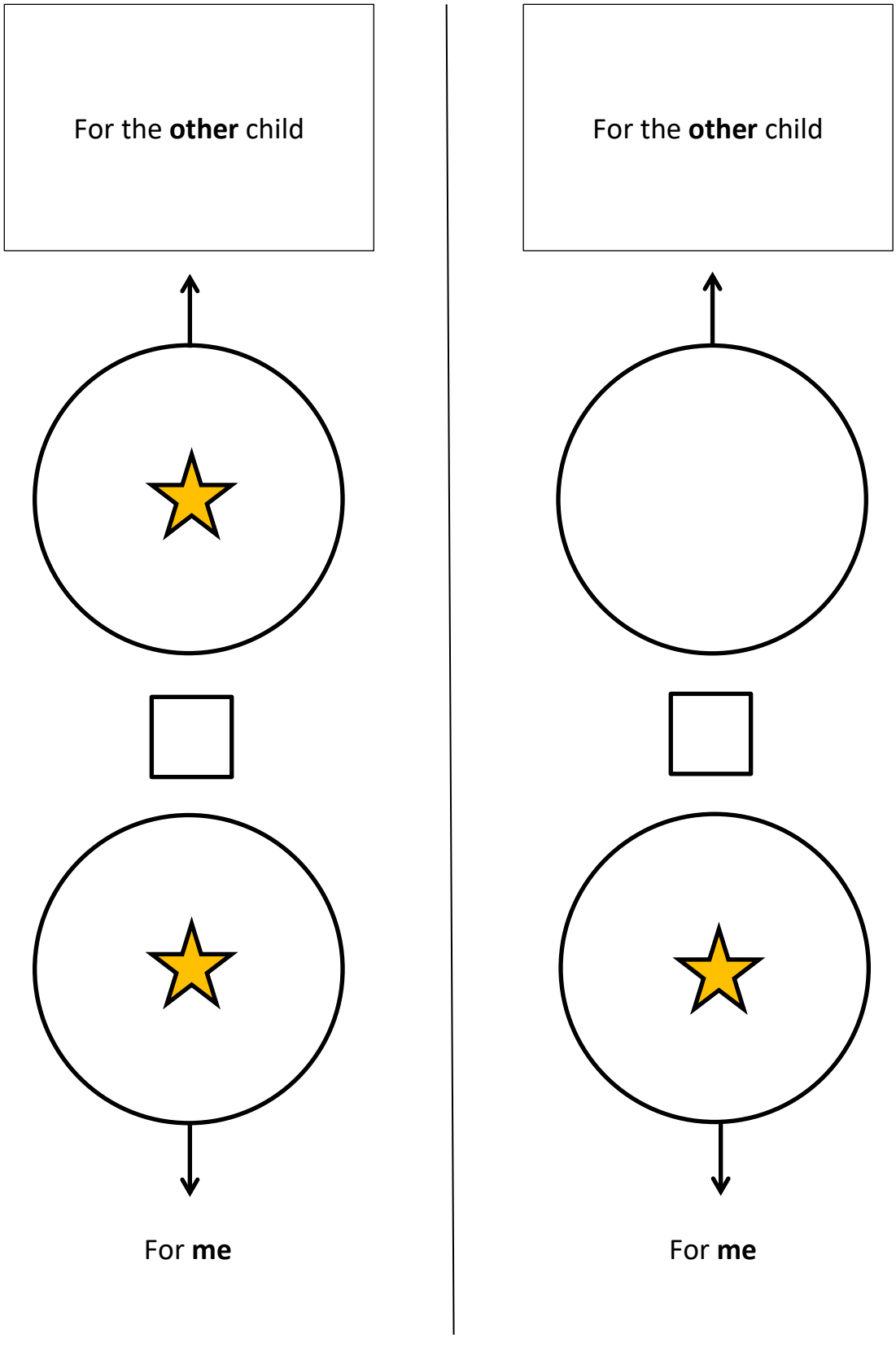
Are you okay so far? *Leave time for questions and answer them privately.*

As I mentioned earlier, you will get four decision sheets. The decision sheets differ from each other in the amount of stars that can be divided between you and the other child. Please choose one of the two options for each decision sheet. At the end of the game, you will roll a die (*show the process*). Here the number you roll corresponds to the sheet you will get paid for, meaning if you roll 1, you get paid for decision sheet 1 etc. If this game is selected for payment, you and the other child will be paid according to the selected decision sheet. If you roll a 5 or 6, no decision sheet will be paid.

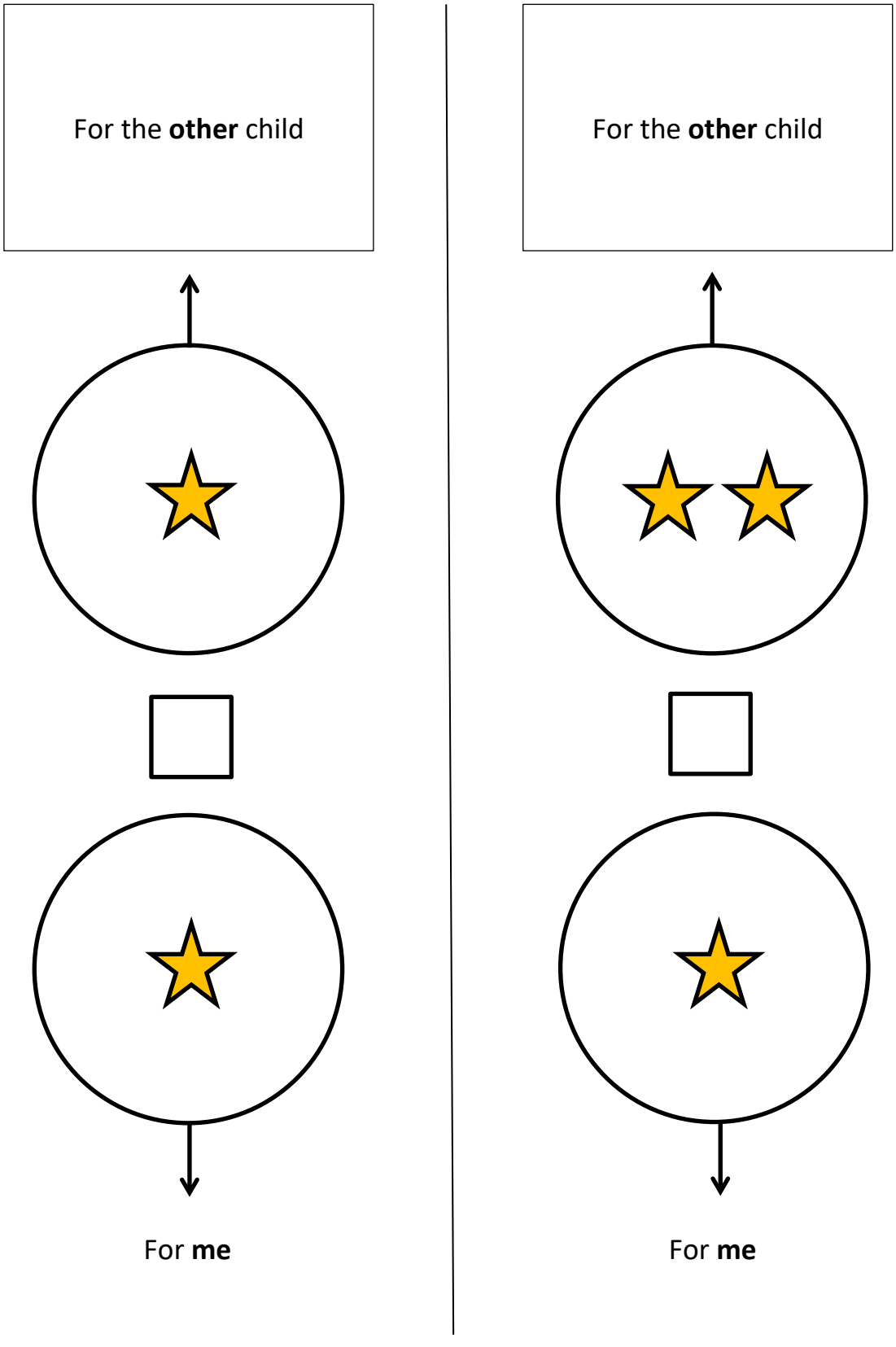
Decision sheet 1



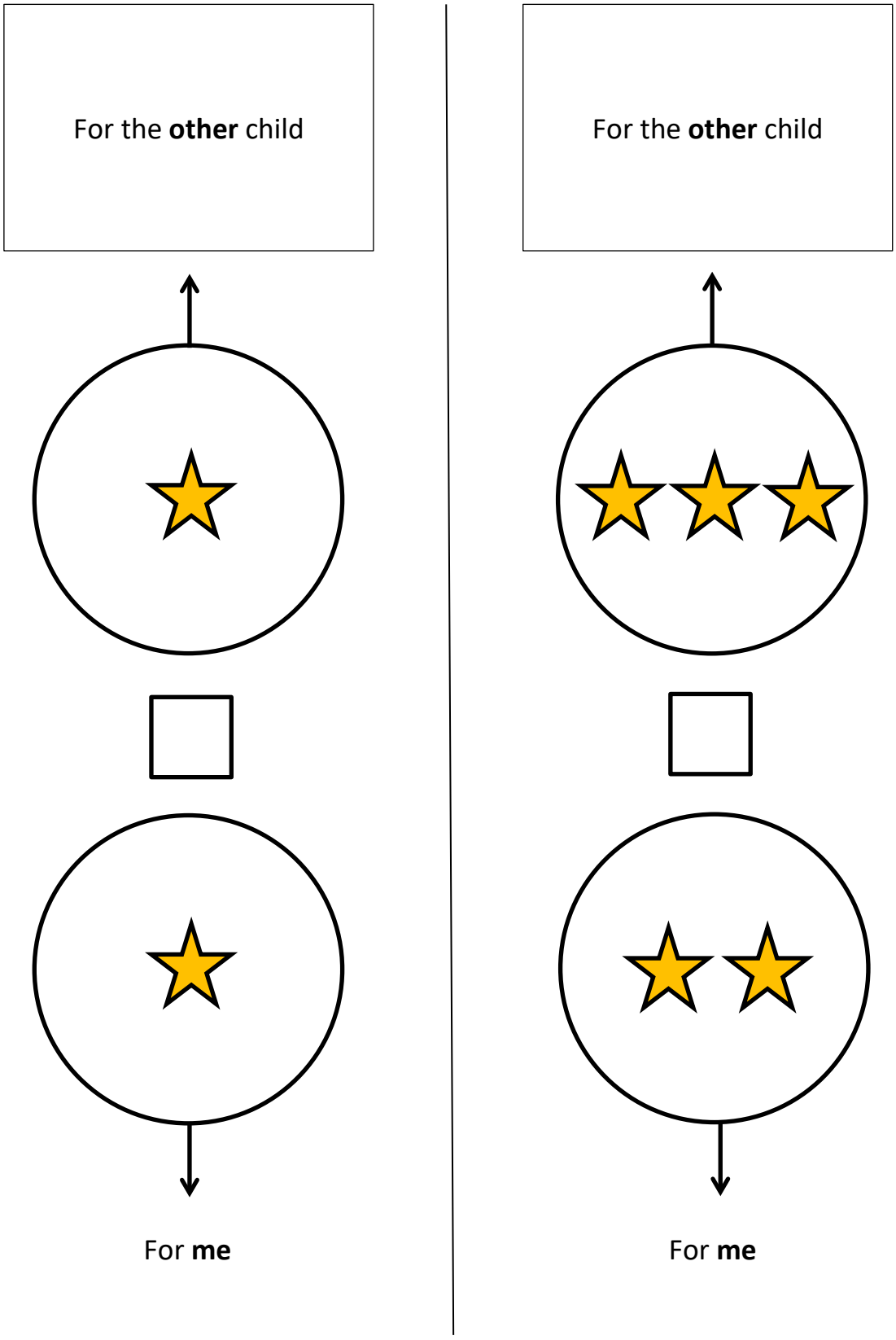
Decision sheet 2



Decision sheet 3



Decision sheet 4



2. Decision on first sheet: ○ 1 = left, 2 = right

3. Decision on second sheet: ○ 1 = left, 2 = right

4. Decision on third sheet: ○ 1 = left, 2 = right

5. Decision on fourth sheet: ○ 1 = left, 2 = rights

Roll a die to determine which decision sheet would be paid if this game got selected for payoff in the end.

Risky behaviors
(*children aged 10 to 16*)

Scale: 1 = yes, 2 = no

1. Do you smoke?
2. Do you eat pan/jorda/supari?
3. Do you gamble/bet/play lottery?
4. Do you play on the road with car tires?
5. Do you jump from tree/bridge/saqo/troller to river or canal?
6. Do you run behind the motorbike/car/trolley?
7. Do you play danguli?
8. Do you get up in the tree or your house roof?
9. Do you play dive in pond/river?
10. Do you bring flowers or fruits without permission from someone else's garden?
11. Do you play somersault?
12. Do you blow fire-works?
13. Do you play ha-du-du?
14. Do you use marijuana/ganja/hashish?
15. Do you drive a car/motorbike?
16. Do you often get into physical fights?

5 point, visualized Likert scale

Oral introduction by interviewer: I will now read a few statements and will ask you afterwards whether these statements apply to you. For example, one statement is "I like rice". Some children think that this statement (*point at scale*)...

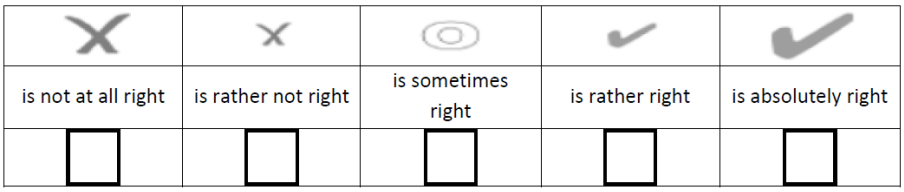
...is not at all right
...is rather right
...is sometimes right
...is rather right
...is absolutely right

Importantly, there are no right or wrong answers. Back to our example, "I like rice". How about you: Do you think that this statement...

...is not at all right
...is rather right
...is sometimes right
...is rather right
...is absolutely right

Graphical scale as below will be printed on extra sheet that interviewers will carry with them (*interviewers will point at the scale when introducing the possible answers*):

Do you find that the following statement...



I will now read several statements. Please tell me after each statement whether you think that the statement applies to you. If you do not understand the question, I am happy to repeat it for you.

Are you okay so far? *Leave time for questions and answer them privately.*

Please rate the following items/statements, using the 5 point, visualized Likert scale from above for all measures except the risky behaviors and happiness items.

Locus of control
(*all children*)

1. By working very hard, one can succeed at each area in life, for example at school or in the job.
2. I get into trouble even if I am not responsible.
3. The best way to deal with most problems is not to think about them at all.
4. Parents listen to what their children would like to tell them.
5. I often think that working hard will not pay off anyhow because the other children are smarter than me.

Time preferences
(*all children*)

I am good at giving up something nice today (e.g., a reward) in order to get something even nicer in the future (e.g., a larger reward).

Risk preferences
(*all children*)

I often take risks. (*give examples, e.g. quickly crossing a street although a car is approaching*)

Self-control
(*children aged 12 to 16*)

1. I am good at resisting temptation.
2. I have a hard time breaking bad habits. (*reversed item*)
3. I am lazy. (*reversed item*)
4. I say inappropriate things. (*reversed item*)
5. I do certain things that are bad for me, if they are fun. (*reversed item*)
6. I refuse things that are bad for me.
7. I wish I had more self-discipline. (*reversed item*)
8. People would say I have iron self-discipline.
9. Pleasure and fun sometimes keep me from getting work done. (*reversed item*)
10. I have trouble concentrating. (*reversed item*)
11. I am able to work effectively towards long-term goals.
12. Sometimes, I cannot stop myself from doing something, even if I know it is wrong. (*reversed item*)
13. I often act without thinking through all the alternatives. (*reversed item*)

Big-Five
(*children aged 10 to 16*)

Using the scale provided, please indicate how much each of the following statements reflects how you typically are (1 = "does not apply to me at all" to 5 = "applies to me perfectly"):

I see myself as someone who...

1. ...does a thorough job.
2. ...is communicative, talkative.
3. ...is sometimes somewhat rude to others.
4. ...is original, comes up with new ideas.
5. ...worries a lot.
6. ...has a forgiving nature, *that means I accept apologies quickly.*
7. ...tends to be lazy.
8. ...is outgoing, sociable.
9. ...values artistic, aesthetic experiences, *that means I enjoy painting or playing music, I love going to theater or to visit a museum.*
10. ...gets nervous easily.
11. ...does things effectively and efficiently.
12. ...is reserved.
13. ...is considerate and kind to others.
14. ...has an active imagination, *that means I am well at imagining things and I enjoy (day)dreaming.*
15. ...is relaxed, handles stress well.
16. ...is eager for knowledge.

Self-esteem
(*children aged 9 to 16*)

Below is a list of statements dealing with your general feelings about yourself. Using the scale provided, please indicate how much each of the following statements reflects your thoughts and feelings (1 = "strongly disagree" to 5 = "strongly agree"):

1. On the whole, I am satisfied with myself.
2. At times, I think I am no good at all. (*reversed item*)
3. I feel that I have a number of good qualities.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of. (*reversed item*)
6. I certainly feel useless at times. (*reversed item*)
7. I feel that I'm a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself. (*reversed item*)
9. All in all, I am inclined to feel that I am a failure. (*reversed item*)
10. I take a positive attitude toward myself.

Happiness
(*all children*)

Scale: 1 = "extremely unhappy" to 5 = "extremely happy"

I still have another question for you: How happy are you most of the time? (*explain scale by pointing at and explaining extreme faces*). The face on the extreme left means I am so unhappy that it is impossible to be even more unhappy. The face on the extreme right means I am so happy that it is impossible to be even more happy. The other faces are in between.

Please note that there is no right or wrong answer.

3.F.2 Mothers about children questionnaire

Impulsivity/Self-control
(*mothers about all children aged 6 to 13*)

Scale:

1	=	almost never
2	=	about once per month
3	=	about 2 to 3 times per month
4	=	about once per week
5	=	at least once per day

1. My child interrupts other people.
2. My child says something rude.
3. My child loses temper.
4. My child talks back when upset.
5. My child forgets something needed for school.
6. My child cannot find something because of mess.
7. My child does not remember what someone said to do.
8. My child My child's mind wanders.

Big-Five
mothers about all children aged 6 to 11)

How would you rank your child in comparison to other children of the same age?

238 The further to the left you make the X, the more the characteristic on the left side applies.

238 The further to the right you make the X, the more the characteristic on the right side applies.

My child...

1.	...is rather talkative	1	2	3	4	5	6	7	8	9	10	11	...is rather quiet
2.	...is messy	1	2	3	4	5	6	7	8	9	10	11	...is neat
3.	...is good-natured	1	2	3	4	5	6	7	8	9	10	11	...is irritable
4.	...is disinterested	1	2	3	4	5	6	7	8	9	10	11	...is curious to learn
5.	...is self-confident	1	2	3	4	5	6	7	8	9	10	11	...is insecure
6.	...is withdrawn	1	2	3	4	5	6	7	8	9	10	11	...is outgoing
7.	...is focused	1	2	3	4	5	6	7	8	9	10	11	...is easily distracted
8.	...is disobedient	1	2	3	4	5	6	7	8	9	10	11	...is obedient
9.	...is quick at learning new things	1	2	3	4	5	6	7	8	9	10	11	...needs more time
10.	...is timid	1	2	3	4	5	6	7	8	9	10	11	...is fearless

Strengths and Difficulties Questionnaire
(*mothers about all children aged 6 to 16*)

Scale:

1	=	not true
2	=	somewhat true
3	=	certainly true

My child...

1. ...is considerate of other people's feelings.
2. ...is restless, overactive, cannot stay still for long.
3. ...often complains of headaches, stomach-aches or sickness.
4. ...shares readily with other children (treats, toys, pencils, etc.).
5. ...often has temper tantrums or hot tempers.
6. ...is rather solitary, tends to play alone.
7. ...is generally obedient, usually does what adults request.
8. ...has many worries, often seems worried.
9. ...is helpful if someone is hurt, upset or feeling ill.
10. ...is constantly fidgeting or squirming.
11. ...has at least one good friend.
12. ...often fights with other children or bullies them.
13. ...is often unhappy, down-hearted or tearful.
14. ...is generally liked by other children.
15. ...is easily distracted, concentration wanders.
16. ...is nervous or clingy in new situations, easily loses confidence.
17. ...is kind to younger children.
18. ...often lies or cheats.
19. ...is picked on or bullied by other children.
20. ...often volunteers to help others (parents, teachers, other children).
21. ...thinks things out before acting.
22. ...steals from home, school or elsewhere.
23. ...gets on better with adults than with other children.
24. ...has many fears, is easily scared.
25. ...sees tasks through to the end, has good attention span.

Parenting style
(*answered once for all children in the household*)

Scale:

1	=	never
2	=	seldom
3	=	sometimes
4	=	frequently
5	=	very frequently

How often do the following things occur?

1. I use words and gestures to show my child that I love him/her.
2. I criticize my child.
3. I talk to my child about things he/she has done, seen, or experienced when he/she was out.
4. I punish my child when he/she was disobedient.
5. I threaten my child with punishment, but don't actually follow through with it.
6. When my child is outside the home, I know exactly where he/she is.
7. I tend to be strict with my child.
8. I comfort my child when he/she feels sad.
9. I shout at my child, when he/she did something wrong.
10. I feel that my child is ungrateful because he/she disobeys.
11. I stop talking to my child for a while when he/she did something wrong.
12. I make it clear to my child that he/she should not oppose orders and decisions.
13. I praise my child.
14. I scold my child when I am angry at him/her.
15. I try to actively influence my child's circle of friends.
16. I reduce punishments or lift them ahead of time.
17. I am disappointed and sad when my child misbehaves.
18. It is hard for me to be consistent in my childrearing.

3.F.3 Experimental questionnaire for adults: Preferences sections

Time preferences

Let us start with this game. Before we start, let me explain the rules of our game. In this game you can earn money. That's why it is important that you understand the rules of our game. Please interrupt me anytime in case you have a question.

Are you okay so far? *Leave time for questions and answer them privately.*

1. Determine the order of explanation by rolling a die (blue, green, yellow) and write it down:

○1	=	choice set 1, choice set 2, choice set 3
○2	=	choice set 1, choice set 3, choice set 1
○3	=	choice set 2, choice set 3, choice set 1
○4	=	choice set 2, choice set 1, choice set 3
○5	=	choice set 3, choice set 1, choice set 2
○6	=	choice set 3, choice set 2, choice set 2

The game works as follows:

The game consists of three choice sets. There are six choices in each choice set. You need to make a choice between two payment options: Option A or Option B. In each choice set, there are six such decisions that you need to make. Each decision is a paired choice between Option A and Option B. You will be asked to make a choice between these two payment options in each decision row. For example, (*assuming the first choice set is being randomly picked first*) in the first row, you need to make a choice between payment Option A and payment Option B where payment Option A pays you Taka 100 tomorrow and Option B pays you Taka 105 after 3 months from today. In the second choice, Option A pays you Taka 100 tomorrow, and Option B pays you Taka 110 in 3 months. In the third choice, Option A pays you Taka 100 tomorrow, and Option B pays you Taka 120 in 3 months. Notice that Option A remains unchanged while Option B is increasing.

If you go for Taka 100 tomorrow, you will need to tick Option A. If selected, one of us will come to your home and to deliver the money in an envelope with your name marked on it. If you wait, you will get Taka 105 after 3 months. Again, one of us will come to your home and to deliver the money in an envelope with your name marked on it.

Could you please repeat the rules of the game? *If the respondent is unable to repeat, please explain the game again; the respondent has to be able to repeat the correct meaning of the game autonomously.*

2. Respondent understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

The second choice set is very similar to the first choice set. However, Option A now pays in 1 month, and Option B pays in 4 months. If you go for Taka 100 in 1 month, you will need to tick Option A. If selected, one of us will come to your home and deliver the money in an envelope with your name marked on it. If you wait 4 months, you will get Taka 105 after 4 months. Again, one of us will come to your home and deliver the money in an envelope with your name marked on it.

Could you please repeat the rules of the game? *If the respondent is unable to repeat, please explain the game again; the respondent has to be able to repeat the correct meaning of the game autonomously.*

3. Respondent understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

The third choice set is very similar to the second and first choice set. However, Option A now pays in 1 year, and Option B pays in 1 year and 3 months. If you go for Taka 100 in 1 year, you will need to tick Option A. If selected, one of us will come to your home and to deliver the money in an envelope with your name marked on it. If you wait 1 year 3 months, you will get Taka 105 after 1 year 3 months. Again, one of us will come to your home and to deliver the money in an envelope with your name marked on it.

If this game is paid, only one of the three choice sets counts. The selection will be made by rolling a six-sided die twice – first to decide the set, and second to decide the choice. You will roll the die after your decisions (*please demonstrate*). In the first die roll, if 1, 2 or 3 is rolled, you will receive the money from the particular choice set, if 4, 5 or 6 is rolled, you will not receive any money. Depending on the outcome of the first die roll, the second die roll would determine the particular choice that you would be paid for. For example, if 3 is rolled in the second roll, you will receive the money from your decision concerning the third payoff alternative (*third row*) of the relevant choice set.

Could you please repeat the rules of the game? *If the respondent is unable to repeat, please explain the game again; the respondent has to be able to repeat the correct meaning of the game autonomously.*

4. Respondent understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

Please take your decision for each of the choice sets now (*place the decision sheets side by side on the table*). Start with this part (*point at the first decision sheet (depending on the order of explanation)*) and continue with this part (*point at the second decision sheet*) and finally make your decision in this part (*point at the final decision sheet*). Take as much time as you need. In the meantime, I will turn around so that I do not disturb you. Just call me when you are done or have any questions.

Roll a die to determine which decision sheet would be paid if this game got selected for payoff in the end.

Choice set 1

Payoff alternative	**Payment Option A** (pays amount below **tomorrow**)	**Payment Option B** (pays amount below **after 3 months**)	Annual interest rate in %	Preferred Payment Option (A or B)
1	100	105	20%	
2	100	110	40%	
3	100	120	80%	
4	100	125	100%	
5	100	150	200%	
6	100	200	400%	

Choice set 2

Payoff alternative	**Payment Option A** (pays amount below **after 1 month**)	**Payment Option B** (pays amount below **after 4 months**)	Annual interest rate in %	Preferred Payment Option (A or B)
1	100	105	20%	
2	100	110	40%	
3	100	120	80%	
4	100	125	100%	
5	100	150	200%	
6	100	200	400%	

Choice set 3

Payoff alternative	**Payment Option A** (pays amount below **after 1 year**)	**Payment Option B** (pays amount below **after 1 year 3 months**)	Annual interest rate in %	Preferred Payment Option (A or B)
1	100	105	20%	
2	100	110	40%	
3	100	120	80%	
4	100	125	100%	
5	100	150	200%	
6	100	200	400%	

Risk preferences

Let us start with this game. Before we start, I will explain the rules of our game. Similar to the other games, you can earn money in this game as well. How much money you will earn depends mainly on your decisions. That's why it is important that you understand the rules of our game. Please listen carefully now. I will frequently stop during my explanation and allow you to ask questions. Therefore, please interrupt me anytime in case you have a question.

Are you okay so far? *Leave time for questions and answer them privately.*

In this game, you need to select the gamble you would like to play from among six different gambles, which are listed below. You must select one and only one of these gambles.

If this game is selected for payment, you will have a one in six chance of receiving the money. The selection will be made by rolling a six-sided die twice—first, you will roll the die to decide the gamble, and the second to decide the outcome of the particular gamble. For example, if you selected gamble number 4, then if the first roll of the die is 4, you would receive one of the payoffs of gamble 4, which will be determined in the second roll. If the first roll of the die is not 4 and you have chosen gamble number 4, you would not receive any payments. Depending on the outcome of the first roll, the second roll would determine the outcome of the selected gamble. Each gamble has two possible outcomes—low and high. If 1, 2 or 3 is rolled, the outcome of the selected gamble is the low one, and if 4, 5 or 6 is rolled, the outcome of the gamble is the high one, and you would receive money accordingly.

Notice that the low outcome is decreasing and the high outcome is increasing for each successive gamble. For example, in the first gamble, both outcomes are identical. If you select it and then this number is rolled in the first roll, your payoff would be 125 Taka. If on the other hand, you had selected gamble number 2, and if it is rolled on the first roll, your payoff could be 110 Taka or 240 Taka. In the second roll, if 1, 2 or 3 is rolled, you would receive 110 Taka, whereas if 4, 5 or 6 is rolled, you would receive 240 Taka.

Ask the respondent to repeat the game.

1. Respondent understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

Before you select the actual gamble involving money, we will have a practice session with candies. There are two gambles from which you need to select one:

	Outcome	Payoff	Chances	Your Selection
Gamble 1	LOW	1	50%	
	HIGH	1	50%	
Gamble 2	LOW	0	50%	
	HIGH	2	50%	

Both gambles have two outcomes. The first gamble pays 1 candy in both states, while the second gamble pays no (0) candy in the low state and 2 candies in high state. Which gamble would you like to play? Once you make your selection, you will first roll the die to decide the gamble, and then again roll the die to decide the outcome. For example, if you selected gamble number 2, then if the first roll of the die is 2, you would receive one of the payoffs of gamble number 2, which will be determined in the second die roll. In the second roll, if 1, 2 or 3 is rolled, the outcome of the selected gamble is the low one, which is 0 here. That means, you will not receive any candy. However, if 4, 5 or 6 is rolled, the outcome of the gamble is the high one, and you will receive 2 candies. Let us start this now.

Are you okay so far? *Leave time for questions and answer them privately.*

2. Gamble number picked involving candies: ○

Roll a die to determine whether gamble number 1 or gamble number 2 is payoff-relevant. If you have rolled a 1 or a 2, please roll the die a second time to determine whether the low or the high payoff is realized.

Mark the gamble you like best with an X in the last column “Your Selection”
(mark only one of the six gambles):

	Outcome	**Payoff**	**Chances**	**Your Selection**
Gamble 1	LOW	125	50%	
	HIGH	125	50%	
Gamble 2	LOW	110	50%	
	HIGH	240	50%	
Gamble 3	LOW	100	50%	
	HIGH	300	50%	
Gamble 4	LOW	75	50%	
	HIGH	375	50%	
Gamble 5	LOW	25	50%	
	HIGH	475	50%	
Gamble 6	LOW	0	50%	
	HIGH	500	50%	

3. Gamble number picked: ○

Roll a die to determine whether gamble number 1 or gamble number 2 is payoff-relevant. If the outcome of the first die roll equals the gamble number picked (if 6. = 7.), please roll the die a second time to determine whether the low or the high payoff is realized.

Social preferences

In this game you can earn stars, which you can convert into money. Each star is equal to Taka 100. The more stars you will earn, the more money you will get. That's why it is important that you understand the rules of our game. Please listen carefully now. I will frequently stop during my explanation and allow you to ask questions. Therefore, please interrupt me anytime in case you have a question.

Are you okay so far? *Leave time for questions and answer them privately.*

In this game you have to decide how to divide stars between yourself and another person similar to you but from a different village. You will never know who exactly the other person is and the other person will not get to know you. However, I will ensure that the other person does indeed receive the money that corresponds to the stars that you will give to him/her.

You will get four different decision sheets. You will need to decide how to divide stars between yourself and this person similar to you.

Are you okay so far? *Leave time for questions and answer them privately.*

There are two possible ways to allocate the stars: the option on the left-hand side and the option on the right-hand side.

Please look at the decision sheet. With option "left" you get one star and the person from another village with whom you are randomly matched gets 1 star. One star equals 100 Taka. With option "right" you get 2 stars and the person from another village gets 0 stars.

Are you okay so far? *Leave time for questions and answer them privately.*

Depending on which option you want to choose, you should check the box at the left- or the right-hand side. You can choose either option "left" or option "right". If you would like to divide the stars according to option "right", which box would you have to check? Right, the box at the "right" side.

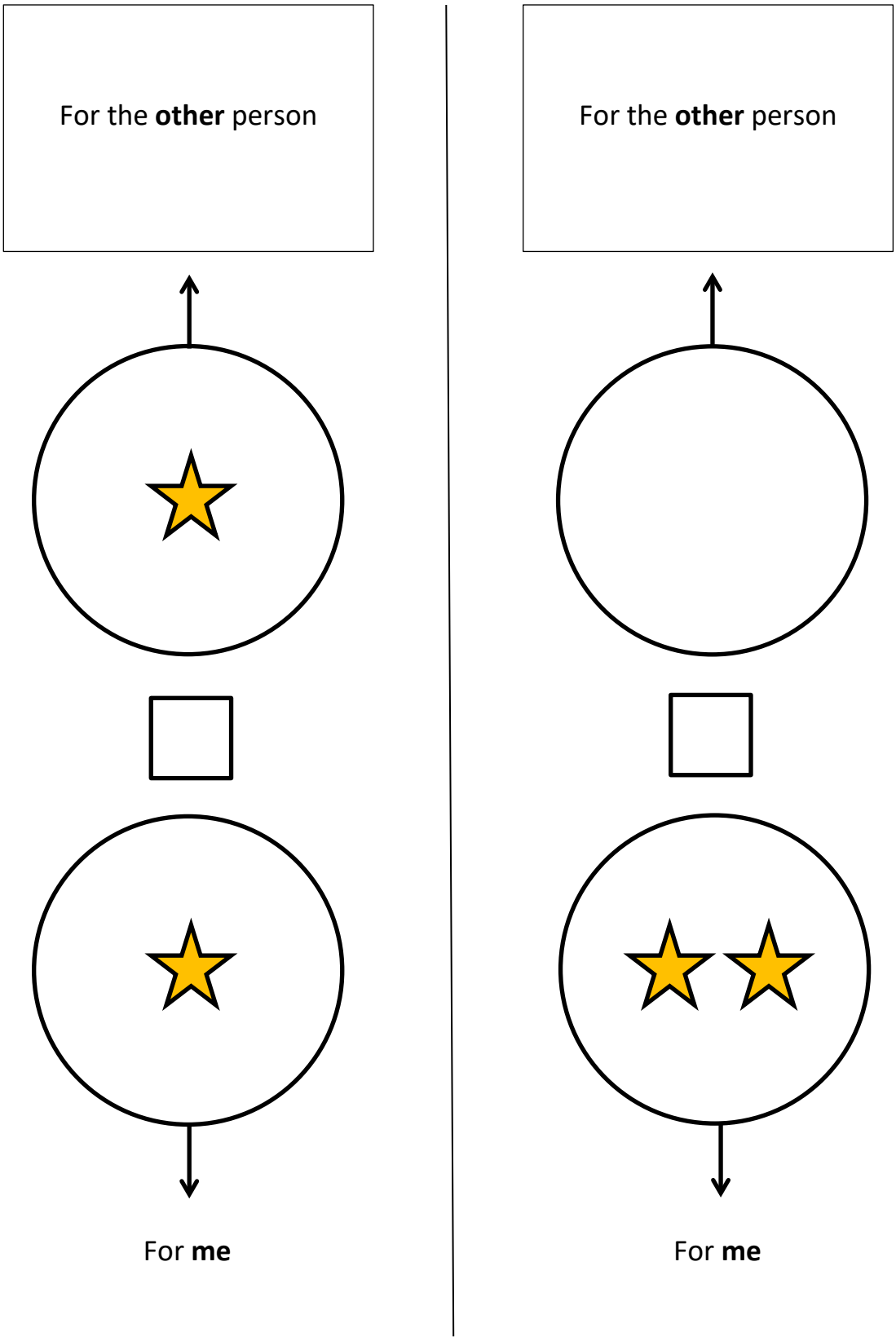
How much would you earn and how much would the person from the other village with you are randomly matched earn in this case? Right, you would get 100 Taka and the other person similar to you would get nothing.

1. Respondent understood the game after: ○
1 = first explanation, 2 = second explanation, 3 = third explanation, 4 = did not understand

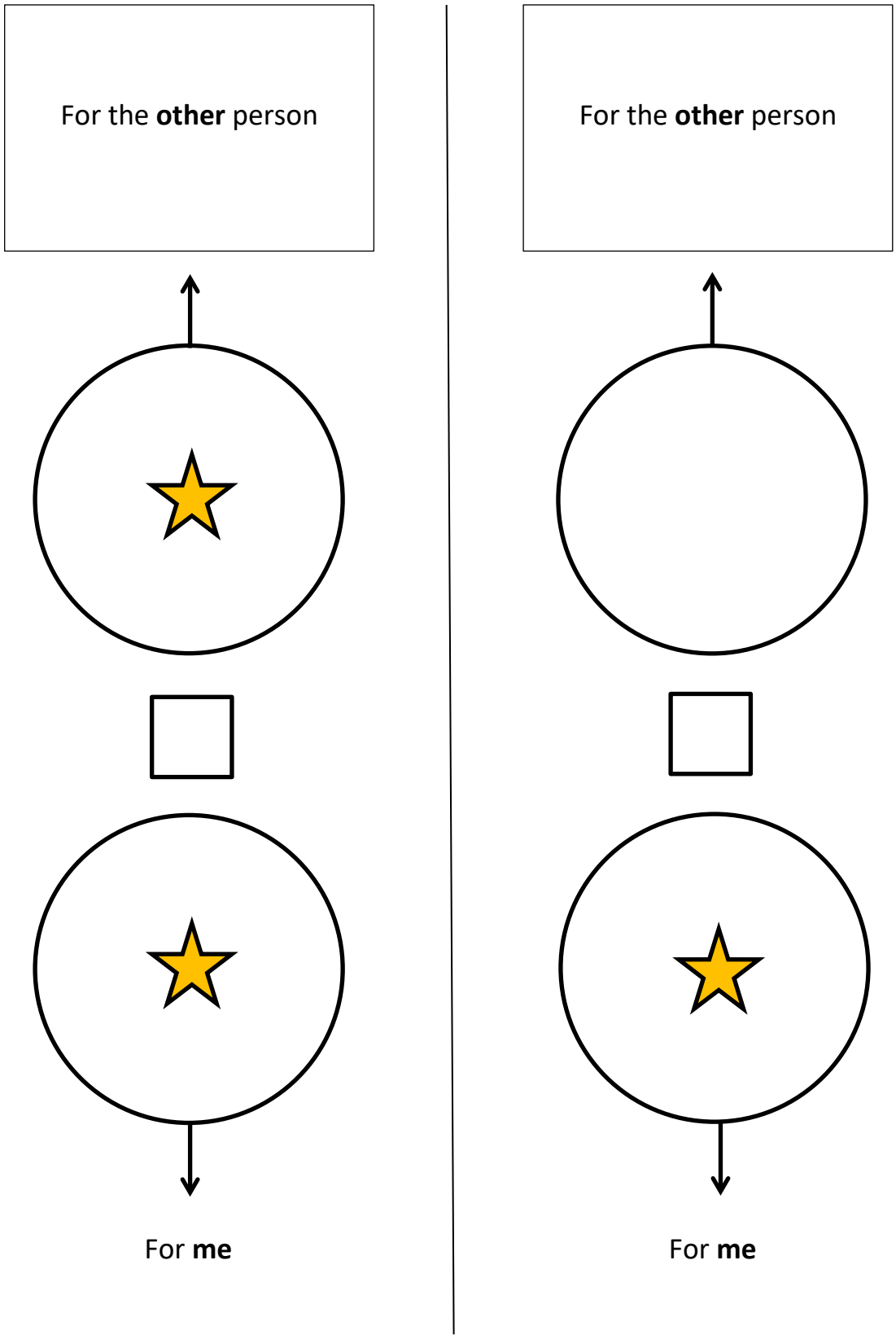
Are you okay so far? *Leave time for questions and answer them privately.*

As I mentioned earlier, you will get four decision sheets. The decision sheets differ from each other in the amounts of stars that can be divided between you and the other person. Please choose one of the two options for each decision sheet. At the end of the game, you will roll a die to determine the decision sheet out of four (*show the process*). Here the number you roll corresponds to the sheet you will get paid for, meaning if you roll 1, you get paid for decision sheet 1. If this game is selected for payment, you and the other person will be paid according to the selected decision sheet. If you roll a 5 or 6, no decision sheet will be paid.

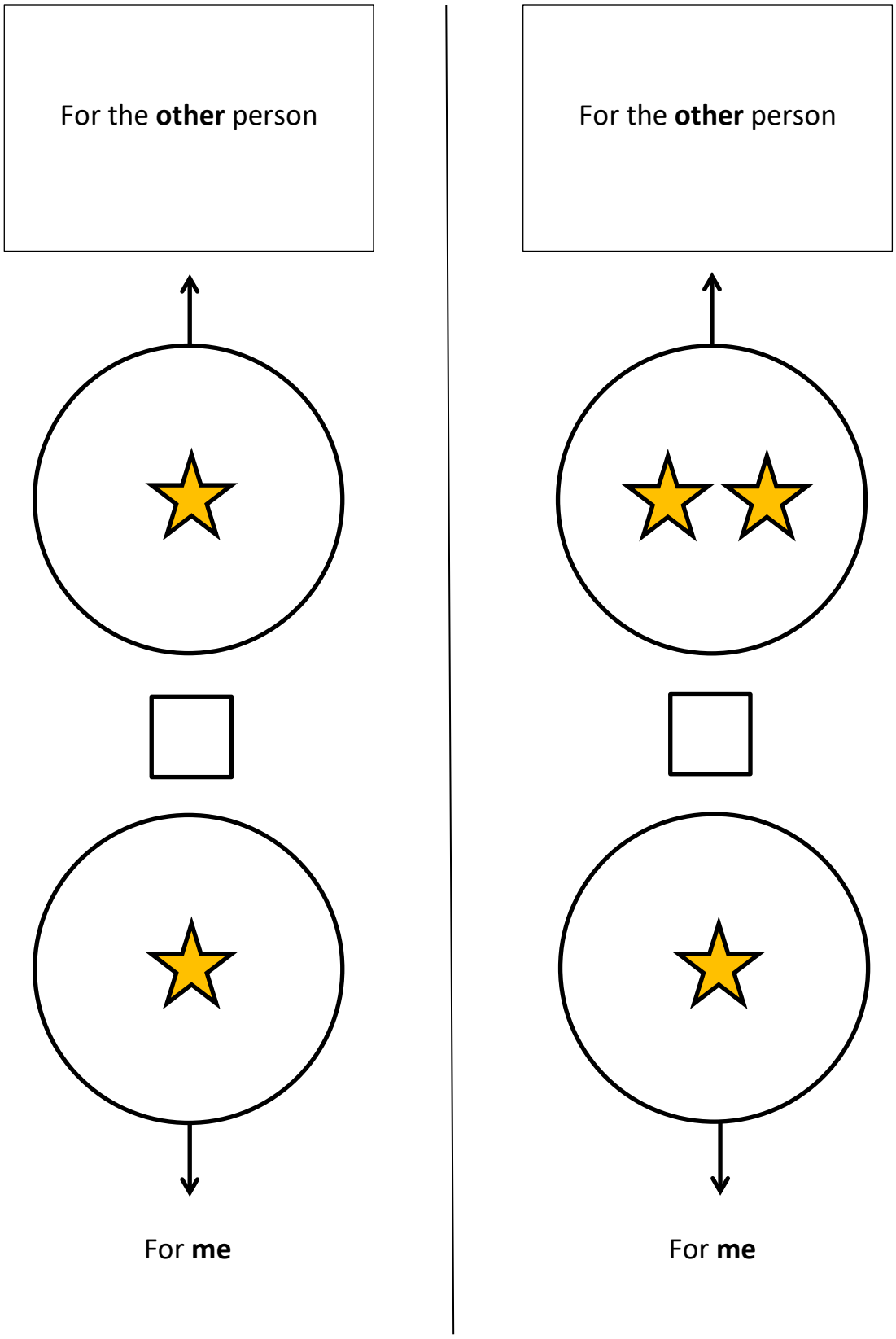
Decision sheet 1



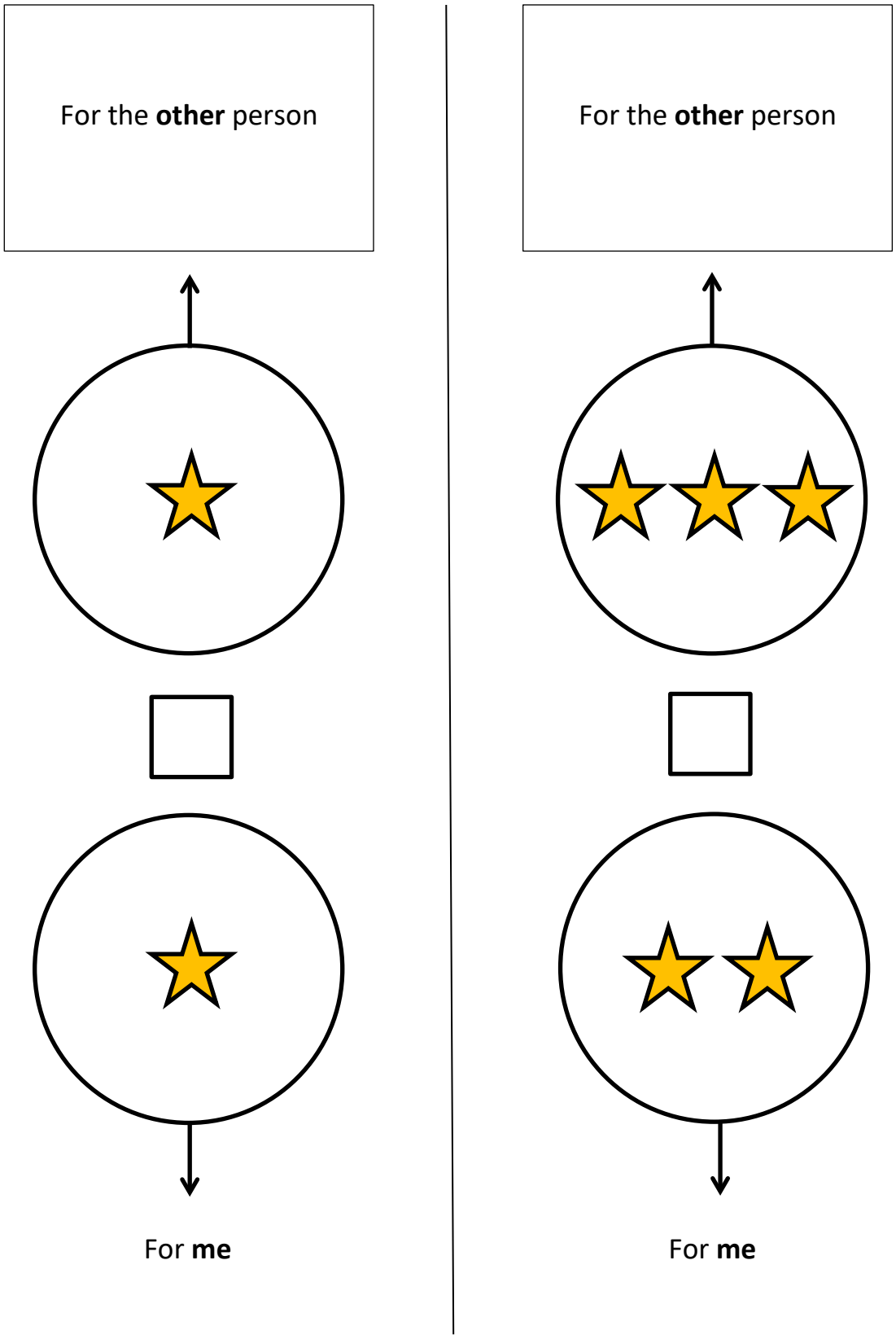
Decision sheet 2



Decision sheet 3



Decision sheet 4



2. Decision on first sheet: ○ 1 = left, 2 = right

3. Decision on second sheet: ○ 1 = left, 2 = right

4. Decision on third sheet: ○ 1 = left, 2 = right

5. Decision on fourth sheet: ○ 1 = left, 2 = rights

Roll a die to determine which decision sheet would be paid if this game got selected for payoff in the end.

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Chapter 4

Positive Parenting Styles and Skills of Children

Joint with Laura Breitkopf, Shyamal Chowdhury, Hannah Schildberg-Hörisch, and Matthias Sutter

4.1 Introduction

Children are deeply influenced by how their parents raise them (Kaufmann, Gesten, Lucia, Salcedo, Rendina-Gobioff, et al., 2000; Milevsky, Schlechter, Netter, and Keehn, 2007; Doepke and Zilibotti, 2019). Parental investments affect children's formation of cognitive and non-cognitive skills. This has long-term consequences for the life outcomes of children, including their education, health and labor market outcomes (Cunha, Heckman, and Schennach, 2010; Francesconi and Heckman, 2016; Cobb-Clark, Salamanca, and Zhu, 2019). Parenting styles as one key factor of parental investments matter a lot. Positive parenting styles – characterized by emotional warmth and monitoring – have a positive association with health and well-being (Ranson and Urichuk, 2008; Davids, Roman, and Leach, 2017), virtuous behavior (Chen, Haines, Charlton, and VanderWeele, 2019), fewer risky behaviors (Borawski, Ievers-Landis, Lovegreen, and Trapl, 2003), academic achievement (Dornbusch, Ritter, Leiderman, Roberts, and Fraleigh, 1987; Pinquart, 2016; Pinquart, 2017; Pinquart and Kauser, 2018), and increased self-esteem (Bun, Louiselle, Misukanis, and Mueller, 1988; Chang, 2007; Chan and Koo, 2011). Negative parenting styles – reflected in negative communication and psychological and strict control – are negatively associated with these various forms of children's behavior and outcomes (Doepke and Zilibotti, 2017).

Previous work has typically studied the relation of parenting styles and single outcomes, thus building up the evidence piece-by-piece – or outcome-by-outcome – rather than by looking at large sets of outcomes and behaviors at the same time

within a unified framework. A piece-wise approach, however, may overlook the scope that parenting styles have on children's development as a whole. Parenting styles may be linked to parental income, which has been shown to have an effect on cognitive outcomes and behavioral problems of children (Noonan, Burns, and Violato, 2018). However, the role of financial status may not be exclusive of other parental inputs that income does not capture (Anger and Schnitzlein, 2017).

In this study, we use data from surveys and incentivized games with 5,351 children, aged 6 to 16 years, and their parents from 3,389 families in rural Bangladesh to examine the relationship between parenting styles and a very broad (and hitherto unaccounted for) range of cognitive and non-cognitive skills of children. Differently from previous work, we do not put our emphasis on behavioral outcomes, but we focus on the underlying cognitive and non-cognitive skills. While we also analyze different outcomes (study attitudes, risky behavior, emotional and behavioral problems, happiness), we believe that focusing on cognitive and non-cognitive skills can help better understand why parenting styles are related to children's outcomes.

The origin of our sample from a non-WEIRD (western, educated, industrial, rich, and democratic) country, i.e., Bangladesh, is a special feature of our study. There are very few studies conducted in these areas on the topics that we study despite the majority of the world's population living in non-WEIRD. countries. Therefore, we provide important evidence on skill formation of children in poorer countries, which apart from being interesting in itself also allows investigating whether the relationships between parenting styles and children's skills in these countries looks similar to the ones found in WEIRD countries.

The data was collected in four different districts across three administrative divisions of Bangladesh between March and May 2018. Children and their parents were interviewed individually and separately at their homes to ensure independent responses. The mothers, as they are universally the primary caregivers in these families, were surveyed regarding parenting styles. The survey referred to five dimensions of parenting, i.e., emotional warmth, monitoring, negative communication, psychological control, and strict control (Richter, Rorher, Metzing, Nestler, Weinhardt, et al., 2017). We applied linear discriminant analysis (LDA) to reduce the parenting style dimensions to a binary classification that we denote as positive parenting. We used monthly income as classifying groups, with above and below median household income forming the two groups that the LDA was based on, as children from higher-income families show different non-cognitive and behavioral outcomes compared to children from low-income families (Fletcher, 2010; Noonan, Burns, and Violato, 2018). Positive parenting shows positive correlations with emotional warmth and monitoring (which the literature often classifies as positive parenting), and negative correlations with negative communication, psychological control, and strict control (which is often subsumed as negative parenting) (Maccoby and Martin, 1983). For children, we measured the following (cognitive and

non-cognitive) skills and outcomes: cognitive abilities (as full scale intelligence quotient, FSIQ), personality traits (as the Big-Five), self-esteem, self-control, and happiness. Moreover, we elicited children's risk and time preferences and their level of altruism (by combining incentivized experimental choices and survey responses). As outcomes, we measured children's study attitude, their risky behavior in everyday-life situations, and we administered the well-established Strength and Difficulties Questionnaire (SDQ) to measure behavioral and emotional problems (the "internalizing" component of the SDQ indicates emotional and peer problems, and the "externalizing" component measures hyperactivity and conduct problems). The SDQ also contains a prosociality scale to measure the extent to which children interact with others in a cooperative way in their daily routine.

In addition to these measures for children, the household head responded to a household survey[1] which captured general socioeconomic information including income of the household.

4.2 Data

The data used for this chapter and Chapter 3 comes from the same source. The format of data collection, the tools used and the complete sampling strategy are further elaborated in Appendix 3.6. Specifically for this study, a subset of the complete data is used. The data and methods used are explained below.

4.2.1 Study sample

The sample selected for this study comes from four districts in Bangladesh, across three administrative divisions. In total, there are 3,389 households that are in this data set with 1,962 households having two children appear in the sample and 1,427 households having only one child. These households were sampled from 135 primary schools. From these schools, 20 students were selected (five from each grade between grade 2 and 5). The mothers of these students were surveyed in their villages. If these households had more than one child between the ages of 6 and 16, a second child was randomly selected for experimental survey. The children and their mothers were interviewed separately in their houses and incentives were given to them commensurate with their age in the experimental games.

4.2.2 Measurement

Children's outcomes. Table 4.C.1 summarizes the scales (and corresponding references) for the cognitive and non-cognitive skills and the outcomes that we measured.

1. The survey conducted for this chapter and Chapter 3 was the same. The details of the measures used are presented together in Appendix 3.6.

Here we provide a brief description of these scales.

To measure children's cognitive outcomes, we used the matrix test of the Wechsler Intelligence Scale for Children (WISC-IV) and a context-specific vocabulary test for children to measure fluid and crystallized IQ. These components are used to construct the Full Scale Intelligence Quotient (FSIQ) as our standardized IQ measure. Personality traits were measured using a ten-item Big-Five scale for younger children where mothers had to rank their own child in comparison to other children of their age on an eleven-point scale (Weinert, Asendorpf, Beelmann, Doil, Frevert, et al., 2007). For older children, a battery of sixteen questions was used and children rate themselves on a scale from one to five (Gerlitz and Schupp, 2005). To construct the measure, each scale was standardized within the younger or older age group, then combined and standardized across all age groups. Self-esteem was measured for children aged 9-16 using a four-point scale where children rated themselves on ten statements concerning how they view their qualities and self-worth (Rosenberg, 1965). For children younger than nine years old no self-esteem module was implemented. Self-control questions for children, aged 6-11 were answered by the mothers where domain-specific impulsivity was measured by eight items on a five-point scale (Duckworth, Kim, and Tsukayama, 2013). Older children, aged 12-16, responded to a 13-item index on a five-point scale to measure their self-control (Tangney, Baumeister, and Boone, 2004). All measures used here were standardized. Happiness was measured by asking the question "How happy are you most of the time?". Responses were collected using a visual Likert scale with five smiley faces from 'very unhappy' to 'very happy' (Haerpfer, Inglehart, Moreno, Welzel, Kizilova, et al., 2020).

All children played games measuring their time, risk, and social preference, incentivized with stars which were exchanged for money (in Bangladeshi Takas; with exchange rates proportional to average weekly allowances). Our time preference measure is composed of (i) the number of patient choices made out of six such decisions in the time preference game (Bauer, Chytilová, and Morduch, 2012), and (ii) a survey question which asked participants how willing they were to give up a sooner, but smaller, reward for a later, but larger, one. The risk measure consists of (i) an experimental game where the participants had to pick one out of six lotteries that differed in expected payoffs and variance of payoffs (Bauer, Chytilová, and Morduch, 2012), and (ii) the degree of agreement to the statement "I often take risks". Both for risk and time preferences, we first standardized both components of the measure, then obtained the mean and standardized the overall measure again. For measuring social preferences, we counted the number of altruistic decisions in four so-called dictator games in which children had to divide stars between themselves and another, yet unknown, child (Bauer, Chytilová, and Pertold-Gebicka, 2014).

As an important behavioral outcome, we included a child's study attitude, which was measured as the five-point scale response to the statement "By working very hard, one can succeed at each area in life, for example at school or at work". We

also measured risky behavior in their everyday-life by an index constructed from responses to how frequently a child took risks in 16 situations that are specific to rural Bangladesh (e.g., "Do you jump from a tree/a bridge into a river or canal?" or "Do you often get into physical fights?").

We also used the well-established Strength and Difficulties Questionnaire (SDQ) to measure behavioral and emotional problems. The full SDQ score comprises four subscales which are further broken down into "Internalizing" (indicating emotional and peer problems) and "Externalizing" (indicating hyperactivity and conduct problems) problems. The SDQ also contains a stand-alone prosociality scale to measure the extent to which children interact with others in a cooperative way in their daily routine (Goodman, Renfrew, and Mullick, 2000; Goodman, Lamping, and Ploubidis, 2010; Briole, Le Forner, and Lepinteur, 2020).

In addition to these outcome measures, the household head responded to a household survey which captured general socioeconomic information about the household that we are using as control variables.

Parenting styles. A survey module was administered to mothers regarding their parenting behavior. Mothers rated 15 behavioral items on a five-point scale from "never" to "very frequently". These items were combined into five scales indicating emotional warmth, monitoring, negative communication, psychological control and strict control. An additional scale with three questions related to inconsistent parenting was administered, however, due to translation and implementation of questions, the particular scale has been dropped from the analysis.

Further, using linear discriminant analysis for dimensionality reduction, we combined the parenting styles into positive parenting (=1) where the LDA based categorization was positively correlated with warmer parenting styles (emotional warmth and monitoring) and negatively correlated with more controlling parenting styles (negative communication, psychological control, and strict control). High and low income groups, split at the median, were used as the group on which the LDA classifier was based. More details about dimensionality reduction can be found in Section 4.3.

4.2.3 Implementation

The data was collected using trained surveyors who visited each household. A full set of instructions for the surveyors is listed in Appendix 3.6. It should be noted that special provisions were made to ensure that children's responses were not influenced by the presence of their parents or the siblings. The surveys took place in different areas, and even on separate days if it was so required. The data was collected both manually on paper for the experimental modules and using electronic data collection tools on mobile tablets.

4.3 Empirical Strategy

The results of the study were estimated using the following OLS regressions model:

$$y_{ij} = \alpha + \beta_P P_{ij} + \boldsymbol{\phi_X X_{ij}} + \boldsymbol{\sigma_H H_j} + \boldsymbol{\lambda_{ij}} + \varepsilon_{ij} \tag{4.3.1}$$

where y_{ij} is the outcome of individual i in family j, P_{ij} is the positive parenting style dummy variable, $\boldsymbol{X}_{ij}$ is a vector of control variables, H_j is a vector if household environment variables. It comprises household sociodemographics. $\boldsymbol{\lambda_{ij}}$ is the vector of fixed effects used at the districts and age level and ε_{ij} is the error term. Standard errors are clustered at the village level.

We also checked for multiple hypothesis testing using sharpened two-stage q-values[2]. Main outcomes present results for children of all ages pooled together. The sample was also split up and outcomes were standardized separately by age groups, 6-9 years as younger children and 10-16 years as older children, to check for age group specific effects.

4.3.1 Positive parenting categorization

The survey module presented in Appendix 3.D shows different dimensions of parenting styles captured for each mother in the household.[3] The five parenting styles (emotional warmth, monitoring, negative communication, psychological control, and strict control) are divided into two categories of parenting based on linear discriminant analysis. LDA is a supervised learning model and in this case we use the income categorization, split at median, to form the parenting categories. Higher family income is associated with fewer behavioral problems as measured by the SDQ (Noonan, Burns, and Violato, 2018). Income is also important for non-cognitive skills outcomes of children, and this relationship increases with age of children (Fletcher and Wolfe, 2016). In our data we find that a split by income groups is correlated with cognitive skills, self-esteem, and self-control, in line with Fletcher and Wolfe (2016), but there are several non-cognitive skills outcomes and behavioral outcomes where we do not find a correlation (see Table 4.A.5).

Previous literature has also emphasized the role of not just income, but family background. Higher-income parents are able to afford high quality professional child care. As compared to home care, the high-quality child care did not lead to significant differences in outcomes for children (Gupta and Simonsen, 2010). From studies of sibling data, family background seems to speak for the one-fifth to one-half of variance in outcomes of children (Anger and Schnitzlein, 2017). This

2. See Anderson (2008) for use of adjusted p-values using False Discovery Rate as per Benjamini, Krieger, and Yekutieli (2006)

3. There were a total of six parenting style dimensions, however due to translations and implementation difficulties the module “inconsistent parenting" had to be dropped from the measure.

family background is a combination of both the socioeconomic level of the family as well as the childcare and parenting style exercised at home. This is why our LDA uses high/low income groups as dimensionality reduction classifiers for parenting styles. The new classes formed by the LDA are correlated with cognitive as well as a large number of non-cognitive outcomes for children.

Discriminant analysis is a classificatory technique (Fisher, 1936) which is used to classify cases into preexisting groups based on similarities between that case and the other cases belonging to the groups. When examining how to improve human capital formation for children at the household level, policy focuses on increasing incomes of families. This is based on the assumption that higher income families will be in a place to afford better child care. Despite this, we find that income groups are predictive of only our cognitive outcome, and few non-cognitive outcomes. We perform this analysis on the assumption that family background and parenting styles will have significant impacts on outcomes of children. We use linear discriminant analysis as a dimension reduction technique for parenting styles. We assume the five parenting styles to be a subset of variables that can capture the maximum classification between the centroids of the high/low income groups.

Assumptions of the model.

1. Means of the independent variables (parenting styles) are statistically significantly different across the two income groups.
2. The data from the classes of income has a common variance-covariance matrix.
3. Variables are not highly correlated.
4. The data is normally distributed.
5. Subjects are independently sampled.

Linear discriminant equation:

$$D = \phi_1 x_1 + \phi_2 x_2 + ...\phi_n x_n \tag{4.3.2}$$

Where ϕ_n are model coefficients and x_n are the measurements of independent variables (parenting styles).

Linear score function:

$$S(\phi) = \frac{(\phi' \mu_1 - \phi' \mu_2)}{\phi' \Sigma \phi} \tag{4.3.3}$$

Where
μ_1 = mean of group with low income
μ_2 = mean of group with high income

Σ = pooled variance-covariance matrix
ϕ' = transpose of ϕ.

Linear coefficients that maximize the linear score can be solved by:

$$\phi = \Sigma - 1(\mu_1 - \mu_2) \tag{4.3.4}$$

Where ϕ is a vector of linear model coefficients indicating

$$\Sigma = (\frac{1}{n_1 + n_2})(n_1\Sigma_1 + n_2\Sigma_2) \tag{4.3.5}$$

and
Σ_1 = variance-covariance matrix for group with low income
Σ_2 = variance-covariance matrix for group with high income.

Classification rule: A new mother-child pair is classified by projecting it into the maximally separating direction and classifying it as a positive parenting style if

$$\phi[\boldsymbol{X} - (\frac{\mu_1 + \mu 2}{2})] \leq log\frac{p(low)}{p(high)} \tag{4.3.6}$$

Where $\boldsymbol{X}$ = data vectors.

4.3.2 Descriptive results

Table 4.3.1. Group descriptive statistics

Income category		Emotional Warmth	Monitoring	Negative Communication	Psychological Control	Strict Control
	N	2,675	2,675	2,675	2,675	2,675
Low	Mean	-0.023	-0.044	0.064	0.035	0.024
	SD	0.98	0.979	0.992	1.013	1.007
	N	2,676	2,676	2,676	2,676	2,676
High	Mean	0.023	0.044	-0.064	-0.035	-0.024
	SD	1.019	1.019	1.004	0.986	0.992

Note: The table shows the descriptive statistics for each of the parenting styles corresponding to the income categories. The low-income category is composed of those households that have less than median monthly income.

Assumption 1. Table 4.3.2 summarizes the standardized parenting style data for the two categories of income groups. We find here that for the low income group, the mean of the positive parenting styles is below zero. For the high-income category, the means of the negative parenting styles are below zero. By doing a test of equality of means, we find that the means for the parenting styles significantly differ in the two income groups as seen in Table 4.3.2.

Table 4.3.2. Test of equality of group means within income categories

	Wilks' Lambda	df1	df2	F	*p-val*
Emotional Warmth	1	1	5349	2.73	0.099
Monitoring	0.998	1	5349	10.52	0.001
Negative Communication	0.996	1	5349	22.23	0
Psychological Control	0.999	1	5349	6.64	0.01
Strict Control	0.999	1	5349	3.21	0.073

Table 4.3.3. Test of equality of group means within income categories

Box's M	34.12
F	2.27
df1	15
df2	115200111.70
p-val	0.003

Assumption 2. We perform the Box's M test of homogeneous covariance matrices. As the p-values <0.05 we fail to reject the null hypothesis that there exists homogeneous covariance matrices of the parenting styles by the two income groups.

Table 4.3.4. Pairwise correlations between parenting styles

	Emotional Warmth	Monitoring	Negative Communication	Psychological Control	Strict Control
Emotional Warmth	1				
Monitoring	0.367	1			
Negative Communication	0.070	0.175	1		
Psychological Control	0.010	0.217	0.363	1	
Strict Control	0.051	0.230	0.424	0.388	1

Assumption 3. Table 4.3.4 shows the pairwise correlations between the parenting styles where we find that none of the variables are correlated more than 90 percent.

Assumption 4. Table 4.3.5 shows that the parenting styles are normally distributed with p-values < 0.05 for all variables, thereby satisfying the assumptions for the LDA to take place.

Table 4.3.5. Skewness/kurtosis test of normality

	Skewness	Kurtosis	p-val
Emotional Warmth	0.000	0.001	0.000
Monitoring	0.014	0.206	0.022
Negative Communication	0.000	0.612	0.000
Psychological Control	0.000	0.000	0.000
Strict Control	0.000	0.000	0.000

Table 4.3.6. Canonical discriminant function coefficients

	Function
Emotional Warmth	-0.067
Monitoring	-0.669
Negative Communication	0.747
Psychological Control	0.267
Strict Control	0.014
Constant	0.000

4.3.3 Linear discriminant analysis function

Table 4.3.6 contains the unstandardized discriminant function coefficients for the LDA. The values mentioned here are used as coefficients in equation 4.3.6 to construct the prediction equation to be used to classify new cases.

Table 4.3.7. Structure matrix

	Function
Emotional Warmth	-0.254
Monitoring	-0.498
Negative Communication	0.724
Psychological Control	0.396
Strict Control	0.275

The structure matrix, as shown in Table 4.3.7 shows the correlation of each variable within each discriminant function. The correlations serve like factor loadings in factor analysis. By identifying the largest absolute correlation associated with each discriminant function, one can understand how to name each function. Variables with bigger values in the structure matrix play a more significant role in the discriminant function analysis.

Table 4.3.8. Pairwise correlation between parenting style classification and different dimensions of parenting styles

	Parenting Style
Emotional Warmth	0.227
Monitoring	0.379
Negative Communication	-0.585
Psychological Control	-0.343
Strict Control	-0.254

Table 4.3.9. Income categories and categorization based on LDA

Income Category	Classified		Total
TRUE	0	1	
0 (Low)	1,422	1,253	2,675
	53.16%	46.84%	100%
1 (High)	1,201	1,475	2,676
	44.88%	55.12%	100%
Total	2,623	2,728	5,351
	49.02%	50.98%	100%

Note: The median split by monthly income was N=2,675 for low income households, and N=2,676 for high income households (p50 and above = 1, below = 0). The classified values show how the LDA spits the two groups based on the five parenting styles.

Table 4.3.9 shows how the LDA classifies the true income categories into the classifications created by using dimensionality reduction with parenting style. We are naming this classification parenting style, where 1 = positive parenting. In order to check model accuracy, we create a random 80:20 data split to create training and testing data. We repeat the LDA over ten iterations and using a support-vector machine classifier to test model accuracy. The data is presented in the visual matrix in Figure 4.B.1 in Appendix 4.A where we see that the model is able to correctly predict the categories (positive parenting = 1) of observations with only parenting style data.

4.4 Results

Figure 4.4.1 displays our main results. It presents the effect of positive parenting (=1) on the dependent variables that are shown in the rows. The figure is based on OLS regressions for each dependent variable. We show the underlying full regressions (with further control variables) in Appendix 4.4.1 Table 4.A.2.

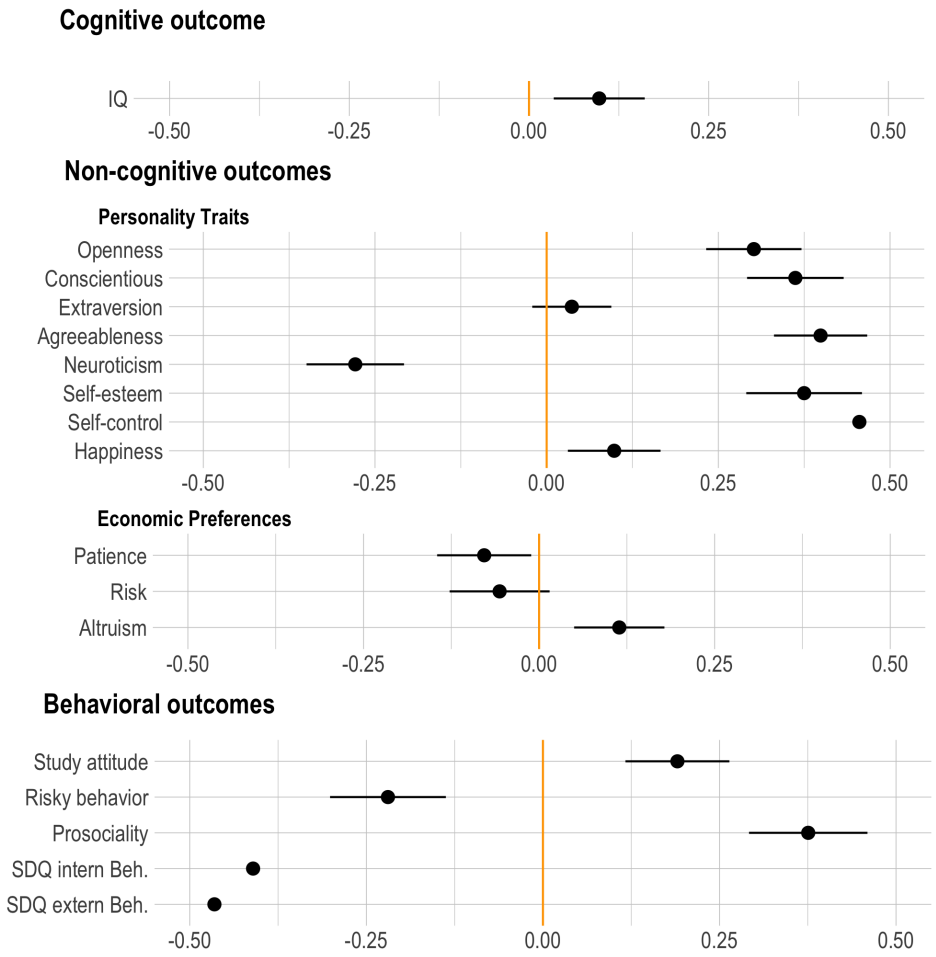

Figure 4.4.1. Positive parenting and outcomes of children (ages 6-16)

Note: The figure above shows results of OLS regressions of children's outcomes on positive parenting. Positive parenting is measured using a survey module on five dimensions of parenting for the primary caregiver. The y-axis shows the dependent variables from OLS regressions, and the plotted coefficients show the standard deviation increase/decrease in the dependent variable associated with a positive parenting style (=1). Controls in the models include gender, no. of siblings, family income, literacy of father, literacy of mother and FE at the age and district levels. Standard errors are clustered at the village level.

4.4.1 Cognitive outcomes

Positive parenting is significantly positively related to children's IQ, with a marginal effect of about 10 percent of a standard deviation ($p<0.01$). This finding is in line with previous work documenting a positive relationship between parental involvement and academic achievement of children (WHO, 2009).

4.4.2 Non-cognitive outcomes

Personality traits. Positive parenting has a significant relation to children's personality traits. Among the five dimensions captured by the Big-Five, openness, conscientiousness, and agreeableness are all significantly positively associated with positive parenting (in the range of 30 percent to 40 percent of a standard deviation; $p<0.001$), and neuroticism has a negative relationship (in the order of 28 percent of a standard deviation). Only for extraversion, we find no significant coefficient for our parenting score in the overall sample; yet it turns significantly positive if we only consider the sample of older children (in Appendix Table 4.A.3, $\beta=0.302$, $p<0.001$). Positive parenting is also significantly positively associated with a child's self-esteem (38 percent of a standard deviation; $p<0.001$), with self-control (46 percent of a standard deviation, $p<0.001$), and happiness (10 percent of a standard deviation, $p<0.01$).

Economic Preferences. Positive parenting is also associated with economic preferences. Children from families with positive parenting are more altruistic (by 12 percent of a standard deviation, $p<0.01$). While there is no significant relationship between risk taking and parenting, positive parenting is negatively aligned with children's patience (8 percent of a standard deviation, $p<0.005$). While this may look surprising in comparison to evidence from WEIRD countries where more parental involvement is typically associated with more patience of children (Falk, Kosse, Pinger, Schildberg-Hörisch, and Deckers, 2021), this observation is in line with earlier evidence from poor countries with respect to how patience is related to parenting. In an unrelated study from Bangladesh (Chowdhury, Sutter, and Zimmermann, 2020), positive parenting has been found to be positively correlated with paternalism of parents (measured as to what extent parents interfere in the decision making of their children). More paternalistic parents made fewer patient choices for their children, thus establishing the same link of a negative relation between positive parenting and children's patience as we find here.

4.4.3 Behavioral outcomes

Positive parenting is positively associated with a better study attitude of children (19 percent of a standard deviation, $p<0.001$), suggesting that it creates an attitude in children to believe in the value of hard work for success. Risk taking behavior in the

field is less often observed with positive parenting (22 percent of a standard deviation, $p<0.001$), while prosocial behavior of children (like helping others or sharing goods) is more often observed with positive parenting (38 percent of a standard deviation, $p<0.001$).

Positive parenting is negatively related to emotional and behavioral problems. This holds true both for children's internalizing SDQ score as well the externalizing SDQ score; in both cases positive parenting reduces problems by more than 40 percent of a standard deviation ($p<0.001$).

4.5 Discussion

Parenting is on the way to being recognized as an important contributor to the health and well-being of children as well as their cognitive and non-cognitive development. Despite the existence of several sources of influencing factors on the life outcomes of young people – ranging from their peer groups to teachers and the neighborhood environment – the way children are raised and treated by their parents remains of prime importance.

This study adds to the evidence that there exist meaningful relationships between parenting styles and a wide range of children's skills and behaviors. Contrary to previous studies, we have studied a very broad range of outcomes and have related them to parenting. After condensing five different domains of parenting through a linear discriminant analysis into a binary variable that we denote as positive parenting (as it loads on emotional warmth and monitoring, but in opposite direction on negative communication, psychological control and strict control), we have found persistent patterns. Positive parenting has significant associations with a plethora of important cognitive and non-cognitive skills, and behavioral outcomes, including, among others, IQ, the Big Five, self-control, self-esteem, economic preferences, study attitude, emotional symptoms or risky behaviors in the field. All of these variables have been shown to have a profound relationship with later-life outcomes as adults (Golsteyn, Grönqvist, and Lindahl, 2014; Falk, Becker, Dohmen, Enke, Huffman, et al., 2018; Kosse and Tincani, 2020). While the relationship between positive parenting and each of these variables individually may be considered to be of minor importance for a child's later life, the persistent pattern of positive parenting affecting so many cognitive and non-cognitive skills and behavioral outcomes at the same time, and in almost all cases also in the same direction, will leave a lasting imprint on a child's life. This makes our encompassing results so important. Furthermore, if skills cross-fertilize each other (Cunha and Heckman, 2007) single effects may reinforce each other and therefore have an even larger joint effect.

Our results then suggest that positive parenting is helpful for children's lives. This may be particularly important for poor countries (like Bangladesh) where

inputs through good parenting may have positive effects on skill formation and emotional stability and may thus help in fighting poverty.

Overall, our study results emphasize the deep connection between parenting styles and human development of children across various ages. This has immediate policy implications by highlighting the importance of effective parenting techniques. The latter can be molded, as some work shows that parenting styles can be modified for better health outcomes of children (WHO, 2009) or for improving their prosociality (Cappelen, List, Samek, and Tungodden, 2020). In addition to addressing parenting styles directly, our findings also stress the importance of parents for the development of their children more generally. This insight, in turn, has also implications for labor market policies. Understanding that parenting can be crucial for child development may provide a push for the formulation of labor market policies that reduce parental stress, for example, by allowing for flexible working hours or reducing the number of unplanned meetings. A reduction in stress has been found to have positive effects on parenting styles (Neece, 2014; Parent, McKee, Rough, and Forehand, 2016) and may, through this channel, then improve the development and life outcomes of children.

Appendix 4.A Additional Results

Table 4.A.1. Summary statistics for all children (age 6-16)

	Mean	S.D.	Min	Max	N
Characteristics					
Female	0.518	0.500	0.000	1.000	5351
Age	10.253	2.627	6.000	16.000	5351
No. of siblings	2.479	1.432	0.000	10.000	5351
Log income	11.535	1.964	0.000	16.146	5351
Father's literacy	0.550	0.498	0.000	1.000	5351
Mother's literacy	0.654	0.476	0.000	1.000	5351
Cognitive outcome					
IQ	44.718	4.127	40.000	70.000	5351
Non-cognitive outcomes					
Personality traits					
Openness	0.000	1.000	-3.631	1.926	5351
Conscientiousness	0.000	1.000	-3.572	1.550	5351
Extraversion	0.000	1.000	-3.705	2.376	5351
Agreeableness	0.000	1.000	-3.932	1.949	5351
Neuroticism	0.000	1.000	-1.653	3.655	5351
Self-esteem	0.000	1.000	-4.237	2.337	3814
Self-control	0.000	1.000	-4.159	2.320	5336
Happiness	0.000	1.000	-5.320	0.667	5351
Economic preferences					
Patience	0.000	1.000	-2.011	1.981	5351
Risk taking	0.000	1.000	-2.508	2.071	5351
Altruism	0.000	1.000	-2.189	1.971	5351
Behavioral outcomes					
Study attitude	0.000	1.000	-4.337	0.718	5351
Risky behaviors	0.000	1.000	-1.172	3.823	3071
Prosociality	0.000	1.000	-2.858	1.558	5351
SDQ-Internalizing Beh.	0.000	1.000	-1.997	4.129	5351
SDQ-Externalizing Beh.	0.000	1.000	-1.828	4.020	5351

Note: The table provides summary statistics for the sample of this study. For the subset of the sample that was used in Chapter 3, see Appendix 3.B.

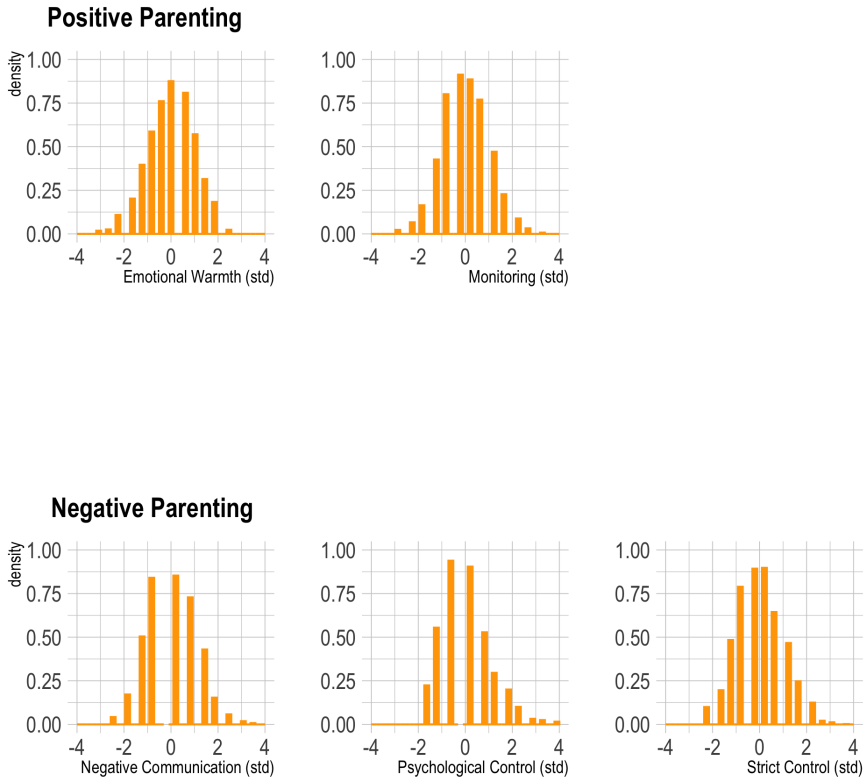

Figure 4.A.1. Distribution of parenting styles

Note: The figures above show the distributions of the five components of parenting styles. A full explanation of these parenting styles and their measurement is provided in Appendix 3.D. One of the parenting style components which was collected during the survey, inconsistent parenting, had to be dropped from the analyses due to translation issues.

Table 4.A.2. Children's outcomes and positive parenting for children aged 6-16

	Positive Parenting			*q*-val	N
	Mean	S.E.	R^2		
Cognitive outcome					
IQ	0.098**	(0.033)	0.273	0.002	5351
Non-cognitive outcomes					
Personality traits					
Openness	0.302***	(0.036)	0.056	0.001	5351
Conscientiousness	0.362***	(0.036)	0.06	0.001	5351
Extraversion	0.037	(0.030)	0.05	0.031	5351
Agreeableness	0.399***	(0.035)	0.059	0.001	5351
Neuroticism	-0.279***	(0.036)	0.036	0.001	5351
Self-esteem	0.375***	(0.043)	0.125	0.001	3814
Self-sontrol	0.455***	(0.045)	0.095	0.001	5336
Happiness	0.098**	(0.034)	0.03	0.002	5351
Economic preferences					
Patience	-0.078*	(0.035)	0.006	0.006	5351
Risk taking	-0.056	(0.038)	0.023	0.027	5351
Altruism	0.114***	(0.032)	0.008	0.001	5351
Behavioral outcomes					
Study attitude	0.190***	(0.037)	0.043	0.001	5351
Risky behaviors	-0.219***	(0.041)	0.257	0.001	3071
Prosociality	0.376***	(0.043)	0.072	0.001	5351
SDQ-Internalizing Beh.	-0.410***	(0.046)	0.096	0.001	5351
SDQ-Externalizing Beh.	-0.465***	(0.044)	0.125	0.001	5351

Note: The table above shows results for OLS regressions of children's outcomes on parenting. Columns (2), (3) and (4) show results for parenting category using LDA (based on income groups split at the median) where 0 = negative parenting, 1 = positive parenting. Column (5) shows the false discovery rate adjusted q-values that display significance changes from multiple hypothesis testing. The left-most column shows the dependent variables in OLS regressions, and column (2) shows the coefficients of the binary parenting variable. Controls include gender, no. of siblings, family income, literacy of father, literacy of mother and FE at the age and district level. Standard errors are clustered at the village level.
Significance at * $p<.05$, ** $p<.01$, *** $p<.001$.

Table 4.A.3. Children's outcomes and positive parenting for children aged 10-16

	Positive Parenting			*q*-val	N
	Mean	S.E.	R^2		
Cognitive outcome					
IQ	-0.001	(0.043)	0.149	0.132	3040
Non-cognitive outcomes					
Personality traits					
Openness	0.311***	(0.045)	0.071	0.001	3040
Conscientiousness	0.329***	(0.047)	0.068	0.001	3040
Extraversion	0.302***	(0.044)	0.071	0.001	3040
Agreeableness	0.329***	(0.044)	0.045	0.001	3040
Neuroticism	-0.278***	(0.044)	0.042	0.001	3040
Self-esteem	0.430***	(0.047)	0.129	0.001	3040
Self-control	0.478***	(0.050)	0.101	0.001	3025
Happiness	0.088*	(0.040)	0.035	0.011	3040
Economic preferences					
Patience	-0.113*	(0.044)	0.009	0.004	3040
Risk taking	-0.034	(0.041)	0.017	0.055	3040
Altruism	0.112**	(0.043)	0.008	0.004	3040
Behavioral outcomes					
Study attitude	0.221***	(0.048)	0.037	0.001	3040
Risky behaviors	-0.191***	(0.039)	0.256	0.001	3040
Prosociality	0.322***	(0.053)	0.055	0.001	3040
SDQ-Internalizing Beh.	-0.481***	(0.052)	0.108	0.001	3040
SDQ-Externalizing Beh.	-0.492***	(0.051)	0.125	0.001	3040

Note: The table above shows results for OLS regressions of older children's outcomes on parenting. Columns (2), (3) and (4) show results for parenting category using LDA (based on income groups split at the median) where 0 = negative parenting, 1 = positive parenting. Column (5) shows the false discovery rate adjusted q-values that display significance changes from multiple hypothesis testing. The left-most column shows the dependent variables in OLS regressions, and column (2) shows the coefficients of the binary parenting variable. Controls include gender, no. of siblings, family income, literacy of father, literacy of mother and FE at the age and district level. Standard errors are clustered at the village level.
Significance at * $p<.05$, ** $p<.01$, *** $p<.001$.

Table 4.A.4. Children's outcomes and positive parenting for children aged 6-9

	Positive Parenting			*q*-val	N
	Mean	S.E.	R^2		
Cognitive outcome					
IQ	0.153***	(0.044)	0.228	0.001	2311
Non-cognitive outcomes					
Personality traits					
Openness	0.262***	(0.047)	0.061	0.001	2311
Conscientiousness	0.329***	(0.045)	0.061	0.001	2311
Extraversion	-0.191***	(0.041)	0.092	0.001	2311
Agreeableness	0.352***	(0.048)	0.065	0.001	2311
Neuroticism	-0.255***	(0.050)	0.038	0.001	2311
Self-esteem	0.215**	(0.070)	0.135	0.002	774
Self-control	0.277***	(0.051)	0.066	0.001	2311
Happiness	0.100*	(0.046)	0.032	0.017	2311
Economic preferences					
Patience	-0.065	(0.047)	0.007	0.047	2311
Risk taking	-0.018	(0.045)	0.011	0.138	2311
Altruism	0.018	(0.040)	0.01	0.138	2311
Behavioral outcomes					
Study attitude	0.092	(0.051)	0.026	0.033	2311
Risky behaviors	-0.828*	(0.371)	0.446	0.017	31
Prosociality	0.415***	(0.058)	0.066	0.001	2311
SDQ-Internalizing Beh.	-0.232***	(0.047)	0.068	0.001	2311
SDQ-Externalizing Beh.	-0.383***	(0.049)	0.087	0.001	2311

Note: The table above shows results for OLS regressions of younger children's outcomes on parenting. Columns (2), (3) and (4) show results for parenting category using LDA (based on income groups split at the median) where 0 = negative parenting, 1 = positive parenting. Column (5) shows the false discovery rate adjusted q-values that display significance changes from multiple hypothesis testing. The left-most column shows the dependent variables in OLS regressions, and column (2) shows the coefficients of the binary parenting variable. Controls include gender, no. of siblings, family income, literacy of father, literacy of mother and FE at the age and district level. Standard errors are clustered at the village level.
Significance at * $p<.05$, ** $p<.01$, *** $p<.001$.

Table 4.A.5. Children's outcomes and income category (median split) for children aged 6-16)

	Income Category			N
	Mean	S.E.	R^2	
Cognitive outcome				
IQ	0.096**	(0.03)	0.273	5351
Non-cognitive outcomes				
Personality traits				
Openness	0.056	(0.036)	0.035	5351
Conscientiousness	0.047	(0.034)	0.029	5351
Extraversion	0.009	(0.032)	0.049	5351
Agreeableness	0.023	(0.037)	0.021	5351
Neuroticism	-0.043	(0.035)	0.017	5351
Self-Esteem	0.115**	(0.041)	0.094	3814
Self-Control	0.085*	(0.037)	0.047	5336
Happiness	0.072	(0.033)	0.029	5351
Economic preferences				
Patience	-0.009	(0.032)	0.004	5351
Risk taking	-0.04	(0.035)	0.022	5351
Altruism	0.024	(0.032)	0.005	5351
Behavioral outcomes				
Study Attitude	0.022	(0.036)	0.034	5351
Risky behaviors	-0.151***	(0.043)	0.25	3071
Prosociality	0.06	(0.035)	0.039	5351
SDQ-Internalizing Beh.	-0.056	(0.042)	0.056	5351
SDQ-Externalizing Beh.	-0.064	(0.035)	0.073	5351

Note: The table above shows results for OLS regressions of all the children's outcomes on income categories. Income is calculated as the family's monthly income, the categories are created by splitting at median (p50 and above = 1, below = 0). The left-most column shows the dependent variables from OLS regressions, and column (2) shows the coefficients from the independent variable. Controls include gender, no. of siblings, income, literacy of father, literacy of mother. Standard errors are clustered at the village level, and FE at the age and district level.
Significance at * $p<.05$, ** $p<.01$, *** $p<.001$.

4.A.1 Complete regression tables

Table 4.A.6. Association between cognitive outcome and positive parenting

	IQ
Positive parenting	0.098**
	(0.033)
Female = 1	0.091***
	(0.023)
No. of siblings	-0.042***
	(0.010)
Log income	0.013
	(0.007)
Literacy (mother)	0.291***
	(0.028)
Literacy (father)	0.126***
	(0.032)
i.Districts	
Chandpur	0.269***
	(0.062)
Sunamganj	0.102
	(0.064)
Gopalganj	0.440***
	(0.053)
i.Age	
Age in years=7	-1.039***
	(0.070)
Age in years=8	-0.794***
	(0.069)
Age in years=9	-0.933***
	(0.065)
Age in years=10	-1.187***
	(0.067)
Age in years=11	-1.442***
	(0.070)
Age in years=12	-1.332***
	(0.071)
Age in years=13	-1.415***
	(0.076)
Age in years=14	-1.520***
	(0.073)
Age in years=15	-1.396***
	(0.080)
Age in years=16	-1.681***
	(0.089)
Constant	0.548***
	(0.098)
Observations	5351
R^2	0.273

Notes: The table above shows results for OLS regressions of children's standardized FSIQ outcome on parenting category created by LDA (based on income groups split at the median) where 0 = negative parenting, 1 = positive parenting. The controls and fixed effects used in the model are shown above. Standard errors are clustered at the village level.
Significance at * $p<.05$, ** $p<.01$, *** $p<.001$.

Table 4.A.7. Association between personality traits and positive parenting-1

	Openness	Consciousness	Extraversion	Agreeableness	Neuroticism
Positive parenting	0.302***	0.362***	0.037	0.399***	-0.279***
	-0.036	-0.036	-0.03	-0.035	-0.036
Female = 1	0.038	0.119***	-0.171***	0.136***	0.083**
	-0.026	-0.026	-0.027	-0.03	-0.028
No. of siblings	-0.037***	-0.001	-0.002	-0.012	-0.007
	-0.01	-0.011	-0.011	-0.01	-0.011
Log income	0.017*	-0.001	-0.004	-0.003	-0.002
	-0.008	-0.007	-0.007	-0.008	-0.007
Literacy (mother)	0.104**	0.066*	0.002	0.074*	-0.033
	-0.031	-0.03	-0.034	-0.031	-0.03
Literacy (father)	0.059	0.028	0.02	0.015	-0.034
	-0.038	-0.038	-0.031	-0.036	-0.036
i.Districts					
Chandpur	-0.126*	-0.230**	0.172**	-0.224**	0.211*
	-0.063	-0.084	-0.058	-0.082	-0.087
Sunamganj	-0.170**	-0.378***	-0.113	-0.222**	0.334***
	-0.053	-0.07	-0.071	-0.067	-0.069
Gopalganj	0.085*	-0.176***	0.427***	-0.079	0.093
	-0.037	-0.048	-0.051	-0.041	-0.058
i.Age					
Age in years=7	0.125	0.141*	-0.136*	0.107	-0.02
	-0.069	-0.069	-0.065	-0.069	-0.068
Age in years=8	0.176**	0.175**	-0.105	0.12	-0.045
	-0.063	-0.062	-0.065	-0.066	-0.065
Age in years=9	0.136*	0.198**	-0.142*	0.091	-0.054
	-0.066	-0.063	-0.07	-0.066	-0.069
Age in years=10	0.1	0.124	-0.118	0.093	-0.029
	-0.068	-0.067	-0.078	-0.072	-0.072
Age in years=11	0.077	0.068	-0.119	0.085	-0.035
	-0.068	-0.069	-0.074	-0.067	-0.071
Age in years=12	0.14	0.206**	-0.078	0.117	-0.072
	-0.077	-0.077	-0.08	-0.076	-0.076
Age in years=13	0.158*	0.12	-0.117	0.08	0.001
	-0.08	-0.073	-0.085	-0.076	-0.074
Age in years=14	0.254**	0.248**	-0.038	0.059	-0.056
	-0.08	-0.086	-0.086	-0.072	-0.08
Age in years=15	0.324***	0.290***	-0.042	0.156	-0.039
	-0.087	-0.082	-0.088	-0.082	-0.088
Age in years=16	0.458***	0.187	-0.044	0.271**	-0.004
	-0.099	-0.098	-0.108	-0.095	-0.103
Constant	-0.494***	-0.302**	0.062	-0.262*	0.109
	-0.122	-0.113	-0.111	-0.12	-0.113
Observations	5351	5351	5351	5351	5351
R^2	0.056	0.06	0.05	0.059	0.036

Notes: The table above shows results for OLS regressions of children's standardized Big-Five personality traits outcomes on parenting category created by LDA (based on income groups split at the median) where 0 = negative parenting, 1 = positive parenting. The controls and fixed effects used in the model are shown above. Standard errors are clustered at the village level. Significance at * $p<.05$, ** $p<.01$, *** $p<.001$.

Table 4.A.8. Association between personality traits and positive parenting-2

	Self-esteem	Self-control	Happiness
Positive parenting	0.375***	0.455***	0.098**
	(0.043)	(0.045)	(0.034)
Female = 1	0.042	0.151***	0.054
	(0.029)	(0.027)	(0.029)
No. of siblings	-0.026*	0.017	-0.034**
	(0.013)	(0.011)	(0.011)
Log income	-0.003	0.011	-0.003
	(0.008)	(0.008)	(0.007)
Literacy (mother)	0.130***	0.069*	0.051
	(0.034)	(0.032)	(0.032)
Literacy (father)	0.047	0.111**	-0.031
	(0.041)	(0.035)	(0.034)
i.Districts			
Chandpur	-0.061	-0.251*	-0.139**
	(0.102)	(0.102)	(0.051)
Sunamganj	-0.588***	-0.480***	-0.278*
	(0.113)	(0.087)	(0.111)
Gopalganj	0.222***	-0.210**	-0.312***
	(0.052)	(0.067)	(0.044)
i.Age			
Age in years=7	0.972**	0.196**	0.073
	(0.298)	(0.074)	(0.073)
Age in years=8	1.192***	0.168*	0.100
	(0.171)	(0.065)	(0.067)
Age in years=9	1.267***	0.181**	0.132
	(0.058)	(0.068)	(0.076)
Age in years=10	1.226***	0.174*	0.125
	(0.059)	(0.069)	(0.077)
Age in years=11	1.214***	0.288***	0.129
	(0.057)	(0.065)	(0.076)
Age in years=12	1.192***	0.187*	0.021
	(0.067)	(0.078)	(0.080)
Age in years=13	1.089***	0.032	-0.002
	(0.068)	(0.074)	(0.086)
Age in years=14	1.259***	0.225**	-0.003
	(0.069)	(0.077)	(0.092)
Age in years=15	1.380***	0.334***	-0.077
	(0.078)	(0.079)	(0.091)
Age in years=16	1.189***	0.204*	-0.210
	(0.089)	(0.097)	(0.121)
Constant	-1.409***	-0.611***	0.110
	(0.114)	(0.128)	(0.109)
Observations	3814	5336	5351
R^2	0.125	0.095	0.030

Notes: The table above shows results for OLS regressions of children's standardized personality traits outcome on parenting category created by LDA (based on income groups split at the median) where 0 = negative parenting, 1 = positive parenting. The controls and fixed effects used in the model are shown above. Standard errors are clustered at the village level. Significance at * $p<.05$, ** $p<.01$, *** $p<.001$.

Table 4.A.9. Association between economic preferences and positive parenting

	Patience	Risk taking	Altruism
Positive parenting	-0.078*	-0.056	0.114***
	(0.035)	(0.038)	(0.032)
Female = 1	0.018	-0.091***	0.044
	(0.031)	(0.027)	(0.031)
No. of siblings	-0.008	0.014	-0.000
	(0.012)	(0.012)	(0.011)
Log income	-0.004	0.010	0.004
	(0.009)	(0.008)	(0.007)
Literacy (mother)	-0.019	0.042	-0.005
	(0.035)	(0.033)	(0.034)
Literacy (father)	-0.029	-0.053	-0.064
	(0.035)	(0.035)	(0.035)
i.Districts			
Chandpur	-0.012	0.048	-0.070
	(0.059)	(0.064)	(0.045)
Sunamganj	0.069	0.232***	-0.083
	(0.074)	(0.062)	(0.047)
Gopalganj	-0.049	-0.031	-0.049
	(0.049)	(0.048)	(0.040)
i.Age			
Age in years=7	-0.043	0.025	0.013
	(0.070)	(0.070)	(0.077)
Age in years=8	0.035	0.095	-0.043
	(0.067)	(0.065)	(0.070)
Age in years=9	-0.006	0.071	-0.036
	(0.067)	(0.066)	(0.068)
Age in years=10	0.074	0.263***	-0.090
	(0.063)	(0.069)	(0.065)
Age in years=11	0.028	0.277***	-0.102
	(0.066)	(0.068)	(0.068)
Age in years=12	-0.057	0.198**	-0.106
	(0.071)	(0.069)	(0.073)
Age in years=13	0.024	0.244**	-0.064
	(0.067)	(0.074)	(0.077)
Age in years=14	-0.046	0.268***	-0.031
	(0.083)	(0.074)	(0.080)
Age in years=15	-0.032	0.220**	0.057
	(0.085)	(0.083)	(0.085)
Age in years=16	0.111	0.343***	-0.210*
	(0.108)	(0.100)	(0.095)
Constant	0.127	-0.253*	0.005
	(0.127)	(0.118)	(0.103)
Observations	5351	5351	5351
R^2	0.006	0.023	0.008

Notes: The table above shows results for OLS regressions of children's standardized preference measures on parenting category created by LDA (based on income groups split at the median) where 0 = negative parenting, 1 = positive parenting. The controls and fixed effects used in the model are shown above. Standard errors are clustered at the village level.
Significance at * $p<.05$, ** $p<.01$, *** $p<.001$.

Table 4.A.10. Association between behavioral outcomes and positive parenting

	Study attitude	Risky behaviors	Prosociality	SDQ Internalizing Behavior	SDQ Externalizing Behavior
Positive parenting	0.190***	-0.219***	0.376***	-0.410***	-0.465***
	(0.037)	(0.041)	(0.043)	(0.046)	(0.044)
Female = 1	0.033	-0.843***	0.112***	0.031	-0.231***
	(0.026)	(0.033)	(0.027)	(0.025)	(0.026)
No. of siblings	-0.011	0.010	-0.001	0.021	0.013
	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)
Log income	-0.008	-0.020	0.001	0.011	-0.000
	(0.008)	(0.014)	(0.008)	(0.009)	(0.009)
Literacy (mother)	0.030	-0.054	0.122**	-0.039	-0.143***
	(0.031)	(0.035)	(0.038)	(0.034)	(0.035)
Literacy (father)	0.044	-0.036	0.026	0.013	-0.007
	(0.037)	(0.042)	(0.037)	(0.039)	(0.038)
i.Districts					
Chandpur	-0.191*	-0.344***	-0.089	-0.010	0.162
	(0.091)	(0.090)	(0.088)	(0.086)	(0.083)
Sunamganj	-0.319***	0.102	-0.191**	0.530***	0.439***
	(0.068)	(0.096)	(0.073)	(0.089)	(0.079)
Gopalganj	-0.162**	-0.317***	0.015	-0.103*	0.283***
	(0.050)	(0.076)	(0.076)	(0.047)	(0.055)
i.Age					
Age in years=7	-0.001	0.063	0.116	0.015	-0.179**
	(0.079)	(0.252)	(0.070)	(0.068)	(0.068)
Age in years=8	0.064	-0.729*	0.252***	-0.027	-0.216***
	(0.071)	(0.353)	(0.063)	(0.058)	(0.064)
Age in years=9	0.189**	-0.402	0.223***	-0.054	-0.197**
	(0.063)	(0.252)	(0.061)	(0.062)	(0.063)
Age in years=10	0.267***	-0.275**	0.324***	-0.034	-0.297***
	(0.064)	(0.090)	(0.058)	(0.065)	(0.063)
Age in years=11	0.210**	-0.292***	0.340***	-0.076	-0.304***
	(0.068)	(0.085)	(0.061)	(0.065)	(0.071)
Age in years=12	0.349***	-0.430***	0.440***	-0.146*	-0.399***
	(0.069)	(0.091)	(0.064)	(0.070)	(0.071)
Age in years=13	0.279***	-0.455***	0.427***	-0.221**	-0.441***
	(0.070)	(0.097)	(0.069)	(0.076)	(0.073)
Age in years=14	0.383***	-0.548***	0.534***	-0.263***	-0.624***
	(0.079)	(0.087)	(0.072)	(0.072)	(0.068)
Age in years=15	0.527***	-0.654***	0.556***	-0.247**	-0.647***
	(0.082)	(0.088)	(0.071)	(0.088)	(0.077)
Age in years=16	0.442***	-0.725***	0.494***	-0.136	-0.621***
	(0.092)	(0.108)	(0.092)	(0.103)	(0.098)
Constant	-0.139	1.354***	-0.622***	0.092	0.564***
	(0.117)	(0.171)	(0.122)	(0.129)	(0.123)
Observations	5351	3071	5351	5351	5351
R^2	0.043	0.257	0.072	0.096	0.125

Notes: The table above shows results for OLS regressions of children's standardized behavioral outcomes on parenting category created by LDA (based on income groups split at the median) where 0 = negative parenting, 1 = positive parenting. The controls and fixed effects used in the model are shown above. Standard errors are clustered at the village level.
Significance at * $p<.05$, ** $p<.01$, *** $p<.001$.

Appendix 4.B Linear Discriminant Analysis

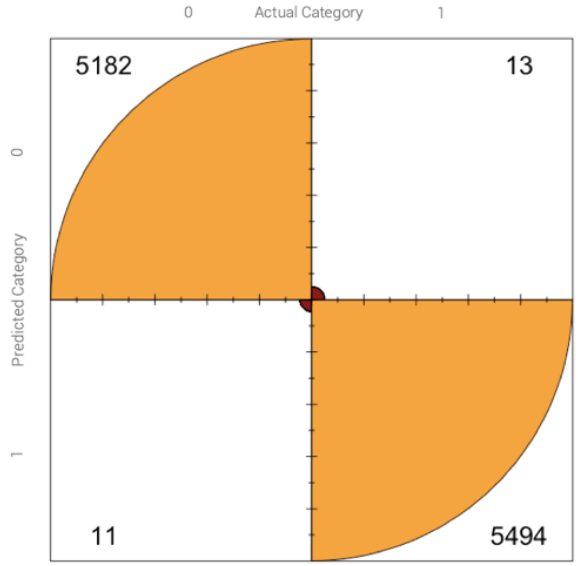

Figure 4.B.1. LDA model accuracy

Note: The matrix above shows the accuracy of the linear discriminant analysis using an SVM model. The orange areas show instances where the model was correctly specified, and red areas show instances when the model was incorrectly specified for the data. The results presented are of a random 20 percent split of the data (testing set), over 10 iterations. 80 percent of the data was used as the training set in each iteration.

Appendix 4.C Outcome Measurement

Table 4.C.1. Details on outcome measurement

Outcomes	Components	Scale	Respondent	Standardization	Source
FSIQ	Fluid IQ and crystallized IQ	WISC IV Modified for local context	Children	Across age groups	Wechsler (2003)
Big-Five (age 6-9)	10-item questionnaire	Likert-scale (11-point)	Mothers	Within age group	Weinert et al. (2007)
Big-Five (age 10-16)	16-item questionnaire	Likert-scale (5-point)	Children	Within age group	Weinert et al. (2007)
Self-esteem (age 9-16)	10-item questionnaire	Likert-scale (5-point)	Children	Across age groups	Rosenberg (1965)
Self-control (age 6-11)	8-item questionnaire	Likert-scale (5-point)	Mothers	Within age group	Tsyukayama et al. (2013)
Self-control (age 12-16)	13-item questionnaire	Likert-scale (5-point)	Children	Within age group	Tangney et al. (2004)
Happiness	Question on general happiness	Visual Likert-scale (5-points)	Children	Across age groups	World Values Survey - modified
Patience	No. of patient choices	Out of 6 incentivized choices	Children	Standardized mean of two components across age groups	Bauer et al. (2012)
	Question on time pref.	Likert-scale (5-point)	Children		Falk et al. (2018) - modified
Risk	Choice of gambles	Out of 6 incentivized gambles	Children	Standardized mean of two components across age groups	Binswanger (1980)
	Question on risk pref.	Likert-scale (5-point)	Children		Falk et al. (2018) - modified
Altruism	No. of altruistic choices	Out of 4 incentivized game	Children	Across age groups	Bauer et al. (2014)
Study attitude	Question on value of hard work	Likert-scale (5-point)	Children	Across age groups	Rotter (1966)
Risky Behaviors (age 11-16)	16-item index of risky behaviors	yes/no	Children	Across age groups	using local FGD's
Prosociality	5-item subscale of SDQ on prosocial acts of kids	Likert-scale (3-point) questions	Mothers	Across age groups	Goodman (1997)
SDQ Internalizing Behaviors	Subscales containing emotional problems and peer problems	Likert-scale (3-point) questions Two 5-item subscale	Mothers	Across age groups	Goodman (1997)
SDQ Externalizing Behaviors	Subscales containing hyperactivity and conduct problems	Likert-scale (3-point) questions Two 5-item subscale	Mothers	Across age groups	Goodman (1997)

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