

Perception of Poverty

B.Stat 3rd Year

Indian Statistical Institute, Kolkata



Course name:

Statistics Comprehensive

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Date of Submission : June 7, 2023

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Acknowledgement:

We would like to express our profound gratitude and indebtedness to Prof. Bimal Kumar Roy and Prof. Debasis Sengupta, Indian Statistical Institute for providing us an opportunity to understand the social issue of poverty in the state of West Bengal and their valuable direction for the completion of the Class project "***Perception of Poverty***".

We also acknowledge all the native residents who helped us in undertaking the surveys smoothly in the respective areas.

B.Stat 3rd Year 2022-23

Date: June 7, 2023

Place: Kolkata

1 Introduction

Poverty is a state or condition in which one lacks the financial resources and essentials for a certain standard of living. The word poverty comes from the old (Norman) French word *poverté* (Modern French: *pauvreté*), from Latin *paupertas* from *pauper* (poor).

According to World Bank, poverty is pronounced deprivation in well-being, and comprises many dimensions. It includes low incomes and the inability to acquire the basic goods and services necessary for survival with dignity. Poverty also encompasses low levels of health and education, poor access to clean water and sanitation, inadequate physical security, lack of voice, and insufficient capacity and opportunity to better one's life.

A common way to measure a country's poverty level is to determine the percentage of people or families who earn less than the "national poverty line", or poverty threshold, the annual income below which a person or family is considered impoverished. The national poverty line is calculated independently for each country because each country's economy is different. The majority of countries in the world, as well as organizations such as World Bank, OECD (Organization for Economic Co-operation and Development), and the European Union, set the national poverty line at 50% of a given year's median income.

Apart from monetary deprivation, poverty measure should reflect multiple deprivations that poor people face in the areas of education, health, and living standards. Sabina Alkire and James Foster (2011) proposed multidimensional poverty index which uses a number of different indicators to identify whether an individual is poor or not. Oxford Poverty and Human Development Initiative (OPHI) enlists 10 different indicator ranging three sectors: Health, Education and Living standards.

The last official estimate of Poverty in India was released in 2011-12 by Planning Commission, which was estimated using Tendulkar Committee approach (According to it, national poverty line using the Mixed Reference Period was estimated at Rs. 816 per capita per month in rural areas and Rs. 1,000 per capita per month in urban areas). After being criticized for this line to be rather low (it risks depriving many worthy households from government programmes by classifying them as above poverty line (APL) households), NITI Aayog has constituted a Multidimensional Poverty Index Coordination Committee (MPICC) with members from relevant Line Ministries and Departments. It is well accepted now globally as well in India that poverty is multi-dimensional and only through a concerted effort on its various dimensions, a real dent on poverty can be made.

While poverty indicators are widely used to quantify and measure poverty levels, their relative importance varies depending on the socio-economic context. This project aims to examine and rank poverty indicators based on their significance, shedding light on the key dimensions that shape perceptions of poverty and guiding policymakers towards more targeted and impactful interventions.

To understand people's opinions on the importance of these poverty indicators, we conducted a survey using partial profile-choice experiments. This approach presents participants with a series of hypothetical scenarios, where they are asked to choose between different combinations of poverty indicators and indicate their preferred options. By analyzing the participants' choices, we can quantify the relative importance of each indicator and uncover the dimensions that individuals prioritize when evaluating poverty.

By using various statistical tools and methodologies on the collected data, we aim to provide robust and evidence-based insights into the relative importance of poverty indicators. This information can guide policymakers and practitioners in formulating targeted poverty alleviation strategies that address the most salient dimensions of poverty and resonate with the needs and priorities of the communities they aim to serve.

2 Global Multi-dimensional Poverty index

The global Multidimensional Poverty Index (MPI) is an international measure of acute multidimensional poverty covering over 100 developing countries. It complements traditional monetary poverty measures by capturing the acute deprivations in health, education, and living standards that a person faces simultaneously.

DIMENSIONS OF POVERTY	INDICATOR	DEPRIVED IF LIVING IN A HOUSEHOLD WHERE...	WEIGHT	SDG AREA
Health (1/3)	Nutrition	Any person under 70 years of age for whom there is nutritional information is undernourished .	1/6	SDG 2: Zero Hunger
	Child mortality	A child under 18 has died in the household in the five-year period preceding the survey.	1/6	SDG 3: Health and Well-being
Education (1/3)	Years of schooling	No eligible household member has completed six years of schooling .	1/6	SDG 4: Quality Education
	School attendance	Any school-aged child is not attending school up to the age at which he/she would complete class 8 .	1/6	SDG 4: Quality Education
Living Standards (1/3)	Cooking fuel	A household cooks using solid fuel , such as dung, agricultural crop, shrubs, wood, charcoal, or coal.	1/18	SDG 7: Affordable and Clean Energy
	Sanitation	The household has unimproved or no sanitation facility or it is improved but shared with other households.	1/18	SDG 6: Clean Water and Sanitation
	Drinking water	The household's source of drinking water is not safe or safe drinking water is a 30-minute or longer walk from home, roundtrip.	1/18	SDG 6: Clean Water and Sanitation
	Electricity	The household has no electricity .	1/18	SDG 7: Affordable and Clean Energy
	Housing	The household has inadequate housing materials in any of the three components: floor, roof, or walls .	1/18	SDG 11: Sustainable Cities and Communities
	Assets	The household does not own more than one of these assets : radio, TV, telephone, computer, animal cart, bicycle, motorbike, or refrigerator, and does not own a car or truck.	1/18	SDG 1: No Poverty

Figure 1: Global MPI – Dimensions, Indicators, Deprivation Cutoffs, and Weights

Source: Alkire, S., Kanagaratnam, U. and Suppa, N. (2020). ‘The global Multidimensional Poverty Index (MPI): 2020 revision’, OPHI MPI Methodological Note 49, Oxford Poverty and Human Development Initiative, University of Oxford.

Fig 1 shows the indicators of MPI. The MPI assesses poverty at the individual level. If a person is deprived in a third or more of ten (weighted) indicators, the global MPI identifies them as ‘MPI poor’^[1]. The extent – or intensity – of their poverty is also measured through the percentage of deprivations they are experiencing.

The global MPI shows who is poor and how they are poor and can be used to create a comprehensive picture of people living in poverty. This makes the MPI and its linked information platform invaluable as an analytical tool to identify the most vulnerable people – the poorest among the poor, revealing poverty patterns within countries and over time, enabling policy makers to target resources and design policies more effectively.

The global MPI was developed by OPHI with the UN Development Programme (UNDP) for inclusion in UNDP’s flagship Human Development Report in 2010. It has been published annually by OPHI and in the HDRs ever since.

3 Methodology of the Survey

3.1 Questionnaire Design

The goal of designing the Questionnaire was to bring forth the perception of people of India about the relative importance of various poverty indicators in their locality. To effectively design the questionnaire, we adopt 2 directions that capture both:

- **Contrastive Comparison:** Perception regarding relative importance between poverty indicators in the presence of other indicators.
- **Perturbative Performance:** Perception regarding poverty threshold level for each poverty indicator which has a threshold above which we call a person poor. Example: Drinking Water (More than 30 minutes to get drinking water: Poor, otherwise:)

NITI Aayog uses 12 poverty indicators to measure poverty level which are quite reasonable indicators and we didn't question the validity of the indicators themselves. Rather our goal was to figure out whether the weights provided by NITI Aayog were appropriate or need tweaking based on the perception of the people.

For the Contrastive Comparison section, we adopted from an Economic Concept of the Theory of Discrete Choice Modelling to find relative valuation of various poverty indicators. To do so, we designed the Questionnaire's section of contrastive comparison as a Discrete Choice Experiment, where we pose each respondents with 12 scenarios of including 2 imaginary person each with different levels of the various indicators and the respondents were asked to choose the alternative they thought to be more poor.

The benefit of this sort of comparison based alternatives include:

- Eradication of Respondent Bias.
- A solid theoretical framework which have been used by Economist to find overall preference of the respondents.

But in our case, we had 12 indicators and showing alternatives with variations of 11 indicators would make it cumbersome and difficult for the respondents to make a decision. Hence, we adopted a strategy of Partial Profile Choice Modelling. Due to the computational expensive computer-based search of the space of all possible designs to come up with a D-Efficient Discrete Choice Experiment Design. We removed Bank Account from the set of 12 indicators because of 2 reasons which includes removal of Bank Account by NITI Aayog on their recent notice and unavailability of pre-built partial profile designs for 12 indicators. Using the Design with 11 indicators with profile strength 4 and depth 2, we obtained in total 60 choice sets after removing the obvious choice sets. It is common in the choice experiment literature to end up with large number of choice sets and hence we randomly allocate 5 set of 12 choice sets. Each respondents is asked one out of these 5 sets. But to compensate for the indicator which we removed we put a question regarding the validity of that indicator in the Additional Questions Section. It was ensured, through the choice of the 4 indicators, that the design remains connected.

The second part of the questionnaire was on Perturbation Performance, which featured 6 multiple choice questions with 4 options each. This section was common to all the 5 sets of questionnaires. For each question, four options were presented with slightly changing hypothetical scenarios for the respondent to mark as "poor". It is to be noted that a provision for choosing more than one option was kept in this section. All the questions were designed in such a manner that none had any single absolutely correct response, but rather choosing any of the options would give some insight into the person's way of reasoning and his/her conception of "poverty". An additional non-compulsory part with 3 questions was also kept at the very end.

Following are the questionnaire prepared by us :

QUESTIONNAIRE(প্রশ্নপত্র)

SECTION 1: Personal Details (ব্যক্তিগত তথ্য)

1. Age (বয়স) :
2. Profession (পেশা):
3. Education (শিক্ষাগত যোগ্যতা) : Below 10th/10th pass/12th pass/Graduate/Postgraduate/PhD

SECTION 2: Contrastive Comparison (তুলনামূলক আলোচনা)

In each of the following question, who among the two persons described in each question is **POOR**.

(নিচের প্রতিটি প্রশ্নে 4টি বৈশিষ্ট্য রয়েছে, বর্ণিত 2 কাল্পনিক ব্যক্তির মধ্যে আপনি কাকে গরীব মনে করেন?)

Respondent - 1, 6, 11, 16, 21, ...

Question-1:

- Housing, Sanitation, School Attendance, Drinking Water
 Housing, Sanitation, School Attendance, Drinking Water

Question-2:

- Cooking Fuel, Assets, Drinking Water, Electricity
 Cooking Fuel, Assets, Drinking Water, Electricity

Question-3:

- Housing, Maternal Health, Assets, Child & Adolescent Mortality
 Housing, Maternal Health, Assets, Child & Adolescent Mortality

Question-4:

- Cooking Fuel, Housing, Sanitation, Maternal Health
 Cooking Fuel, Housing, Sanitation, Maternal Health

Question-5:

- Years of Schooling, Maternal Health, School Attendance, Drinking Water
 Years of Schooling, Maternal Health, School Attendance, Drinking Water

Question-6:

- Maternal Health, School Attendance, Electricity, Child & Adolescent Mortality
 Maternal Health, School Attendance, Electricity, Child & Adolescent Mortality

Question-7:

- Maternal Health, Assets, Drinking Water, Child & Adolescent Mortality
 Maternal Health, Assets, Drinking Water, Child & Adolescent Mortality

Question-8:

- Cooking Fuel, Housing, School Attendance, Electricity
 Cooking Fuel, Housing, School Attendance, Electricity

Question-9:

- Nutritious Meal, Years of Schooling, Assets, Drinking Water
 Nutritious Meal, Years of Schooling, Assets, Drinking Water

Question-10:

- Nutritious Meal, Years of Schooling, Cooking Fuel, Housing
 Nutritious Meal, Years of Schooling, Cooking Fuel, Housing

Question-11:

- Nutritious Meal, Years of Schooling, Sanitation, Maternal Health
 Nutritious Meal, Years of Schooling, Sanitation, Maternal Health

Question-12:

- Nutritious Meal, Sanitation, School Attendance, Assets
 Nutritious Meal, Sanitation, School Attendance, Assets

Respondent - 2, 7, 12, 17, 22, ...**Question-1:**

- Maternal Health, School Attendance, Electricity, Child & Adolescent Mortality
 Maternal Health, School Attendance, Electricity, Child & Adolescent Mortality

Question-2:

- Nutritious Meal, Years of Schooling, Cooking Fuel, Housing
 Nutritious Meal, Years of Schooling, Cooking Fuel, Housing

Question-3:

- Nutritious Meal, Years of Schooling, Electricity, Child & Adolescent Mortality
 Nutritious Meal, Years of Schooling, Electricity, Child & Adolescent Mortality

Question-4:

- Housing, Sanitation, School Attendance, Drinking Water
 Housing, Sanitation, School Attendance, Drinking Water

Question-5:

- School Attendance, Drinking Water, Electricity, Child & Adolescent Mortality
 School Attendance, Drinking Water, Electricity, Child & Adolescent Mortality

Question-6:

- Nutritious Meal, Sanitation, School Attendance, Assets
 Nutritious Meal, Sanitation, School Attendance, Assets

Question-7:

- Cooking Fuel, Sanitation, Electricity, Child & Adolescent Mortality
 Cooking Fuel, Sanitation, Electricity, Child & Adolescent Mortality

Question-8:

Cooking Fuel, Housing, School Attendance, Electricity

Cooking Fuel, Housing, School Attendance, Electricity

Question-9:

Housing, Maternal Health, Assets, Child & Adolescent Mortality

Housing, Maternal Health, Assets, Child & Adolescent Mortality

Question-10:

Years of Schooling, Maternal Health, School Attendance, Drinking Water

Years of Schooling, Maternal Health, School Attendance, Drinking Water

Question-11:

Nutritious Meal, Years of Schooling, Sanitation, Maternal Health

Nutritious Meal, Years of Schooling, Sanitation, Maternal Health

Question-12:

Cooking Fuel, Housing, Sanitation, Maternal Health

Cooking Fuel, Housing, Sanitation, Maternal Health

Respondent - 3, 8, 13, 18, 23, ...**Question-1:**

Nutritious Meal, Years of Schooling, Assets, Drinking Water

Nutritious Meal, Years of Schooling, Assets, Drinking Water

Question-2:

Housing, Maternal Health, Assets, Child & Adolescent Mortality

Housing, Maternal Health, Assets, Child & Adolescent Mortality

Question-3:

Cooking Fuel, Assets, Drinking Water, Electricity

Cooking Fuel, Assets, Drinking Water, Electricity

Question-4:

Maternal Health, Assets, Drinking Water, Child & Adolescent Mortality

Maternal Health, Assets, Drinking Water, Child & Adolescent Mortality

Question-5:

Nutritious Meal, Years of Schooling, Cooking Fuel, Housing

Nutritious Meal, Years of Schooling, Cooking Fuel, Housing

Question-6:

Cooking Fuel, Sanitation, Electricity, Child & Adolescent Mortality

Cooking Fuel, Sanitation, Electricity, Child & Adolescent Mortality

Question-7:

School Attendance, Drinking Water, Electricity, Child & Adolescent Mortality

School Attendance, Drinking Water, Electricity, Child & Adolescent Mortality

Question-8:

Cooking Fuel, Housing, Sanitation, Maternal Health

Cooking Fuel, Housing, Sanitation, Maternal Health

Question-9:

Years of Schooling, Maternal Health, School Attendance, Drinking Water

Years of Schooling, Maternal Health, School Attendance, Drinking Water

Question-10:

Nutritious Meal, Years of Schooling, Electricity, Child & Adolescent Mortality

Nutritious Meal, Years of Schooling, Electricity, Child & Adolescent Mortality

Question-11:

Housing, Sanitation, School Attendance, Drinking Water

Housing, Sanitation, School Attendance, Drinking Water

Question-12:

Nutritious Meal, Years of Schooling, Sanitation, Maternal Health

Nutritious Meal, Years of Schooling, Sanitation, Maternal Health

Respondent - 4, 9, 14, 19, 24, ...**Question-1:**

Nutritious Meal, Sanitation, School Attendance, Assets

Nutritious Meal, Sanitation, School Attendance, Assets

Question-2:

Maternal Health, Assets, Drinking Water, Child & Adolescent Mortality

Maternal Health, Assets, Drinking Water, Child & Adolescent Mortality

Question-3:

Cooking Fuel, Housing, School Attendance, Electricity

Cooking Fuel, Housing, School Attendance, Electricity

Question-4:

Maternal Health, School Attendance, Electricity, Child & Adolescent Mortality

Maternal Health, School Attendance, Electricity, Child & Adolescent Mortality

Question-5:

Cooking Fuel, Assets, Drinking Water, Electricity

Cooking Fuel, Assets, Drinking Water, Electricity

Question-6:

Housing, Maternal Health, Assets, Child & Adolescent Mortality

Housing, Maternal Health, Assets, Child & Adolescent Mortality

Question-7:

Nutritious Meal, Years of Schooling, Electricity, Child & Adolescent Mortality

Nutritious Meal, Years of Schooling, Electricity, Child & Adolescent Mortality

Question-8:

- Nutritious Meal, Years of Schooling, Assets, Drinking Water
 Nutritious Meal, Years of Schooling, Assets, Drinking Water

Question-9:

- Nutritious Meal, Years of Schooling, Cooking Fuel, Housing
 Nutritious Meal, Years of Schooling, Cooking Fuel, Housing

Question-10:

- Years of Schooling, Maternal Health, School Attendance, Drinking Water
 Years of Schooling, Maternal Health, School Attendance, Drinking Water

Question-11:

- School Attendance, Drinking Water, Electricity, Child & Adolescent Mortality
 School Attendance, Drinking Water, Electricity, Child & Adolescent Mortality

Question-12:

- Cooking Fuel, Sanitation, Electricity, Child & Adolescent Mortality
 Cooking Fuel, Sanitation, Electricity, Child & Adolescent Mortality

Respondent - 5, 10, 15, 20, 25, ...**Question-1:**

- Nutritious Meal, Years of Schooling, Sanitation, Maternal Health
 Nutritious Meal, Years of Schooling, Sanitation, Maternal Health

Question-2:

- Housing, Sanitation, School Attendance, Drinking Water
 Housing, Sanitation, School Attendance, Drinking Water

Question-3:

- Cooking Fuel, Housing, Sanitation, Maternal Health
 Cooking Fuel, Housing, Sanitation, Maternal Health

Question-4:

- School Attendance, Drinking Water, Electricity, Child & Adolescent Mortality
 School Attendance, Drinking Water, Electricity, Child & Adolescent Mortality

Question-5:

- Nutritious Meal, Years of Schooling, Electricity, Child & Adolescent Mortality
 Nutritious Meal, Years of Schooling, Electricity, Child & Adolescent Mortality

Question-6:

- Maternal Health, School Attendance, Electricity, Child & Adolescent Mortality
 Maternal Health, School Attendance, Electricity, Child & Adolescent Mortality

Question-7:

Cooking Fuel, Housing, School Attendance, Electricity

Cooking Fuel, Housing, School Attendance, Electricity

Question-8:

Nutritious Meal, Years of Schooling, Assets, Drinking Water

Nutritious Meal, Years of Schooling, Assets, Drinking Water

Question-9:

Cooking Fuel, Sanitation, Electricity, Child & Adolescent Mortality

Cooking Fuel, Sanitation, Electricity, Child & Adolescent Mortality

Question-10:

Cooking Fuel, Assets, Drinking Water, Electricity

Cooking Fuel, Assets, Drinking Water, Electricity

Question-11:

Maternal Health, Assets, Drinking Water, Child & Adolescent Mortality

Maternal Health, Assets, Drinking Water, Child & Adolescent Mortality

Question-12:

Nutritious Meal, Sanitation, School Attendance, Assets

Nutritious Meal, Sanitation, School Attendance, Assets

SECTION 3: Perturbation Performance (বিচুতি)

Whom of the following will you consider to be NOT poor? More than one option can be selected.

(কোন ব্যক্তিকে আপনি অভাবী **বলবেন না**? একাধিক বিকল্প বেছে নিতে পারেন)

1. Education (শিক্ষা)

- A) Attended school upto class 8 (অষ্টম শ্রেণী পর্যন্ত বিদ্যালয়ে পড়েছেন)
- B) Attended school upto class 10 (দশম শ্রেণী পর্যন্ত বিদ্যালয়ে পড়েছেন)
- C) Attended school upto class 12 (দ্বাদশ শ্রেণী পর্যন্ত বিদ্যালয়ে পড়েছেন)
- D) Graduated (স্নাতক)

2. Nutrition (পুষ্টি)

- A) Get food only once in a day (দিনে ১ বার খাদ্য জোগাড় করতে সক্ষম)
- B) Get food twice in a day (দিনে ২ বার খাদ্য জোগাড় করতে সক্ষম)
- C) Get food thrice in a day (দিনে ৩ বার খাদ্য জোগাড় করতে সক্ষম)
- D) Get food four times in a day (দিনে ৪ বার খাদ্য জোগাড় করতে সক্ষম)

3. Housing (বাসস্থান)

- A) Has no shelter (আধিক্যহীন)
- B) Living in a sustainable kaccha house (টেকসই মাটির বাড়িতে বাস করেন)
- C) Living in an unsustainable pucca house (জীর্ণ পাকা বাড়িতে বাস করেন)
- D) Living in a little less secured tenant, but a sustainable pucca house
(পাকা বাড়িতে ভাড়াচিয়া হিসাবে বাস করেন)

4. Assets (সম্পদ)

- A) Has neither TV nor telephone nor computer (টিভি, টেলিফোন কম্পিউটার একটিও নেই)
- B) Has telephone but neither TV nor computer (টেলিফোন আছে কিন্তু টিভি বা কম্পিউটার নেই)
- C) Has TV, telephone but not computer (টিভি, টেলিফোন আছে কিন্তু কম্পিউটার নেই)
- D) Has Telephone, computer but not TV (টেলিফোন, কম্পিউটার আছে কিন্তু টিভি নেই)

5. Health (স্বাস্থ্য)

- A) Neither there is any nearby health center, nor has money to afford medicines
(নিকটবর্তী স্বাস্থ্যকেন্দ্র নেই, ঔষধ ক্রয় করার অর্থ নেই)
- B) Nearby health center is not available but has money to afford medicines
(নিকটবর্তী স্বাস্থ্যকেন্দ্র নেই, ঔষধ ক্রয় করার অর্থ আছে)
- C) There are nearby health center(s) but cannot afford medicines
(নিকটবর্তী স্বাস্থ্যকেন্দ্র আছে, ঔষধ ক্রয় করার অর্থ নেই)
- D) There are nearby health center(s) and can afford medicines
(নিকটবর্তী স্বাস্থ্যকেন্দ্র আছে, ঔষধ ক্রয় করার অর্থ আছে)

6. Drinking Water (পানীয় জল)

- A) Has to walk more than 30 minutes for getting water.
(আধঘন্টার বেশি হেঁটে জল আনতে হয়)
- B) Has to walk less than 30 minutes for getting water.
(আধঘন্টার কম হেঁটে জল আনতে হয়)
- C) Has water connection in the household but does not get adequate water.
(বাড়িতে পানীয় জল আসে কিন্তু পর্যাপ্ত পরিমাণে নয়)

D) Has water connection in the household and gets adequate water
(বাড়িতে পর্যাপ্ত পরিমাণে পানীয় জল আসে)

SECTION 4: Additional Questions (অতিরিক্ত প্রশ্নাবলী)

1. Do you believe a person without Bank Account be considered as a poor? Yes No
(মনে করুন এক ব্যক্তির ব্যাঙ্ক অ্যাকাউন্ট নেই। তাকে কি অভাবী বলা উচিত?)
2. Should a person without access to internet be considered as a poor? Yes No
(মনে করুন এক ব্যক্তির ইন্টারনেট সংযোগ নেই। তাকে কি অভাবী বলা উচিত?)
3. What should be the distribution of Leisure time, Paid work time and unpaid work time in a day to have a good standard of living?
(সঠিক জীবন্যাভাব মান অনুযায়ী দৈনন্দিন জীবনে অবসর সময়, বৈতনিক কাজের সময় ও অবৈতনিক কাজের সময় কীভাবে বণ্টন করা উচিত?)

SECTION 5: For Surveyor Use Only

1. What do you consider about the unit surveyed? Poor Not Poor
2. Why do you think so? _____
3. Where is the household located? (Eg. Near ISI, Near Dunlop, etc.)

4. What do you think about the locality? Poor Not Poor
5. Any lacking/deficiency in the locality?
(Eg. Too much in the Interior, Very remote, Lives near large drainage, etc)

SECTION 6: Sampling Guidelines

1. For the Section 2, if a surveyor/group is asking the questions to the respondents then the 1st respondent should be asked the questions under first set, 2nd respondent should be asked questions under second set, .., 6th respondent will be asked questions under first set and so on..
2. Choose a knowledgeable person in the region (E.g. Tea Seller, Auto, Post Office, Police Station, Locals) about the various classes of people (poor, middle class and rich) living in that locality and which area corresponds to whom.
3. Go to each of these areas and collect sample from household.
4. Each household sampled should be around 20 households apart. (You can follow the right hand rule i.e. keep on selecting households to the right of the first randomly chosen household)
5. When you have a considerable amount of data from that region (say the poor man's locality). Move to the next region (say the middle class man's locality)

6. Each surveyor should collect data from 10 person from the region assigned to him.

7. Surveyors should make groups of size 2-3.

SECTION 7: Note for Surveyor

1. Introduce yourself properly and mention the college name. Say briefly a one line Moto of the survey and the survey title. Establish Rapport.

2. Ask the questions at a moderate pace and make sure the respondent understands them clearly.

3. Emphasis on the fact that the respondents decision should be his own local perspective and not what the perspective of the entire nation/state should be.

4. Use consistent notation (Specially with tick marks - you may use P for Poor and NP for Not Poor to prevent confusion later)

5. Fill the post survey portion (Section 5) after taking data from a unit. Brief answers would do.

SECTION 8: Sample Questions

Section 2:

Housing, Sanitation, School Attendance, Drinking Water

Housing, Sanitation, School Attendance, Drinking Water

Out of 4 things - Housing, Sanitation, School Attendance and Drinking water if the 1st person does not have a proper sanitation facility available and is not able to send his children to school whereas the other person does not have proper housing and is not able to send his children to school. Who do you think is poorer?

(৪টি জিনিসের মধ্যে - বাসস্থান, পরিচ্ছন্নতা, সন্তানের বিদ্যালয়ে যাওয়া এবং পানীয় জল। যদি প্রথম ব্যক্তির কাছে সঠিক পরিচ্ছন্নতা সুবিধা না থাকে এবং সে তার সন্তানদের স্কুলে পাঠ্টাতে সক্ষম না হয় যখনে অন্য ব্যক্তির কাছে সঠিক বাসস্থান না থাকে এবং সে সক্ষম না হয় তার সন্তানদের স্কুলে পাঠ্টান। আপনি কাকে গরীব মনে করেন?)

Nutritious Meal, Years of Schooling, Sanitation, Maternal Health

Nutritious Meal, Years of Schooling, Sanitation, Maternal Health

Out of 4 things - Nutritious Meal, Years of Schooling, Sanitation and Maternal Health if the 1st person only gets proper nutritious meals daily but does not have the remaining whereas the other person has only proper sanitation facility available but does not have the remaining. Who do you think is poorer?

(৪টি জিনিসের মধ্যে - পুষ্টিকর খাবার পাওয়া, সন্তানের বিদ্যালয়ে যাওয়া, পরিচ্ছন্নতা এবং মাতৃস্বাস্থ্য। যদি প্রথম ব্যক্তি শুধুমাত্র প্রতিদিন সঠিক পুষ্টিকর খাবার পায় কিন্তু বাকি তিনটি নেই যখনে অন্য ব্যক্তির শুধুমাত্র সঠিক পরিচ্ছন্নতা সুবিধা পায় কিন্তু কিন্তু বাকি তিনটি নেই। আপনি কাকে গরীব মনে করেন?)

Section 3:

1. Education (শিক্ষা)

A) Attended school upto class 8 (অষ্টম শ্রেণী পর্যন্ত বিদ্যালয়ে পড়েছেন)

B) Attended school upto class 10 (দশম শ্রেণী পর্যন্ত বিদ্যালয়ে পড়েছেন)

C) Attended school upto class 12 (দ্বাদশ শ্রেণী পর্যন্ত বিদ্যালয়ে পড়েছেন)

D) Graduated (ন্যাতক)

Out of these 4 persons - one did his education till class 8, another till class 10, another till class 12 and yet another till graduation. Who all will you think are not poor?

(এই 4 জনের মধ্যে একজন - 8 শ্রেণী পর্যন্ত, একজন 10 শ্রেণী পর্যন্ত, একজন 12 শ্রেণী পর্যন্ত এবং আরেকজন ন্যাতক পর্যন্ত পোরাশোনা করেছেন। কাকে কাকে আপনী গরীব ভাববেন না)

Section 4: Mentioned there

APPENDIX: Bengali Translation and Indicator Details

1. Nutritious Meal - পুষ্টিকর খাদ্য
2. Sanitation - পরিচ্ছন্নতা/ স্বাস্থ্যবিধি
3. Housing - বাসস্থান
4. Cooking Fuel - রান্নার জ্বালানি
5. School Attendance - সন্তানের বিদ্যালয়ে যাওয়া
6. Years of Schooling - পরিবারে অন্তত একজন শিক্ষিত ব্যক্তি
7. Child & Adolescent Mortality - শিশু ও কিশোর মৃত্যু
8. Drinking Water - পানীয় জল
9. Electricity - বিদ্যুত সংযোগ
10. Bank Account - ব্যাঙ্ক অ্যাকাউন্ট
11. Maternal Health - মাতৃস্বাস্থ্য/নারী স্বাস্থ্য
12. Assets - সম্পত্তি

Definition of Indicators:

Health	Nutrition	An adult under 70 years of age or a child is undernourished.	1/6
	Child mortality	Any child under the age of 18 years has died in the five years preceding the survey.	1/6
Education	Years of schooling	No household member aged 10 years or older has completed six years of schooling.	1/6
	School attendance	Any school-aged child is not attending school up to the age at which he/she would complete class 8.	1/6
Standard of living	Cooking Fuel	The household cooks with dung, wood, charcoal or coal.	1/18
	Sanitation	The household's sanitation facility is not improved (according to SDG guidelines) or it is improved but shared with other households.	1/18
	Drinking Water	The household does not have access to improved drinking water (according to SDG guidelines) or safe drinking water is at least a 30-minute walk from home, round trip.	1/18
	Electricity	The household has no electricity.	1/18
	Housing	Housing materials for at least one of roof, walls and floor are inadequate: the floor is of natural materials and/or the roof and/or walls are of natural or rudimentary materials.	1/18
	Assets	The household does not own more than one of these assets: radio, TV, telephone, computer, animal cart, bicycle, motorbike or refrigerator, and does not own a car or truck.	1/18

Antenatal care/Maternal Health: A household is deprived if any woman in the household who has given birth in the last 5 years preceding the survey, has not received at least 4 antenatal care visits for the most recent birth, or has not received assistance from trained skilled medical personnel during the most recent childbirth.

Bank Account: No household member has a bank account or a post office account.

Environmental impact: Unable to protect from environmental risk (like flood, hurricane, extreme weather, climate change, etc.), and/ or working in a risky/life threatening job.

Social security: Uncovered under any social protection scheme.

Note: Years of Schooling and Having educated family members are same.

School Attendance and child goes to school are same.

3.2 Survey Plan

It was decided unanimously that Kolkata and neighbouring regions would be covered in the survey. However, the scope could not be made too large due to the time and the budget constraints. Moreover, it was seen that cities, in particular regions close to Kolkata, would provide us with only a particular socio-economic strata of the society as respondents. To bring about homogeneity in the respondents, it was finally decided that the entire batch of 40 students break into groups of 3-4 and conduct surveys in parts of West Bengal such as Bonhoogly, Saltlake, Park Circus & Topsia, Barasat, Bongaon, Paschim Midnapore.

3.3 Survey Technique

Some personal details of the respondent, including age, gender, profession, educational qualification were collected initially for future analysis. The respondent was assured verbally that the responses would be solely used for research purposes and that the individual identities of the respondents would not be disclosed anywhere. It was conveyed to the respondent that if, at any instant, they felt uncomfortable answering the questions, they could choose to skip the question or even leave answering the questions altogether. An estimated time of 15 minutes was requested from the respondent for answering the complete set of questions. With the consent of the respondent, the survey was initiated. The respondents were asked the questions mostly in Bengali or Hindi or English based on the comfortability of the respondent.

For the first section, the respondent was shown the questions, one by one. The terminologies were explained slowly and clearly to the respondent. Then the respondent was asked to pick the partial profile in each choice set which seemed to depict a comparatively poor condition. The second section began after the first one, and respondents were made aware of the fact that they could choose multiple options. If some time was still left or the respondent showed keen interest in answering the questions, the questions in the final section were asked to them.

After cleaning the data collected, we were left with 271 data points, with which we decided to continue further analysis.

4 Visualisation

4.1 Perception across Gender

For a better depiction of our data, some plots have been constructed to see how the importance of poverty indicators change across genders. Selecting a specific subgroup (male, female, or both), we first considered an indicator (nutritious meal, sanitation,...etc) and went over all the questions where this indicator changed sign (in one option it was present, and in another, it was not). Then we counted the percentage of the questions where the option of the presence of the indicator was chosen. We calculated the percentages of all the indicators and made these pie charts.

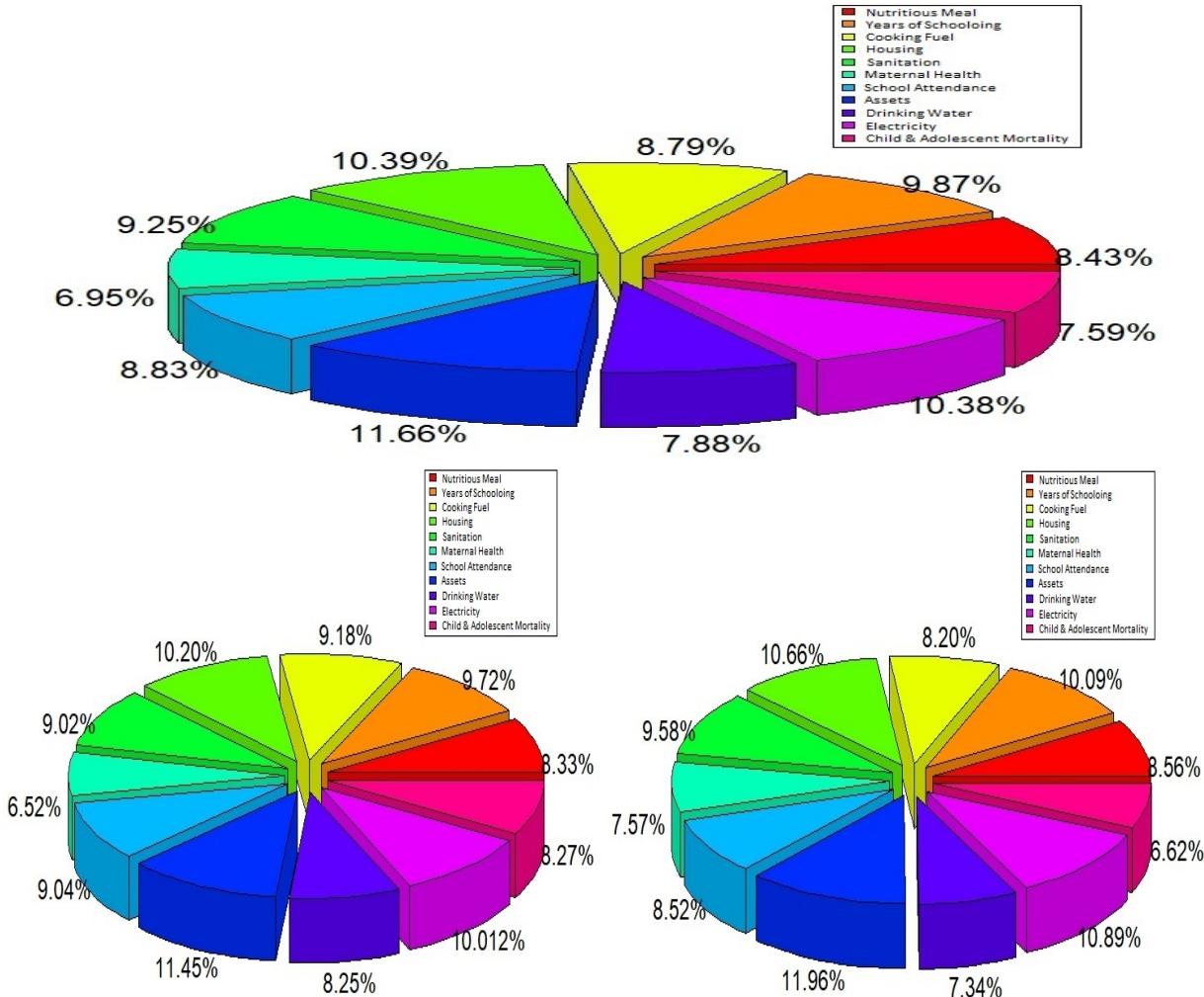


Figure 2: Percentages of selection of indicators for (a)both (b)male (c)female genders

These pie charts show the percentage of men/women/both who choose each comparison option. Fewer choices for a certain indicator means that more people think that it is more important in describing “poverty” level of an individual.

For example, **Assets** seem to be the least important feature in describing a person “poor”. A person with more assets is believed to be poor by most of people.

Children and Adolescent Mortality is the most important feature according to women to describe “poverty”, whereas according to men, **Maternal Health** is the most important feature to describe “poverty”. It means, the

more the presence of this feature, less likely the person is to be considered "*poor*".

Now we measure the change in perception across gender for pairs of indicators, i.e. we want to see if there are indicators A and B such that males find A to be the more important poverty indicator, however, the scenario changes for females. Contrary to the first method, we went over those questions where both the indicators of a predetermined pair changed signs and calculated the proportion of questions where the first one was selected over the second(as an answer to who is poorer). We overlapped stacked bar plots of more than one pair of indicators. We did it for both genders(160 Males and 111 Females).

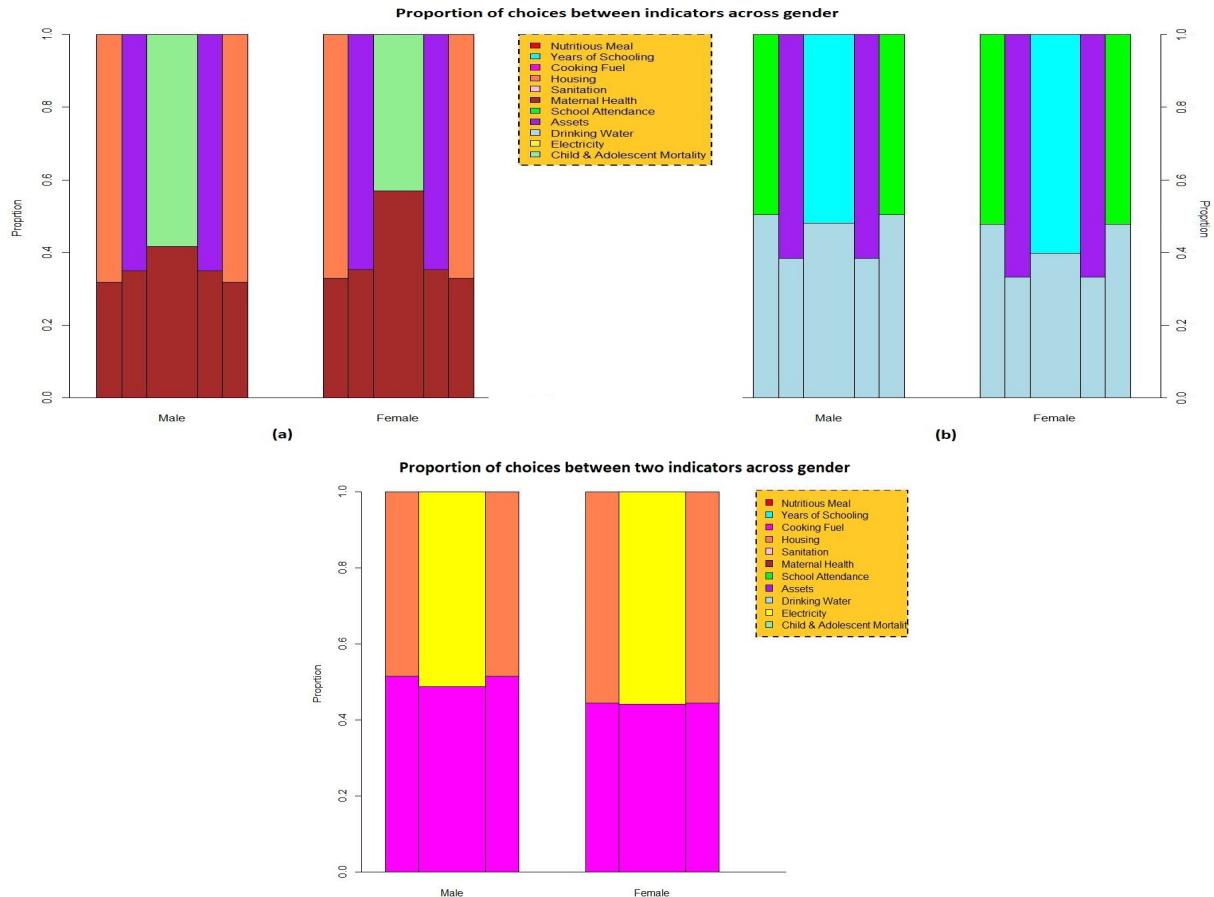


Figure 3: Change in perception across gender for (a) Maternal Health VS Child Mortality, Asset, Housing; (b) Drinking water VS Years of Schooling, Assets, School Attendance; (c) Cooking Fuel VS Electricity, Housing;

The pair which saw the highest change in proportion of choosing is the Maternal Health VS Child Mortality pair. 58.27% males consider lack of maternal health as a bigger indicator than child mortality, where the perception of females is different(43.02%).

When we compared drinking water across other indicators, we found the comparison with 'Years of Schooling' indicator to be the most volatile pair. Women considered lack of drinking water to be a better indicator(60.23% female considers lack of drinking water makes one poor) than schooling years more than that of males(51.85% male considers lack of water as an indication of poverty). However, both the groups consider lack of drinking water as the better indicator of poverty than schooling years.

From Figure 3:(c), we see 51.51% male considers lack of housing to be the better poverty indicator than cooking fuel, whereas females gave more priority to cooking fuel(55.56%)

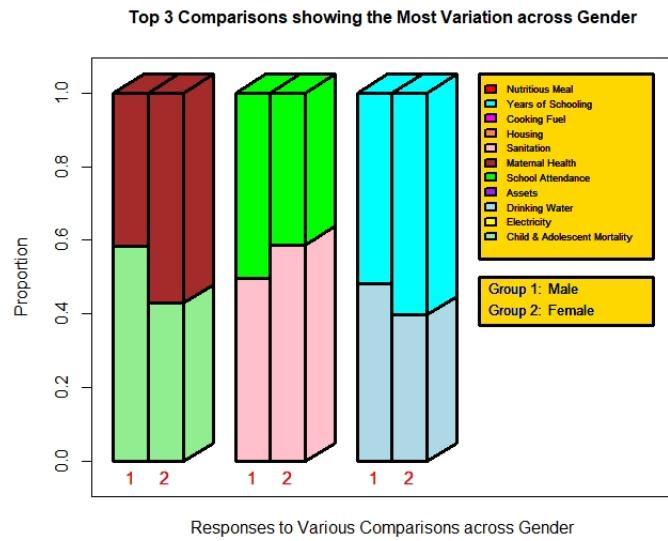


Figure 4: Pairs with the highest difference in male and female perspective

However, in majority of the pairs, the perception of poverty through those pairs are unaltered in both genders; and there was hardly any huge bias (< 30% or > 70% of any group chose one indicator against another) noticed among any pair.

4.2 Perception across Professions

Since the original data had too many professions, we grouped them into 6 broad categories; viz, “businessman”(38), “govt employee”(28), “private employee”(50), “self-employed”(78), “student”(21) and “unemployed”(56). Just like for perception across gender, we have used the same methods and plots to visualize the perception across professions.

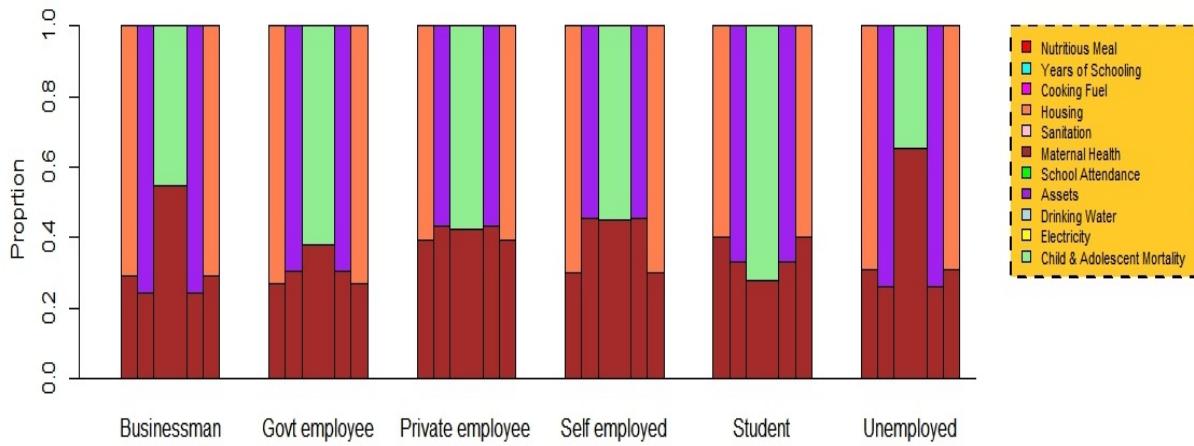


Figure 5: Change in perception across professions for Maternal Health VS Child Mortality, Asset, Housing

Employees (govt, private or self) and students consider maternal health to be the better indicator, however, this

perspective is different for businessmen and unemployed who favored Child Health as the more important indicator.

A merging of categories into employed (businessman, govt., private, self) and unemployed (unemployed and student) presents the following scenario:

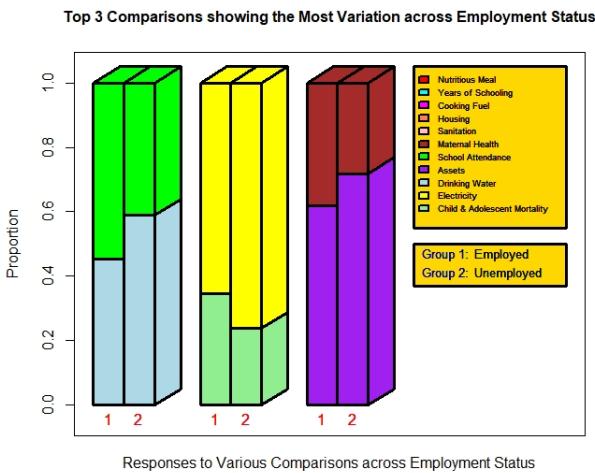


Figure 6: Pairs of indicators capturing the most prominent changes in perception across employment status

It is seen that **people without jobs stressed more on the health indicators**, however, they also prioritized school attendance over drinking water, which can be driven by the fact that the unemployed people missed that opportunity in their childhood, leading to their rueing of the same in their current condition.

We now take a look at a plot where the categories are not merged:

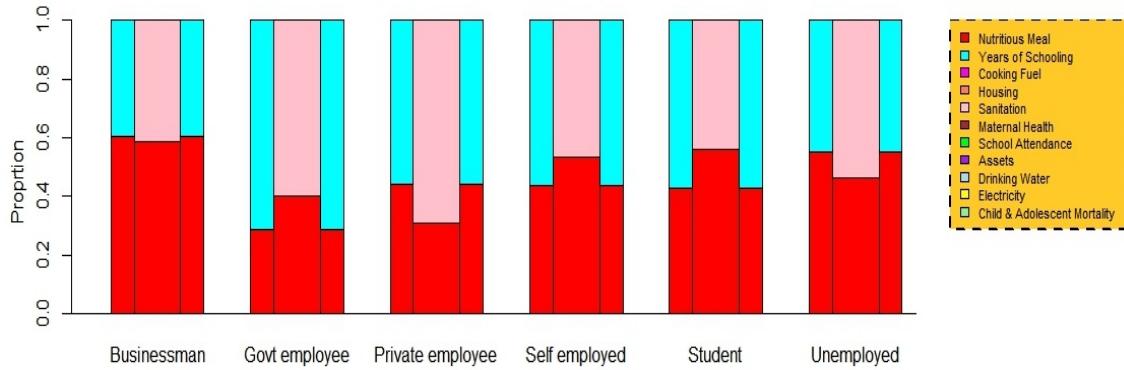


Figure 7: Change in perception across professions for Nutritious Meal VS Sanitation, Years of Schooling

A probable reason behind the change in perspective between businessman/ unemployed and others over this pair is that most of them grow up in an environment where there are enough resources to lead a healthy lifestyle, so they are lesser focused on survival indicators (like drinking water, health, meal,...etc). The same effect can be seen here. Businessmen gave more importance to items like sanitation and education, which are secondary when compared to food and shelter. In their perspective, elements like food do not play that much of a key role in economic upliftment.

Though private employees give equal weightage to assets and drinking water but all other sector gives importance to drinking water. Govt employees and private employees don't see years of schooling and school attendance as same

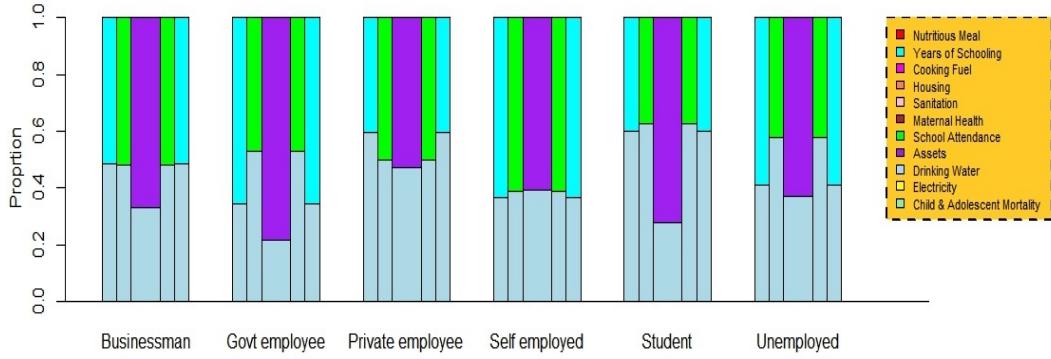


Figure 8: Change in perception across professions for Drinking Water VS Asset, School Attendance, Years of Schooling

but other see them as same but an interesting thing to see here is unemployed school attendance is less important but years of schooling is more important wrt to drinking water.

4.3 Perception across Education Status

Similar to the previous two sections here we try to understand how perception changes across education status. Now, education, like profession, had multiple levels, viz. “Below 10th”, “10th pass”, “12th pass”, “Graduate”, “Post-graduate”, “PhD.” We could have presented a plot to show how perception changes across these 6 levels, but owing to the dearth of a substantial number of respondents in each category, we did so after dichotomizing the levels as “Till School Level” and “Beyond School”. The first three levels contributed to “Till School Level” and the remaining three contributed to “Beyond School”.

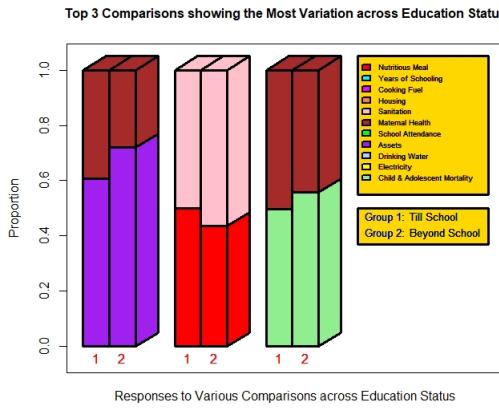


Figure 9: Pairs of indicators capturing the most prominent changes in perception across education status

It is seen that a comparison between indicators “Assets” vs “Maternal Health” marks the most drastic change in response as we change the employment status. The two pairs of indicators following this are “Nutritious Meal” vs “Sanitation” and “Child & Adolescent Mortality” vs “Maternal Health”. The plot shows that **people with education beyond school level are more likely to stress upon health**.

In all the three above sections, it was mainly seen that when confronted with questions concerning comparison

between a health indicator and an indicator like “Electricity”, “Housing” or “Asset”, most people chose the health indicator to be the more important of the two.

4.4 Perturbation Performance

4.4.1 Water Availability

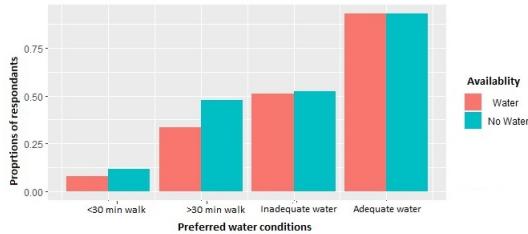


Figure 10: Proportion of preference of Water availability to be not poor by people with and without water availability

This bar chart shows the proportion of people with and without water shortage, with each bar representing one individual's opinion on different types of water access a person needs to be deemed "not poor."

It shows that those who live in areas of water scarcity are more likely to believe that any threshold level of water availability is necessary to break out of the lowest socioeconomic group.

It is easy to understand how this may happen; after all, people often assume that access to resources that aren't available would improve their quality of life.

4.4.2 Housing Availability

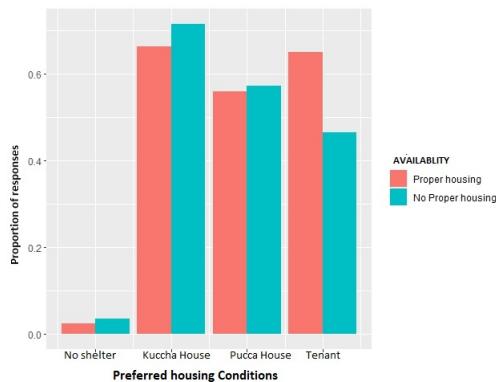


Figure 11: Proportion of preference of housing availability to be not poor by people with/without proper housing

Figure 11 is a bar chart that compares the proportion of people in each group (proper housing and not proper housing conditions) whose view is based on their access to the types of housing they think are required to live a happy life.

The majority of people with proper housing believe that people with good kuccha houses as well as those who leave on rent are not poor whereas people with improper housing seem to have a thought that tenants are poor so they leave on rent as they do not have enough money to be rich.

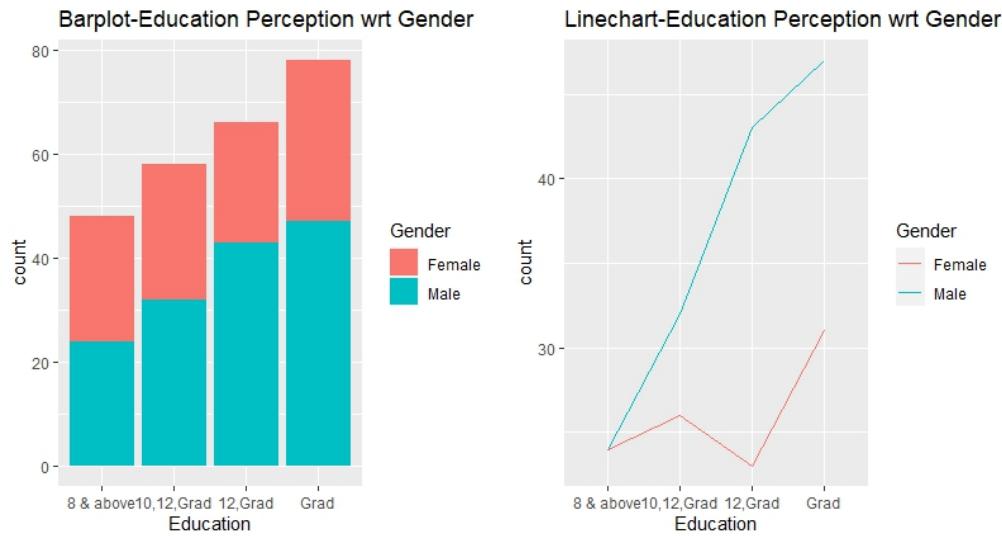


Figure 12: Perception across gender w.r.t. Education

4.5 Perception across Gender w.r.t. Perturbation

We have made some plots to see the perception in perturbation across gender.

In 12 both females and males have the highest proportion in the perception that graduates are only considered to be educated. However, 2nd highest proportion of males think that 12th pass and graduates can be considered to be educated, but the least proportion of females think like that. 2nd highest proportion of females thinks that 10th pass, 12th pass, and graduates can be considered to be educated.

In 13 both Males and females have the highest proportion in the perception that people getting food 3 and 4 times have good nutrition, 2nd highest proportion in the perception that people getting food 2,3 and 4 times have good nutrition, 3rd highest proportion in the perception that people getting food 4 times have good nutrition and least proportion in the perception that people getting food all times have good nutrition.

In 14 Males have highest proportion in the perception that people living in a sustainable and unsustainable kuccha house have better housing, whereas females have highest proportion in the perception that people living in a sustainable and unsustainable kuccha house and a less secured tenant but a sustainable pucca house have better housing. All the other perceptions have more or less same proportion.

In 15 Males have highest proportion in the perception that people not having only tv and only computer and not having only tv or only computer or having telephone have better assets, whereas females have highest proportion in only this perception that people not having only tv or only computer or having telephone have better assets. All the other perceptions have more or less same proportion.

In 16 Males and females have overall same perception about health, with the highest proportion of people having money to afford medicine having better health and least proportion with all possible combinations having good health.

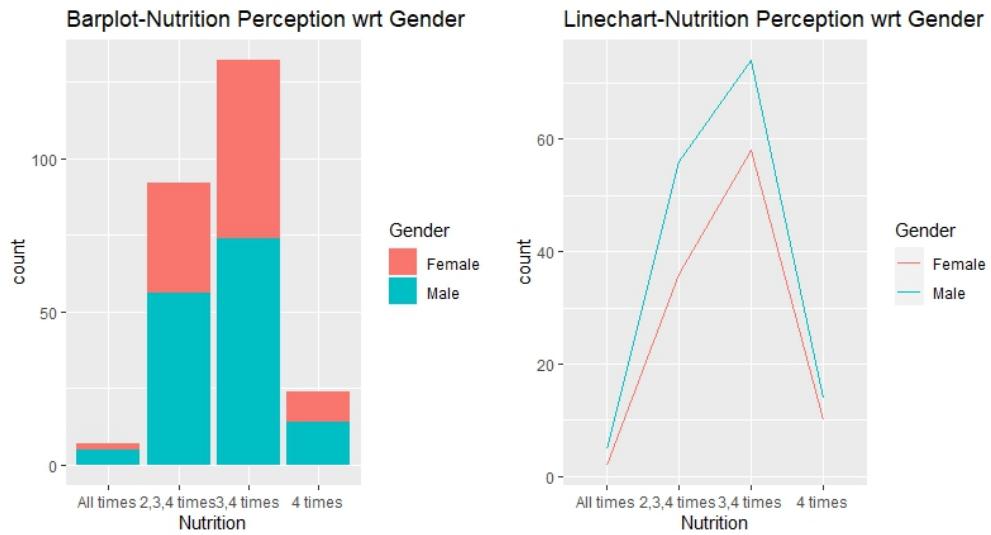


Figure 13: Perception across gender w.r.t. Nutrition

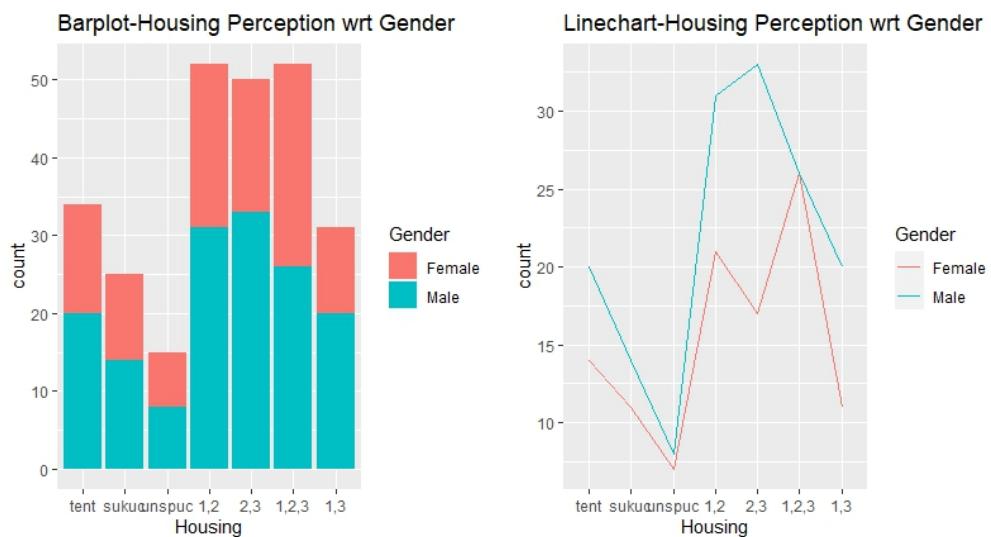


Figure 14: Perception across gender w.r.t. Housing

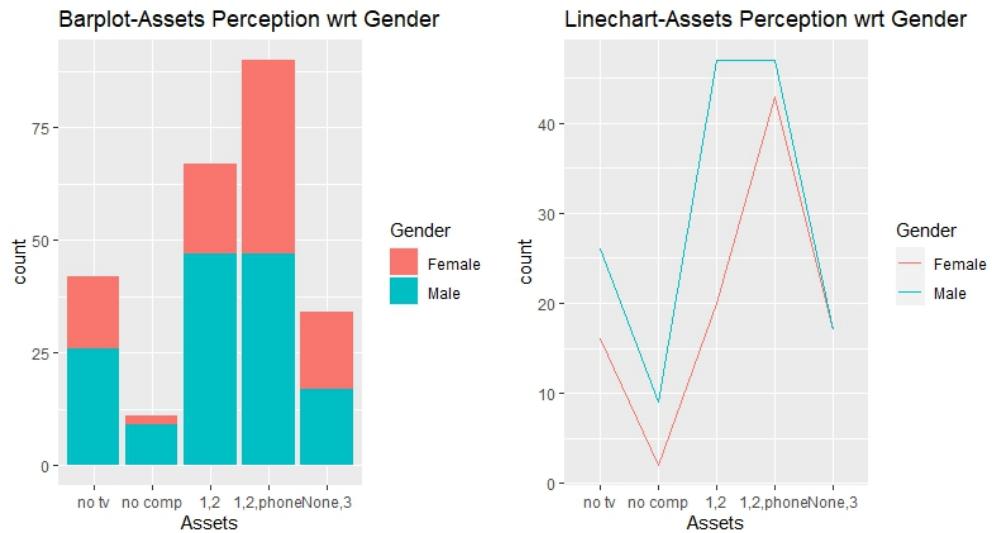


Figure 15: Perception across gender w.r.t. Assets

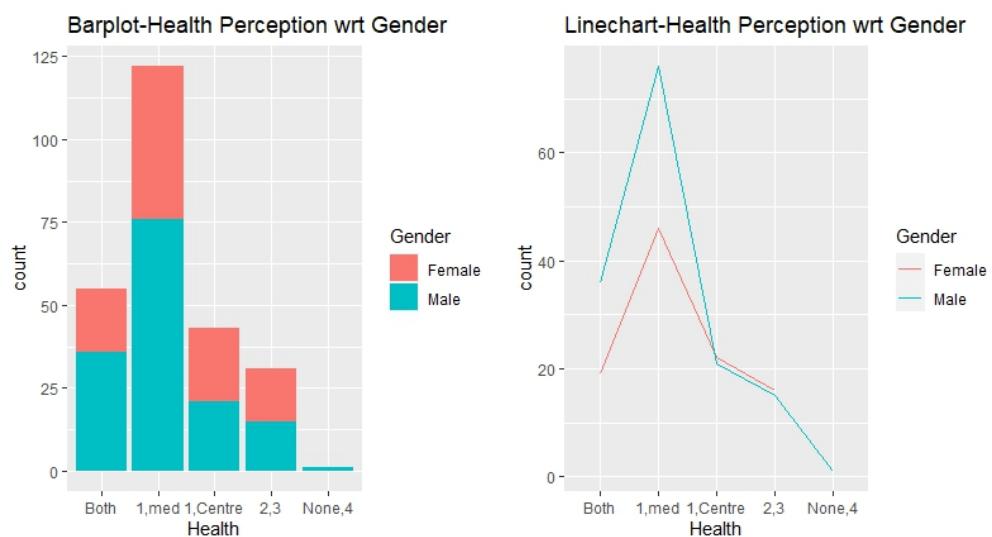


Figure 16: Perception across gender w.r.t. Health

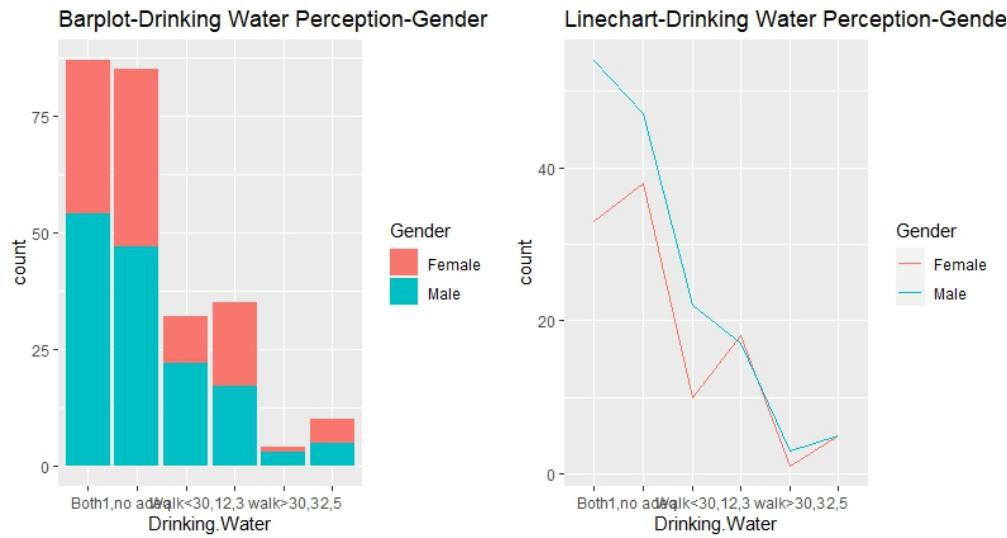


Figure 17: Perception across gender w.r.t. Drinking Water

In 17 Males have highest proportion in the perception that people having water connection in the household and getting adequate water are having better drinking water resources, whereas females have highest proportion in the perception that people having water connection in the household having better drinking water resources. For other proportion of males and females are same almost.

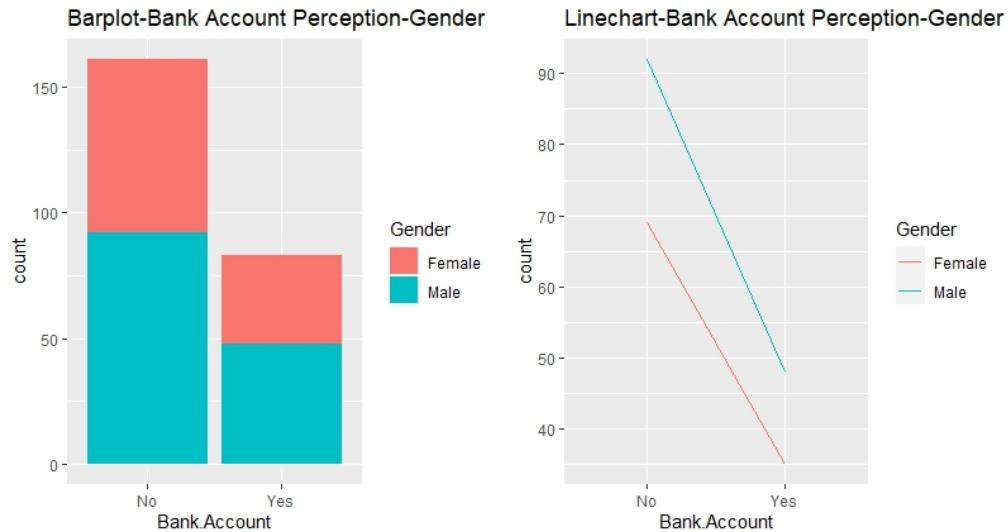


Figure 18: Perception across gender w.r.t. Bank Account

In 18 Both males and females in higher proportion think having no bank account doesn't mean that the person is poor.

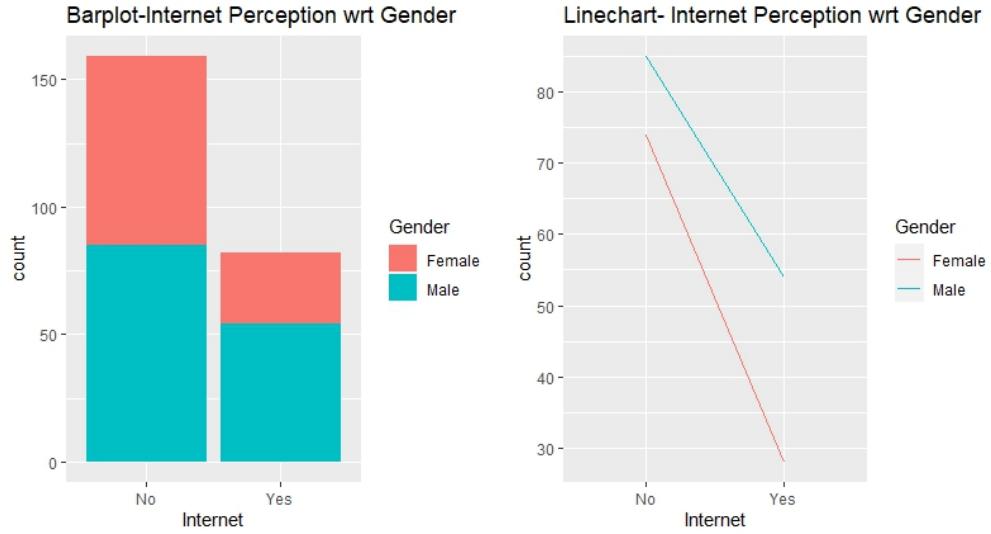


Figure 19: Perception across gender w.r.t. Internet

In 19 Both males and females in higher proportion think having no internet doesn't mean that the person is poor.

4.6 Perception across Education Status w.r.t. Perturbation

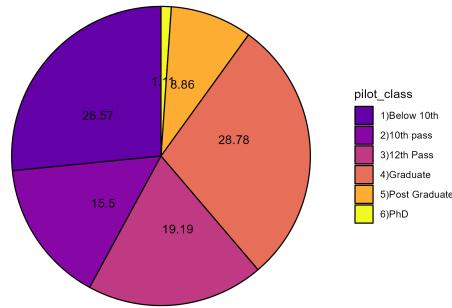


Figure 20: Population Divided in Terms of Education Status

The stacked barplots and stacked percent barplots of perturbation attributes with respondent education status has been shown in Figure 21. The attributes discussed are "Minimum Education", "Minimum Nutrition", "Adequate Healthcare", "Adequate Housing", "Adequate Drinking Water" and "Adequate Assets". We have divided the population into 6 educational levels- "Below 10th", "10th pass", "12th pass", "Graduate", "Post Graduate", "PhD". A pie chart showing the representation of the groups in our sample is given in Figure 20. Only 3 people in the sample had a PhD. The other educational groups are adequately represented in the sample.

For the attributes, "Adequate Healthcare", "Adequate Housing", "Adequate Drinking Water" and "Adequate Assets", the respondents were asked to choose from the 4 options provided, which they judged as "not poor" or "adequate". Note that there was no clear order of preference in the options. Stacked bar plots instead of percent stacked

bar plots have been used to summarise the choices owing to the fact that respondents chose multiple options.

The plots in Figure 21 suggest that for "Adequate Assets", "Adequate Drinking Water", "Adequate Healthcare", there is no significant variation in opinion with education status. In "Adequate Housing", an interesting pattern was observed. The respondents on the first two levels of education seemed to prefer a sustainable kuccha house or an unsustainable pucca house, over a rented sustainable pucca house with less security. But, for the more educated respondents the latter seemed to be more agreeable.

For "Minimum Education" and "Minimum Nutrition", stacked percent barplots have been used. In these attributes, there is a clear order of preference in the levels. So, the respondents could choose only one of these levels. Each of the 6 bars represents the breakdown of opinions, in percentage, in the respective educational groups. For minimum nutrition, all the groups almost unanimously agreed on 2 or 3 meals being sufficient. The plot for minimum education showed more variation. In all the groups except PhD holders, a significant portion believed that a person's education was adequate even if he only studied up to class 8. As education status increased, percentage of people who believed "10th pass" to be adequate declined. Also, with increase in education status, "Graduate" and "12th Pass" began to dominate, showing a greater emphasis on higher secondary education in the more educated groups.

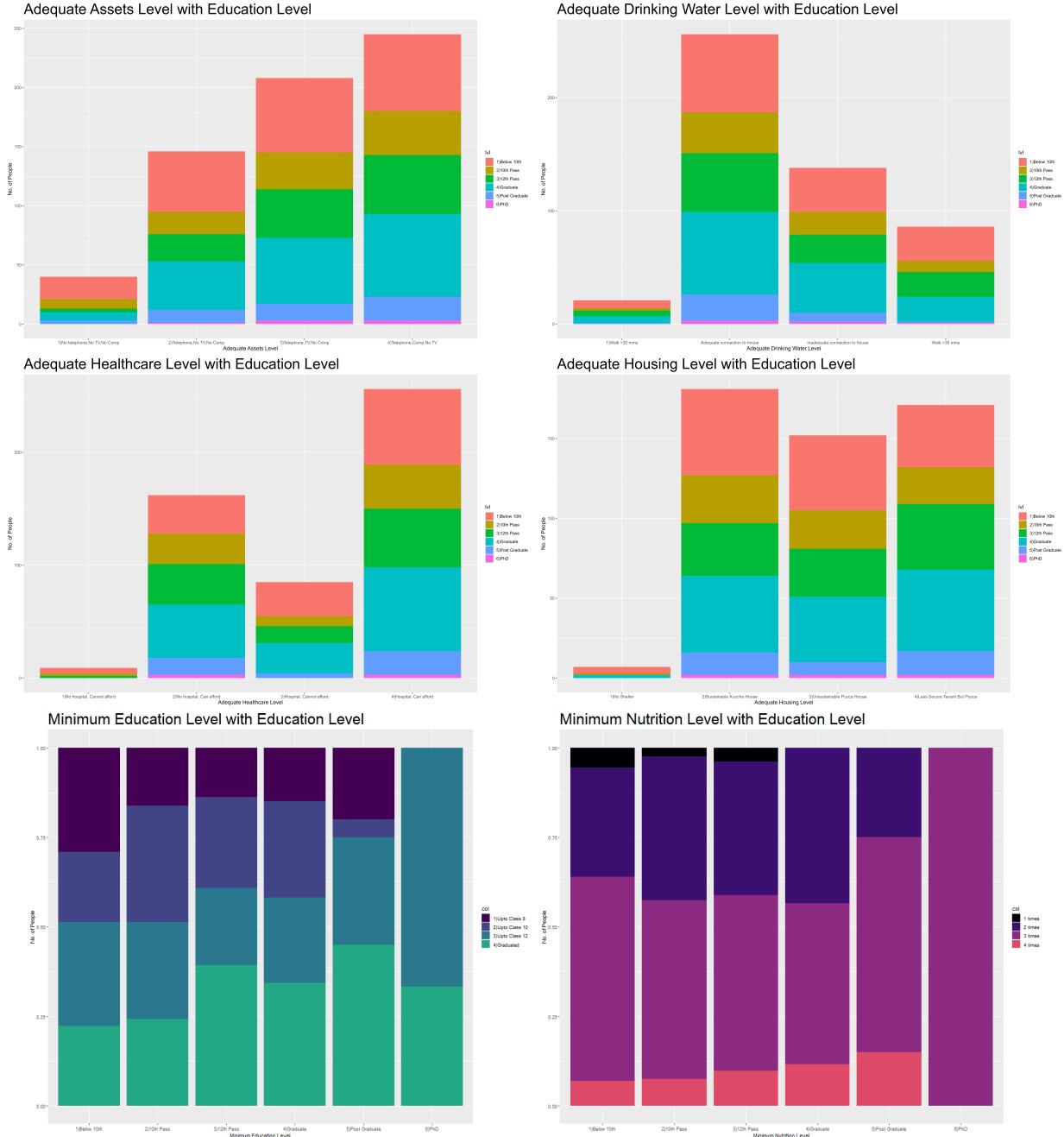


Figure 21: Perception across Education w.r.t perturbation

The opinions on adequate leisure, paid and non-paid working times have been summarised by ridgeline plots in Figure 22. The plots consist of stacked density estimates of the x-variable in the respective groups. The estimates have been made with constant bandwidths. Also, the groups "PhD" and "Post Graduate" have been merged as there were only 3 PhD holders in the sample and the density estimates would have been less informative.

For paid working time, all the educational groups have a sharp peak at around 7-8 hours. However the variation increases in less educated groups, and more higher time values are observed. So, while the common consensus seemed to be at 7-8 hours a day, the less educated groups had more people, believing that working more than 10

hours a day is reasonable.

For non-paid working time, in all educational groups except "Below 10th", a peak was observed at around 5 hours a day. For the "Below 10th" group, a "plateau-like" plot was observed from 1 hour to 8 hours.

For leisure time, most people seemed to be content with around 8 hours a day, including sleep. More variation was observed in the group "12th Pass", and surprisingly low values were observed. A significant portion was content with less than 5 hours a day of leisure, including sleep.

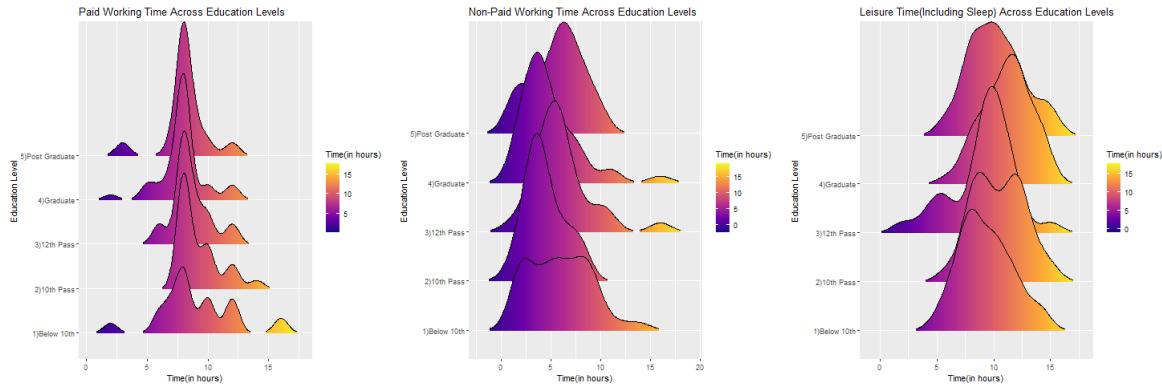


Figure 22: Paid, Non-paid and Leisure Time across Education Status

4.7 Deficiency

The deficiencies in the localities taken into consideration for the survey, along with other problems faced in the respective households have been visualised as follows:

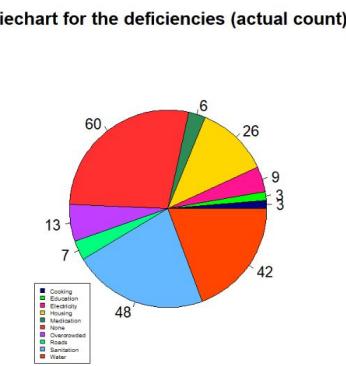


Figure 23: Piechart(showing the actual counts) for the deficiencies according to the surveyor(missing data is not considered)

Few households had multiple deficiencies in their localities. Fig 23 chart gives us the number of households having a specific deficiency in their locality. The surveyors felt that 60 households did not have any deficiency in

their localities. Sanitation and Water supply are the major deficiencies among the households(48 and 42 in number respectively), followed by housing facilities(26) and overcrowdedness(13). 9 households had electricity deficiencies in their localities whereas 7 households had poor roads in their localities.

6 households had medication deficiencies and there are 3 households each with education and cooking fuel deficiencies.

The piechart gives us the broad overview of which of the deficiencies are significant in number with respect to the other.

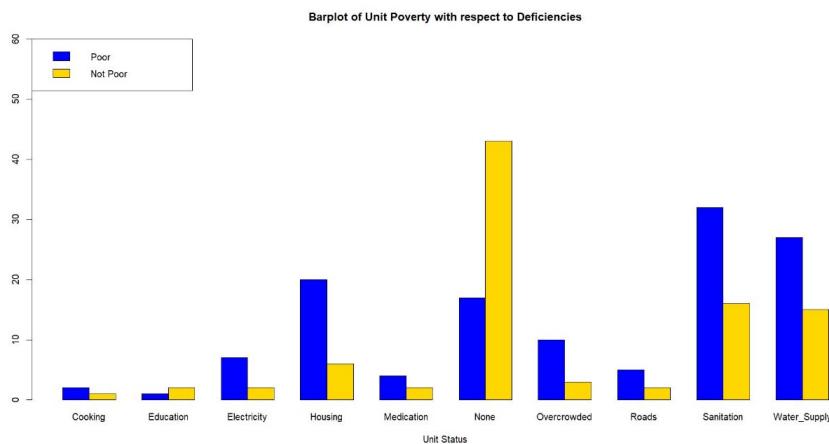


Figure 24: Barplot of Unit poverty(according to the surveyor) with respect to deficiencies

Fig 24 shows that among the households considered to be not having any deficiency in their locality, a good proportion of them are considered to be not poor though there is still a significant proportion for true as well.

Among the households considered to be having any deficiency other than the Education deficiency in their locality, a larger proportion of the people are poor than non poor. But among the households who are considered to be having Education deficiency in their locality, number of units who are considered poor are less than the number of units who are considered to be not poor (though number of households having education deficiencies in their locality are very less.)

Fig 25 shows that a very high proportion of the households having no deficiencies are considered to be not poor while few of them are considered poor as well. Among the households considered to be having Education deficiency, the ones considered poor are less than those that are considered not poor (though number of households having education deficiencies are very less).

All the households having either cooking fuel deficiency or overpopulated are considered to be poor. (Not indicating a causal relationship)

Among the households considered to be having the Medication deficiency, number of households considered poor are equal to the number of localities that are considered not poor. (Note that, the number of households having medication deficiencies are very less).

Among the households considered to be having any other deficiencies, number of households considered poor are more than the number of households that are considered not poor.

This explains that among the households for whom deficiency in their locality is not available or missing, 13

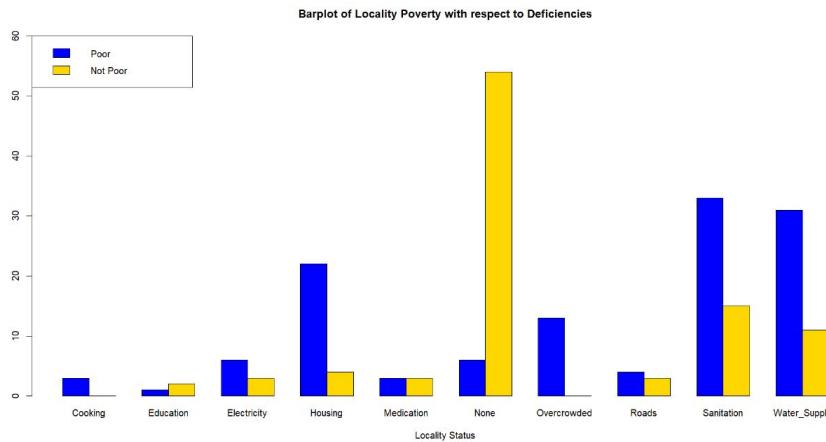


Figure 25: Barplot of Locality poverty(Which is also according to the surveyor) with respect to deficiencies

Data of deficiency Not Available		
Locality Poverty \ Unit Poverty	POOR	NOT POOR
POOR	13	14
NOT POOR	12	66

Figure 26: Data of deficiency not available(i.e.,missing)

households are considered to be poor and are living in localities which are considered to be poor as well where as 14 households are considered to be poor but are living in localities which are considered to be not poor.Also, 66 households are considered to be not poor and are living in localities which are considered to be not poor as well whereas 12 households are considered to be not poor but are living in localities which are considered to be poor.

Data of No Deficiency		
Locality Poverty \ Unit Poverty	POOR	NOT POOR
POOR	4	13
NOT POOR	2	41

Figure 27: Data of No deficiency

This depicts that among the households having no deficiency in their locality, 4 households are considered to be poor and are living in localities which are considered to be poor as well where as 13 households are considered to be poor but are living in localities which are considered to be not poor.Also,41 households are considered to be not poor and are living in localities which are considered to be not poor as well whereas 2 households are considered to be not poor but are living in localities which are considered to be poor.

In some of the following figures, the deficiencies are visualised in a deeper sense, to give a possible understanding of the interdependence of these deficiencies.

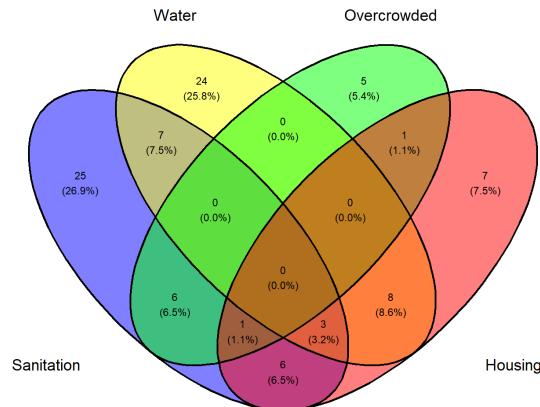


Figure 28: Venn diagram for Sanitation, Water, Overcrowdedness and Housing deficiencies

In Fig 28, Sanitation deficiency, Water deficiency, deficiency of Overcrowdedness, and Housing deficiency are explicitly shown. The points to note in this case are:

1. There are no respondents who share the problems of water and overcrowding
2. Number of people with only water issues is greater than number of people with water issues and at least one of the 3 other problems (24 – 18)
3. Number of people with only sanitation issues is greater than number of people with sanitation issues and at least one of the 3 other problems (25 – 23)
4. The prominent proportions in the Venn diagram are problems of only Water supply (25.8 percentage) and problems of only sanitation (26.9 percentage)
5. 11 out of the 26 people facing housing issues also face water problems
6. 7 out of the 13 people having overcrowding problems also have sanitation problems.

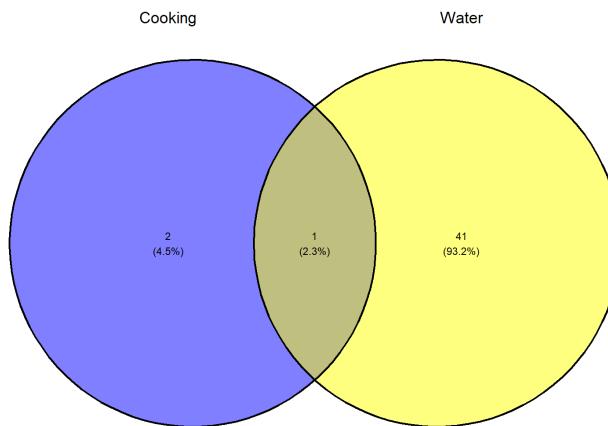


Figure 29: Venn diagram for Cooking and Water deficiencies

In Fig 29, Cooking deficiency, and Water deficiency are explicitly shown. The points to note in this case are:

1. A very low proportion has cooking problems.
2. Yet the intersection is not 0.
3. A prominently high proportion of the sample faces water problems when compared to cooking problems.

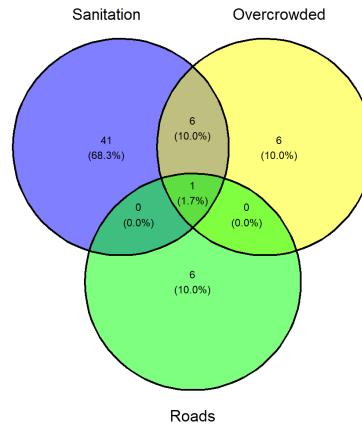


Figure 30: Venn diagram for Sanitation, Overcrowdedness and Roads deficiencies

In Fig 30, Sanitation deficiency, deficiency due to Overcrowdedness, and deficiency of Roads are explicitly shown. The points to note in this case are:

1. A very high percentage has only sanitation problems (68.3 percentage)
2. There are no people who have 2 of these problems including road problems, but there is 1 person who has all of the problems.
3. 7 out of the 13 people having overcrowding problems also have sanitation problems.

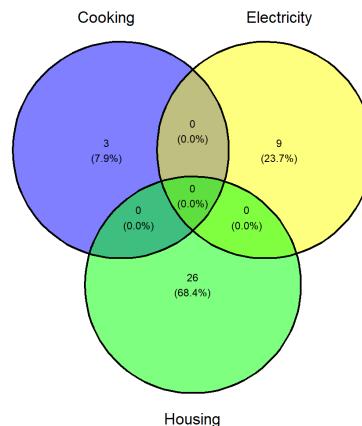


Figure 31: Venn diagram for Cooking, Electricity and Housing deficiencies

In Fig 31, Cooking deficiency, Electricity deficiency, and deficiency of Housing are explicitly shown. The points to note in this case are:

1. There is absolutely no intersection as seen in the sample.
2. 26 (68.4 percentage) have housing problems, 3 (7.9 percentage) have cooking problems and 9 (23.7 percentage) have electricity problems.

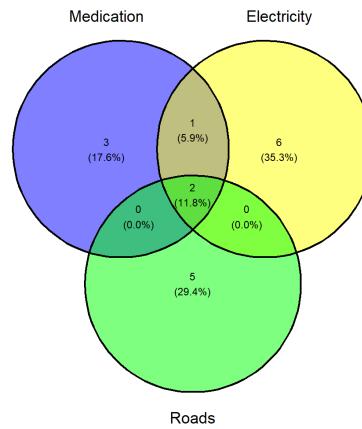


Figure 32: Venn diagram for Medication, Electricity and Road deficiencies

In Fig 32, Medical deficiency, Electricity deficiency, and deficiency of Roads are explicitly shown. The points to note in this case are:

1. People with the above-mentioned problems form a very small proportion of the sample. (a total of only 17)
2. Prominent proportions are electricity only (35.3 percentage) and roads only (29.4 percentage)
3. 3 out of the 9 people having electricity problems also have medication problems.
4. 3 out of the 6 people having medication problems also have electricity problems.
5. 2 people (11.8 percentage) have all 3 problems.
6. Nobody has exactly 2 of the 3 above problems including road problems.

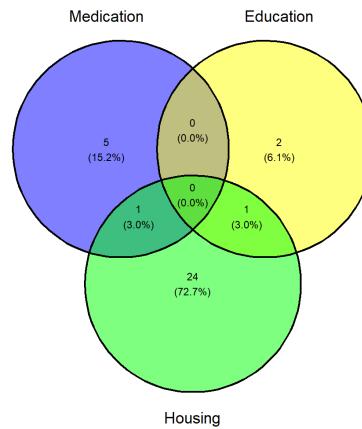


Figure 33: Venn diagram for Medication Education and Housing deficiencies

In Fig 33, Medical deficiency, Housing deficiency, and deficiency of Education are explicitly shown. The points to note in this case are:

1. The most prominent proportion is only housing problem (72.7 percentage)
2. There is no intersection between medication and housing problems
3. 1 out of the 3 with education problems also have housing problems

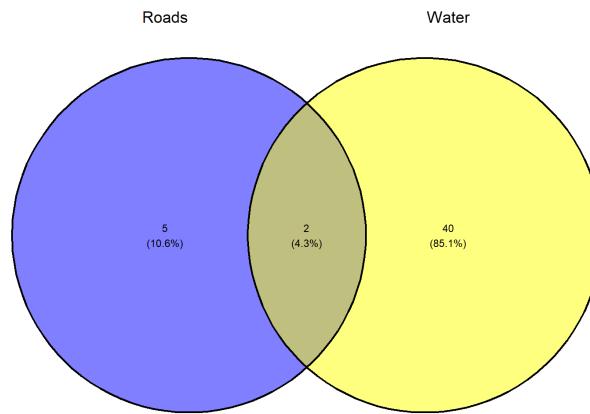


Figure 34: Venn diagram for Water and Roads deficiencies

In Fig 34, Roads deficiency, and Water deficiency are explicitly shown. The points to note in this case are:

1. The significant proportion is the one representing people having water problems only
2. 2 out of the 7 people having the roads problem also have the water problem

One of the part of our study focused on different localities and examined the presence of deficiencies, with respect to the allocation of time towards paid work, unpaid work, and leisure activities. We aimed to understand the relationship between these factors and identify potential problems in these areas. Below are the key findings:

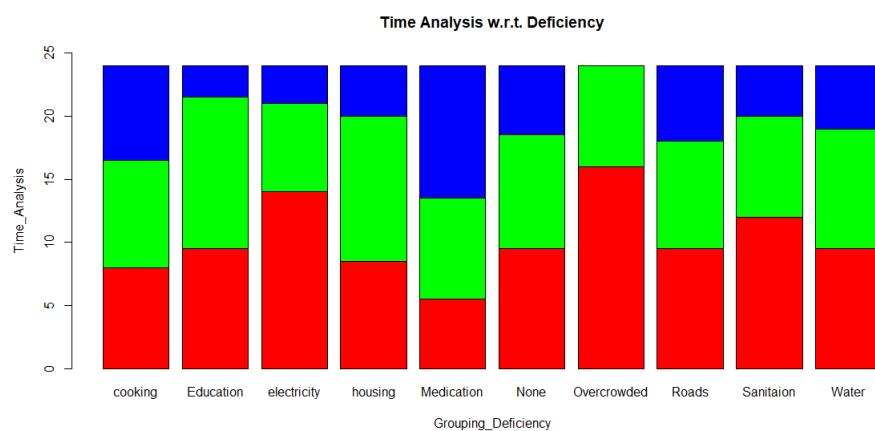


Figure 35: Time use vs deficiency

Visualization of deficiency with time use :

1. While there is relatively lesser leisure time, the amount of paid jobs and unpaid jobs are about the same when it comes to cooking. This shows that not much expenditure is made towards hiring cooks for a paid job, which indicates a problem in the area.
2. Since there is a lot of paid work, we can infer that money is not a problem in the households. However, the abundance of distractive sources, in addition to education, indicates a problem in the education sector in those areas.
3. The high amount of leisure time suggests that not many people capable of electric works are available on-site, highlighting an issue in education related to electric works in those areas.
4. The substantial amount of work devoted to paid hours suggests a change in people's targets and priorities. This shift may indicate an unwillingness to invest in increasing housing costs, making unpaid work a problem.
5. The combination of unpaid work and extremely low leisure time leads to stress and related problems among the people. This strain puts pressure on the existing medical facilities, making medication a problem in those areas.
6. Among all the datasets analyzed, the amounts of time spent on leisure activities and paid work appear to be optimal. This indicates that there should be no significant problems in the villages regarding this aspect.
7. The amount of paid and unpaid work related to roads is about the same, but there is more leisure time. This suggests a lack of commitment to road maintenance, leading to longer commutes and congestion issues.
8. The increase in leisure time implies that an adequate number of sanitary workers might not be available on-site. Additionally, the significant time spent on paid work indicates an unwillingness to invest the required amount of money for sanitary work, causing sanitary problems in the area.
9. The relatively higher amount of leisure time indicates inconsistent water maintenance. The higher ratio of paid jobs suggests a steady demand for water-related works, but the leisure time suggests that these demands might not be adequately met.



Figure 36: Bank Acc vs Deficiency

Visualization of deficiency with Bank Account: In addition to the deficiency analysis, we also examined the correlation between deficiency and bank accounts. Here are the findings:

1. Contrary to our beliefs, areas where education is a problem have higher Bank Account aggregates. However, higher investment in education, coupled with lesser leisure time, suggests a low return on investment in terms of education. This indicates a lack of proper infrastructure, but more data is required for a clearer inference.
2. The lack of physical infrastructure might cause electricity problems, especially when a large percentage of the population has bank accounts. This suggests that the observed correlation might be spurious.
3. As almost half of the sample does not have bank accounts, it can be inferred that they are unaware of good loans that can finance housing infrastructure. This indicates problems in the housing infrastructure of the area.
4. Given that medication is a problem in the sample, it is reasonable to assume that most of them would opt for health insurance and mediclaim benefits, leading to a high percentage of them becoming bank account holders.

4.8 Additional Questions

4.8.1 Bank Account

Should a person without bank account be considered as a poor?



Figure 37: Public opinion on whether a person without bank account be considered a poor

Refer figure 37. 66% people do not think that there is a need to consider a person without bank account as a poor.

4.8.1.1 Study of opinions with Age

Figure 38 represents a basic box plot for the ages of the respondents with respect to the responses to the relevance of having a bank account with poverty.

Figure 39 represents a combined histogram of the age of the respondents. Note that the histogram for negative respondents (red) is getting covered by histogram for positive respondents. Hence, The number of respondents in each of the classes is higher for negative response than affirmative response.

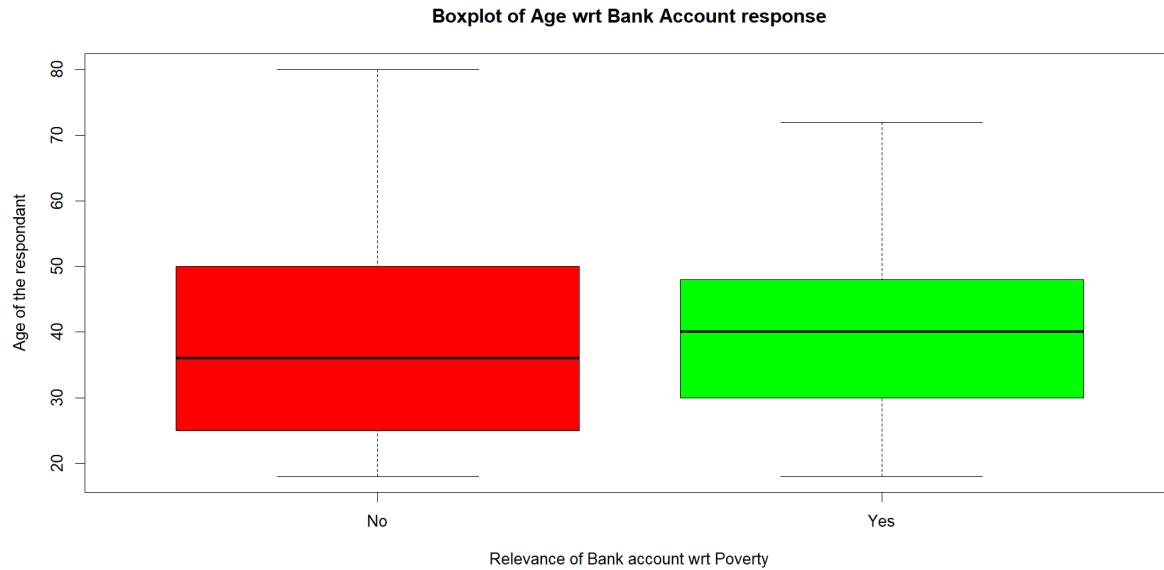
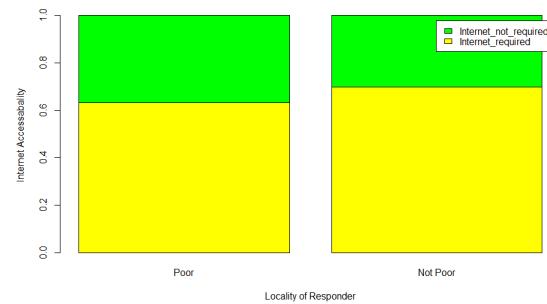


Figure 38: Boxplot of Age wrt bank account response

4.8.2 Internet Access

We have plotted the densities of responses got from the people in poor localities and got from the people in not poor localities and we have observed that in both poor and not poor localities (Figure is given below), majority of the response says Internet access is required not to consider a person as poor and in rural areas, the density of the people who think that Internet access is not required is more higher than densities of people from not poor areas having the same perception. Refer figure 40. 66% people do not feel that a person without internet access be considered as a poor.



4.8.3 Time use

Refer to figure 41. Responses for expected leisure time are concentrated in 8 to 12 hours per day. There is a cluster of responses at 8 hours per day in case of expected paid work time. The variation in responses is less in case of expected paid work time as compared to expected leisure and unpaid work time. Responses for expected unpaid work time are concentrated between 3 and 7 hours per day. Hence, it can be said that according to public opinion based on survey, ideal leisure time should lie between 8 to 12 hours, paid work time should be around 8-9 hours and unpaid work time be in 3-7 hours for having a good standard of living.

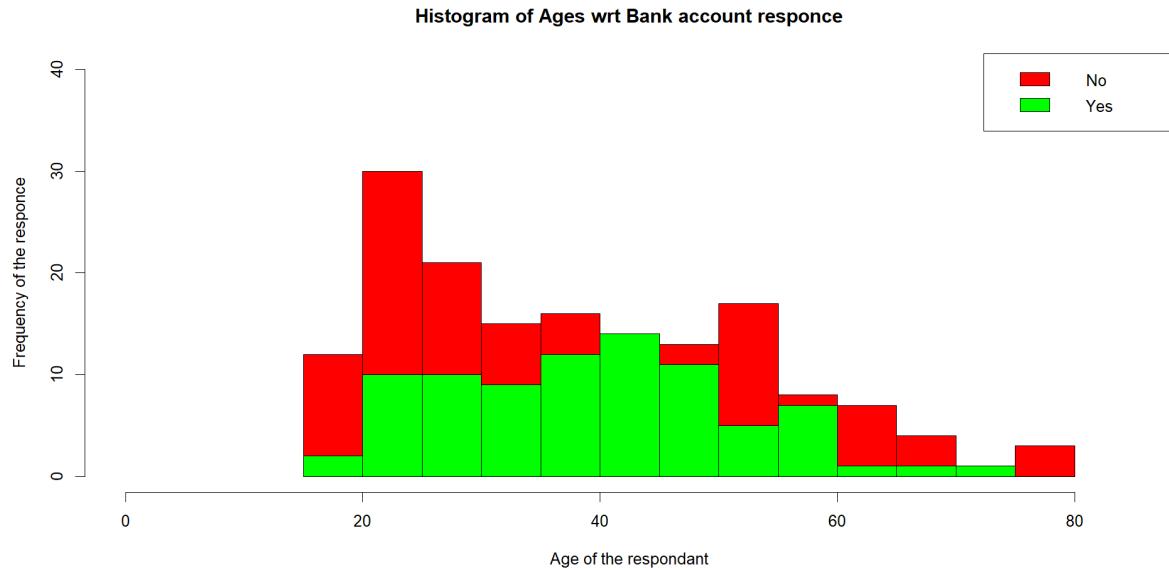


Figure 39: Histogram of bank account response wrt age

Should a person without access to internet be considered as a poor?

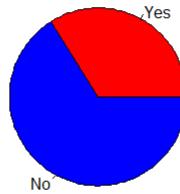


Figure 40: Public opinion on whether a person without access to internet be considered a poor

4.8.3.1 Opinions on time use across Professions

Observe figure 42. Variation in expected leisure time in case of private employees is much smaller and bigger in case of students as compared to other professions. Expected leisure time in case of businessmen/businesswomen is higher as compared to other professions.

Observe figure 43. The phenomenon of cluster of responses at 8 hours per day can be observed across all the professions. Higher proportion of private employees have higher expected paid work time (more than 10 hours) contrary to other professions.

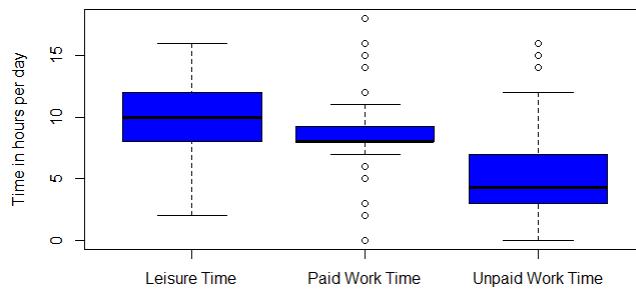


Figure 41: Boxplot of opinions about leisure time, paid work time and unpaid work time in hrs per day

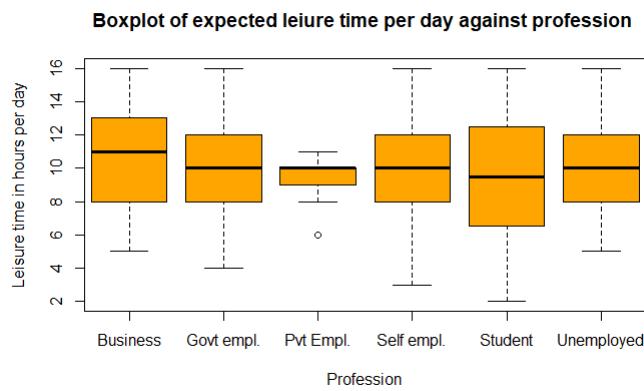


Figure 42: Boxplot of opinions about leisure time in hrs per day across professions

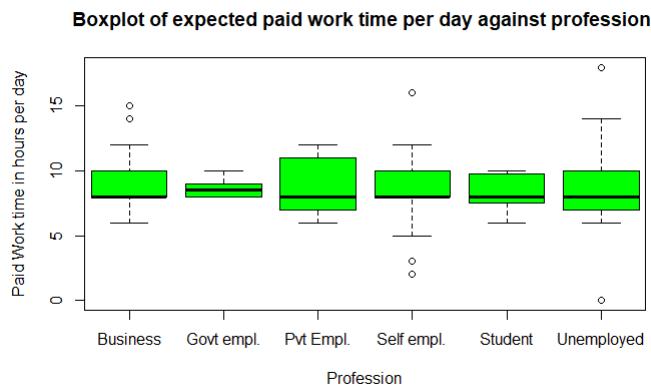


Figure 43: Boxplot of opinions about paid work time in hrs per day across professions

Observe figure 44. Variation in responses of students is higher as compared to other professions. Responses from Businessmen suggest that they have low expected unpaid work time.

Observe figure 45. Here, the plot represents age vs number of hours of time use i.e., Leisure time, Paid work and Unpaid work and also their kernel density estimation. So, we can see that Paid work is kind of uniform around 8 hrs

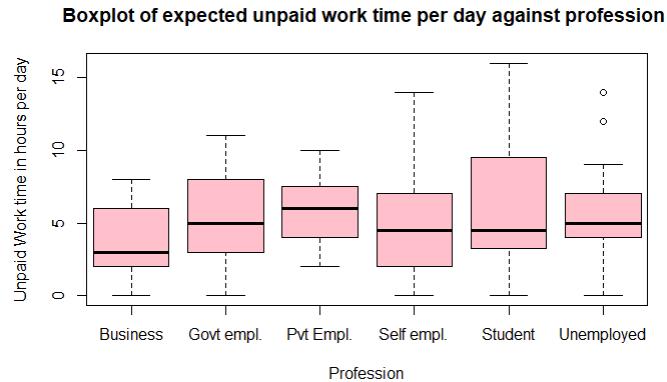


Figure 44: Boxplot of opinions about unpaid work time in hrs per day across professions

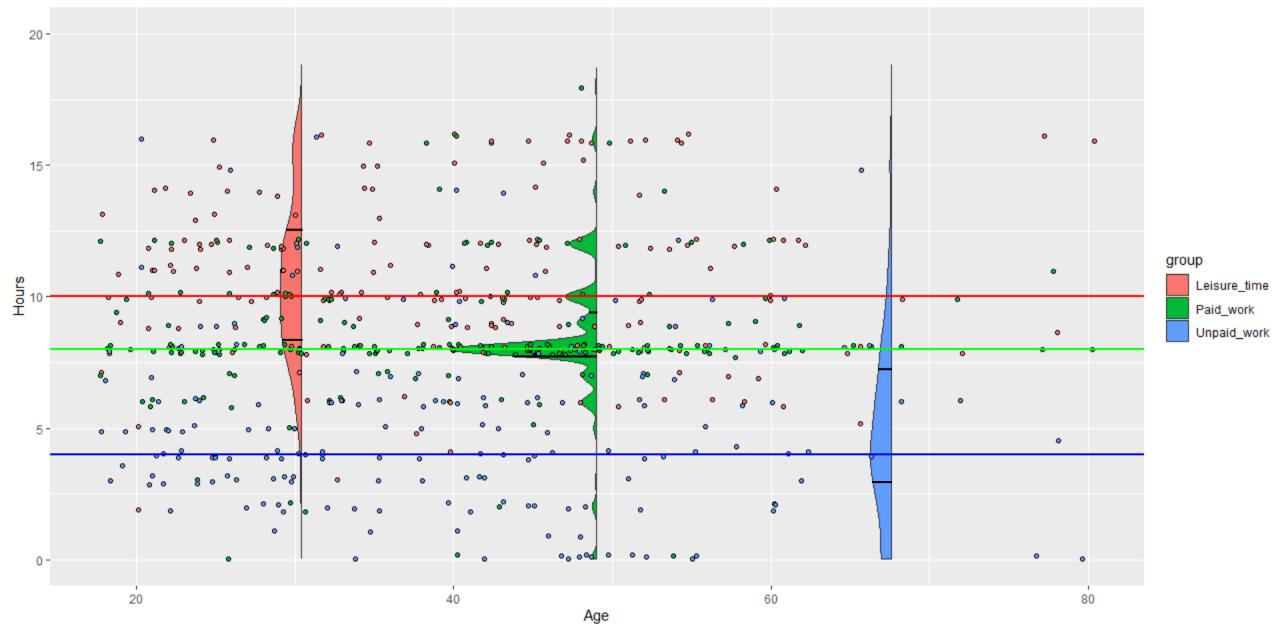


Figure 45: Scatter Plot of Hours across ages, along with their kernel density estimations

as median of paid work time is around 8 hrs. While leisure time has median of 10hrs, this include sleeping time and time for hobbies, spending time with family etc. While Unpaid work is has median around 4 hrs, this includes time where you work but not get paid (monetary) like household chores etc.

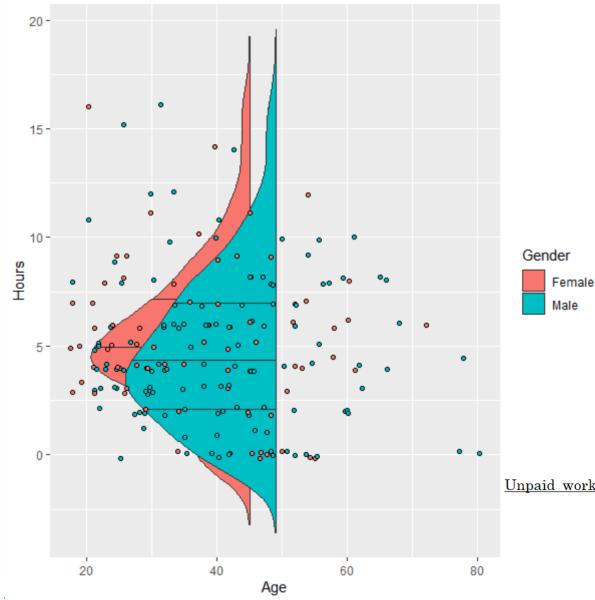


Figure 46: Scatter plot of unpaid work time across ages divided into categories according to gender, along with their kernel density estimation

Observe figure 46. This plot represents density estimation for unpaid work with the bifurcation among genders(male and female). Both the densities are more or less of same shape but with a shifted central parameter. Median of male for unpaid work is 3.5 hrs while for females it's 5hrs. This can be explained by the fact that females spend more time in household work, child care etc.

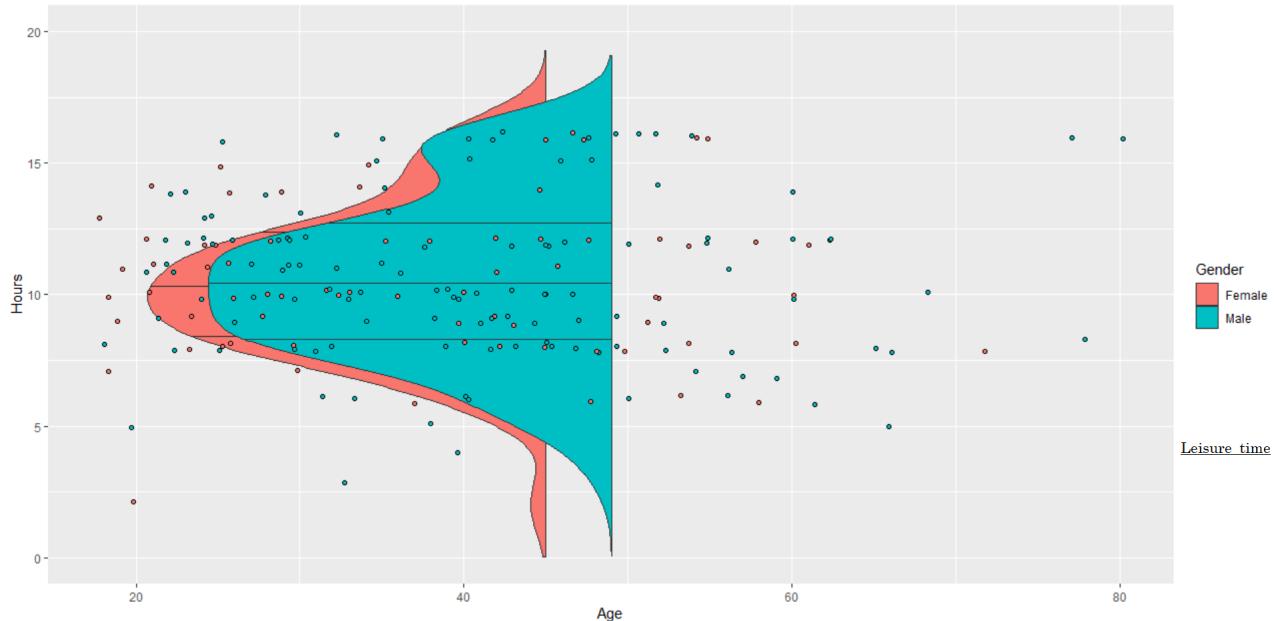


Figure 47: Scatter plot of leisure time across ages divided into categories according to gender, along with their kernel density estimations

Observe figure 47. This plot shows density estimation of leisure time on gender basis and we can see that shape

has more or less looks same also median is almost same i.e. 10.4 hrs. One thing we see that there are two peaks in male density curve while for female it's not peak but there is an increase in frequency of people around 16 hrs.

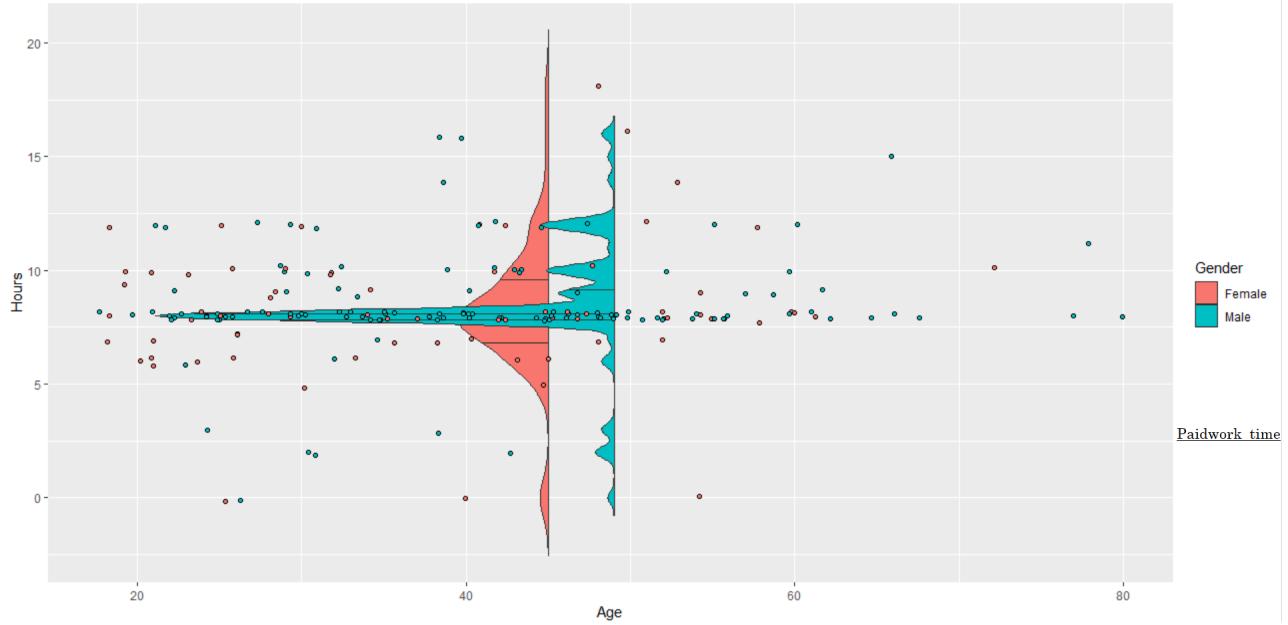


Figure 48: Scatter plot of paid work time across ages divided into categories according to gender, along with their kernel density estimation

Observe figure 48. Here, we can see that for most of the male paid work time is around 8 hrs. While for females, it is quite varying. There are quite a few peaks in the distribution. Also, both the genders have same median i.e, 8hrs.

Observe, figure 49 represents the Q-Q Plot of the distribution of Age. The bottom end of the plot deviates from the straight line but the upper end is more or less aligned with the straight line. Thus the distribution of age has a longer tail to its left or simply it is negatively skewed.

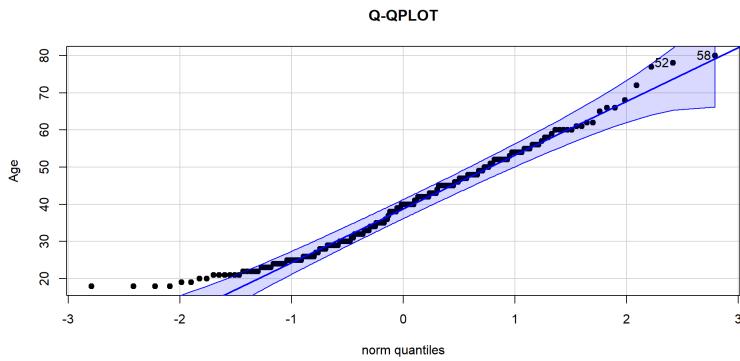


Figure 49: Q-Q Plot of Age against Normal quantiles

Observe, figure 50 represents the Q-Q Plot of the distribution of unpaid work time. The top end of the plot deviates from the straight line but the bottom end is more or less aligned with the straight line. Thus the distribution of unpaid work time has a longer tail to its right or simply it is positively skewed.

Observe, figure 51 represents the Q-Q Plot of the distribution of leisure time. Both the top and bottom ends of the plot deviates from the straight line but by a little margin. Thus the distribution of leisure time has a thin tail.

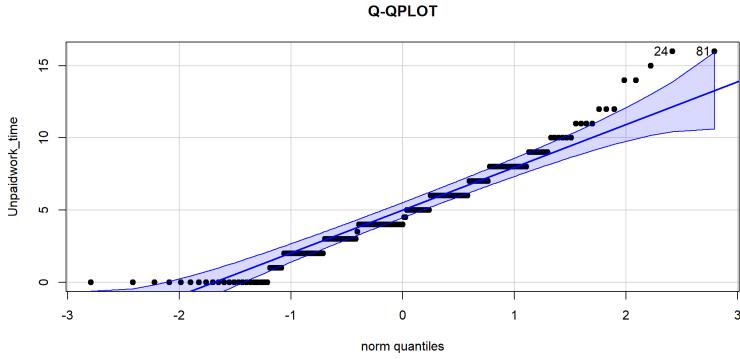


Figure 50: Q-Q Plot of unpaid work time against Normal quantiles

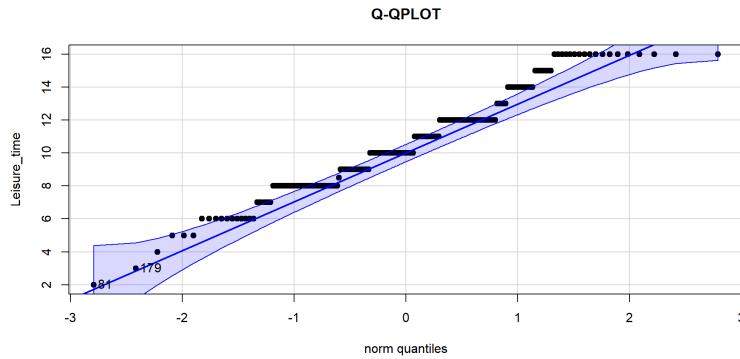


Figure 51: Q-Q Plot of leisure time against Normal quantiles

Observe, figure 52 represents the Q-Q Plot of the distribution of paid work time. Both the top and bottom ends of the plot deviates from the straight line and by a large margin. Thus the distribution of paid work has a fat tail or simply the ends of the distribution of paid work time deviates significantly from that of normal distribution.

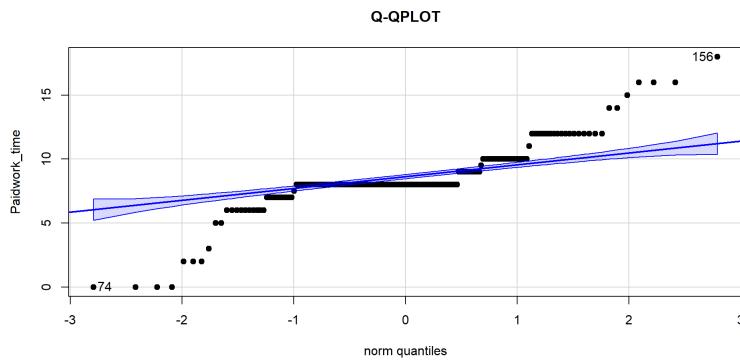


Figure 52: Q-Q Plot of paid work time against Normal quantiles

Figure 53 represents the average time-use with respect to gender for the three different types of time use. We can see that the differences are minor indicating that gender does not have a significant on average time-use.

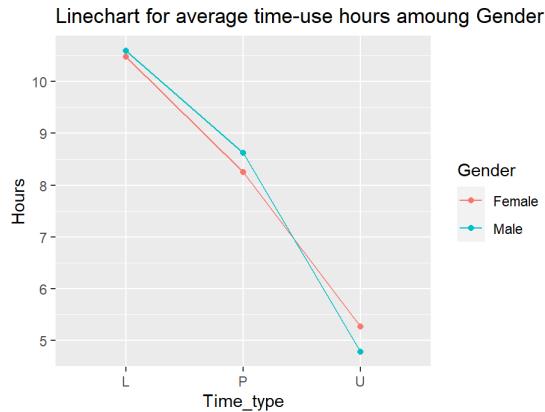


Figure 53: Linechart for average time-use hours with respect to gender

Figure 54 represents the hexbin plot for leisure time with age. We can see that leisure time increases until age 40 and then it decreases as the age increase.

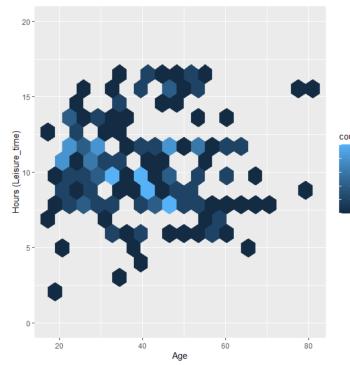


Figure 54: Hexbin plot for leisure time with age

Figure 55 represents the hexbin plot for unpaid work with age. We can see that near origin (until the age 20) time spent on unpaid work is high. In between age 20 and 40 we can see that most of people spend less time for unpaid work .For the age group 40-60 time spent on unpaid work increases and then again decreases for the age group above 60.

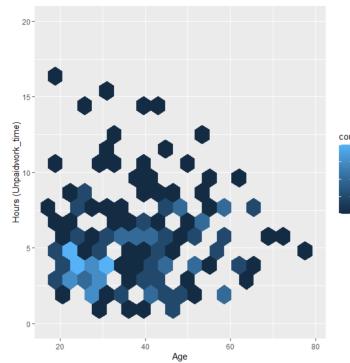


Figure 55: Hexbin plot for unpaid work with age

Figure 56 represents the hexbin plot for paid work with age. We can see that near origin (until the age 20) time spent on paid work is high but the count is low. In between age 20 and 60 we can see that most of people spend around 5-10 hrs daily for paid work. For the age group above 60, the number of people doing paid work decreases but the time spent on paid work remains same.

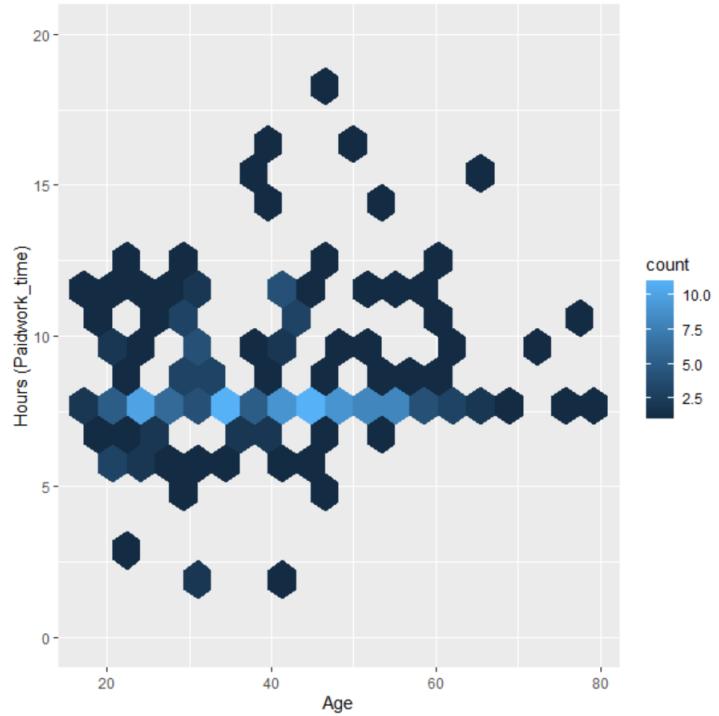


Figure 56: Hexbin plot for paid work with age

5 Data analysis

5.1 Contrastive comparison

In this section we analyse the data obtained from partial profile choice experiment. Partial profile-choice experiments is a powerful methodology that allows for the systematic assessment of preferences and trade-offs. We presented participants with a series of hypothetical scenarios with different combinations of poverty indicators, where they are asked to identify more impoverished scenario thus, indicating their preferred options. By analyzing the participants' choices, we can quantify the relative importance of each indicator and understand key components underlying poverty.

To analyse the preference of the indicator in participants' mind we use the following model. Suppose β_i denote effect of i -th indicator, for $i = 1, 2, \dots, 11$. Let Y be a random variable such that if a participant choose 1st option then $Y = 1$, Otherwise $Y = 0$. With each option we associate a 11-dimensional vector \mathbf{x} (for 1st option) and \mathbf{x}' (for 2nd option), such that if in an option j -th indicator is poor then in \mathbf{x} , j -th position has -1 , if j -th indicator is not poor then j -th position has 1 and if the j -th indicator was not presented in that choice set then the j -th position in \mathbf{x} is set to 0 . Then we fit

$$E(Y|\mathbf{x}) = g((\mathbf{x} - \mathbf{x}')\beta)$$

, Where $g(x) = \frac{e^x}{e^x + 1}$.

After data cleaning we fit this model using 'glm' function in R and then analyse the results. We note in design matrix all the rows are of form $2(\beta_i - \beta_j)$, so the actual magnitude of β_i 's does not matter. Their ordering is more important. Also β_i 's are not estimable (if we add an arbitrary δ to all coefficient the model does not change), so we take $\beta_{11} = 0$. We report the response from glm() below:

Call:

```
glm(formula = y ~ 0 + ., family = binomial(link = "logit"), data = x)
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-1.505	-1.159	0.882	1.135	1.493

Coefficients: (1 not defined because of singularities)

	Estimate	Std. Error	z value	Pr(z >= z)
V1	-0.15806	0.10139	-1.559	0.119023
V2	-0.22156	0.10234	-2.165	0.030386 *
V3	-0.33356	0.07175	-4.649	3.33e-06 ***
V4	-0.34982	0.07322	-4.778	1.77e-06 ***
V5	-0.22800	0.08994	-2.535	0.011241 *
V6	0.02188	0.06176	0.354	0.723108
V7	-0.14474	0.09983	-1.450	0.147094
V8	-0.33667	0.08748	-3.849	0.000119 ***
V9	-0.09472	0.09484	-0.999	0.317938
V10	-0.36437	0.06510	-5.597	2.18e-08 ***

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

```
Null deviance: 4292 on 3096 degrees of freedom
Residual deviance: 4192 on 3086 degrees of freedom
AIC: 4212
```

Number of Fisher Scoring iterations: 4

Observations:

- The function effectively assumes $\beta_{11} = 0$, so we can effectively estimate all coefficient contrasts. So effect of child and adolescent mortality is assumed to be zero.
- 2nd, 3rd, 4th, 5th, 8th, 10th coefficients are very significant. To look into these we create the confidence interval of these variables and present them in form of a interval graph (Fig 57).

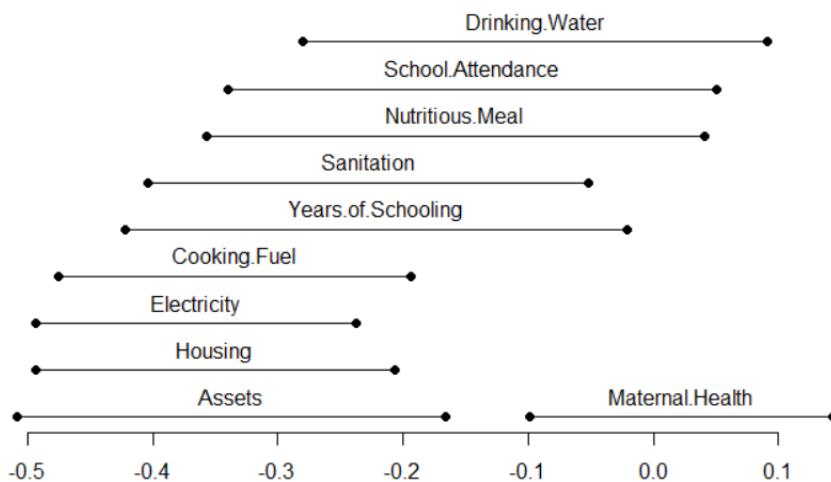


Figure 57: Confidence Interval of the coefficient corresponding to poverty indicator

- Based on the given estimate of the coefficients the preference of indicators are in order: "Maternal.Health" > "Child...Adolescent.Mortality" > "Drinking.Water" > "School.Attendance" > "Nutritious.Meal" > "Years.of.Schooling" > "Sanitation" > "Cooking.Fuel" > "Assets" > "Housing" > "Electricity"

5.2 Contrastive comparison across gender

There are many factor that controls peoples' opinion about various poverty indicator. To investigate this effect we divide the participants into male and female group and apply the model on these two data sets separately. We make the following observation from these.

- From the fitted estimated value of the coefficients we find the following preference of poverty indicator among males.

"Maternal.Health" > "Child...Adolescent.Mortality" > "Drinking.Water" >
 "Nutritious.Meal" > "School.Attendance" > "Sanitation" > "Years.of.Schooling" > "Assets"
 > "Housing" > "Electricity" > "Cooking.Fuel"

- From the fitted estimated value of the coefficients we find the following preference of poverty indicator among females.

"Child...Adolescent.Mortality" > "Maternal.Health" > "Drinking.Water" >
 "School.Attendance" > "Nutritious.Meal" > "Years.of.Schooling" > "Cooking.Fuel" >
 "Sanitation" > "Electricity" > "Assets" > "Housing"

- To understand the amount of concordance between these two opinion we compute Spearman's rank correlation coefficient. The observed value of this coefficient is 0.8454545.

The distribution of spearman's rank correlation under null hypothesis that there is no correlation between these two ranking is known. For n=11, left tail probability of .764 is 0.005 (Page 586 of [6]). So we reject null hypothesis at 5% level of significance.

So we conclude there is significant correlation between opinions of males and females.

5.3 Contrastive comparison across educational levels

Education shapes a person's opinion on every sectors of life. So to investigate effect of educational level in one's judgement on poverty indicators we divide the participants into four category: We use the previous model in each of these group separately then find the ordering of

Educational qualification	Educational level (denoted in data)
Below 10th	level 0
10th pass	level 1
12th pass	level 2
graduate	level 3

Table 1: Educational level

their preferred poverty indicators. We summerize our observations as follows:

- In the group with educational level 0, ordering of preferred poverty indicators are as follows:
 "Child...Adolescent.Mortality" > "Maternal.Health" > "School.Attendance" >
 "Drinking.Water" > "Sanitation" > "Years.of.Schooling" > "Nutritious.Meal" > "Housing"
 > "Cooking.Fuel" > "Assets" > "Electricity"
- In the group with educational level 1, ordering of preferred poverty indicators are as follows:
 "Child...Adolescent.Mortality" > "School.Attendance" > "Drinking.Water" >
 "Maternal.Health" > "Assets" > "Nutritious.Meal" > "Years.of.Schooling" > "Electricity" >
 "Cooking.Fuel" > "Housing" > "Sanitation"

- In the group with educational level 2, ordering of preferred poverty indicators are as follows:
 "Maternal.Health" > "Nutritious.Meal" > "Child...Adolescent.Mortality" >
 "Drinking.Water" > "Cooking.Fuel" > "Sanitation" > "Assets" > "Years.of.Schooling" >
 "Housing" > "School.Attendance" > "Electricity"
- In the group with educational level 3, ordering of preferred poverty indicators are as follows:
 "Maternal.Health" > "Child...Adolescent.Mortality" > "Drinking.Water" >
 "School.Attendance" > "Nutritious.Meal" > "Years.of.Schooling" > "Sanitation" >
 "Electricity" > "Housing" > "Cooking.Fuel" > "Assets"

Since it is difficult to understand the level of concordance or discordance between these rankings we created Spearman's rank correlation coefficient between all possible pairs.

Educational level	0	1	2	3
0	1	0.6272727	0.5	0.8909091
1	0.6272727	1	0.3181818	0.6818182
2	0.5	0.3181818	1	0.5363636
3	0.8909091	0.6818182	0.5363636	1

Table 2: Spearman's rank correlation coefficient between educational levels

We then calculate Kendall's coefficient of concordance. It is a measure of concordance between sample rankings which lies between 0 and 1, with 1 designating perfect agreement or concordance and 0 indicating no agreement. Here the observed value of the coefficient is 0.6943182.

If Kendall's coefficient of concordance is W with n observations and k variates then $k(n - 1)W$ is approximated by the chi-square distribution with $n - 1$ degrees of freedom under null hypothesis that these rankings are independent(Pg 455 of [6]). Here value of this statistics will be 27.77273 with chi square distribution with df 10. Probability of right tail is 0.0019628. So we reject the null hypothesis that the rankings are random and conclude that there is significant amount of correlation between these rankings.

5.4 Comparison of regional rankings

We can compare the different rankings produced by different regions. This can help us gain further insights that we may not have predicted earlier.

First we just list the 6 groups in order: Midnapore, Bonhooghly, Parkcircus, Barasat, Saltlake, Bongaon.

Looking at the correlation matrix provides us with some interesting insights.

1.0000	0.2727	-0.0545	0.4455	0.1636	-0.2818
0.2727	1.0000	0.6455	-0.2091	0.5364	0.2545
-0.0545	0.6455	1.0000	-0.1909	0.2364	0.0364
0.4455	-0.2091	-0.1909	1.0000	-0.1273	0.0636
0.1636	0.5364	0.2364	-0.1273	1.0000	0.0364
-0.2818	0.2545	0.0364	0.0636	0.0364	1.0000

Have a look at regions 2,3 and 5. All of these have positive pairwise correlation, some of which are quite high. This can be used to infer that suburban or areas closer to the metropolitan city have the preference order of ranking.

Another interesting thing that came around was that there is very less correlation between Bongaon and Barasat, although the localities that had been surveyed were similar. This may indicate that marginalized and economically disadvantaged communities in rural areas can have significantly different perceptions about poverty. Also, there is the effect of Bongaon being close to the border which may cause this counter-intuitive effect.

5.5 Analysis of Perturbation Data

5.5.1 Education

The question asked for this section is- "Whom of the following will you consider not poor?". The participants were told to choose from the following options.

1. Attended school upto class 8
2. Attended school upto class 10
3. Attended school upto class 12
4. Graduated

Note there is a clear ordering in these options. For example if a person who attended school upto class 10 is not education deprived then according to his/her, a graduated student must not be education deprived. However we found 12 responses we found these kind of conflicting answer. Suspecting there must been some sort of miscommunication, we remove those datas. Out of the rest of the data we calculated total no of person who responded with a specific answer. Notice

Educational level	upto 8	upto 10	upto 12	graduated	education is unrelated to poverty
No of responses	48	106	172	250	9

Table 3: Perturbation under Educational levels

here this table does not represent the no of people who thinks each level is the threshold to mark someone 'poor'. So to find that we take consecutive differences. From the data we can see 'upto 12' and 'graduate' classes are the only level that can be taken as poverty level. To see which level is more important we do the following test:

Educational level	upto 8	upto 10	upto 12	graduated	education unrelated to poverty
# people consider this poverty limit	48	58	66	78	9

Table 4: Perturbation under Educational levels

Assume a multinomial model, given a person consider the minimum requirement for education to be either 'upto 12' or 'graduate', no of person who consider 'upto 12' is poverty limit (call this x) should follow $\text{Bin}(144, p)$. If 'graduated' is more likely option then $p < 0.5$. So we perform the test of hypothesis with $H_0 : p = 0.5$ vs $H : p < 0.5$.

The test statistics is $\frac{\frac{x}{144} - 0.5}{\sqrt{\frac{1}{4 \times 144}}} = -1$ which follow $N(0, 1)$ approximately and $P(Z < -1) = 0.158$ so we fail to reject H_0 at level 0.05.

So based on this data we fail to make a clear judgement to make the poverty line.

5.5.2 Nutrition

The question asked for this section is- "Whom of the following will you consider not poor?". The participants were told to choose from the following options.

1. Get food once a day
2. Get food twice a day
3. Get food thrice a day
4. Get food 4 times a day

Like the previous case there is a clear ordering in these options. However we found 15 responses we found these kind of conflicting answer. Suspecting there must been some sort of miscommunication or misinterpretation, we remove those datum. Out of the rest of the data we calculated total no of person who responded with a specific answer. Notice here this table does not represent

Nutrition level	get food once a day	get food twice a day	get food thrice a day twice a day	get food four times a day	nutrition is unrelated to po
No of people consider					
No of responses	7	99	231	255	1

Table 5: Perturbation under nutrition levels

the no of people who thinks each level is the threshold to mark someone 'poor'. So to find that we take consecutive differences.

From the data we can see 'twice a day' and 'thrice a day' classes are the only level that can be taken as the minimum requirement for nutrition. To see which level is more important we do the following test:

Assume a multinomial model, given a person consider poverty limit to be either 'twice a day' or 'thrice a day', no of person who consider 'twice a day' is poverty limit (call this x) should

Nutrition level	get food once a day	get food twice a day	get food thrice a day twice a day	get food four times a day	nutrition is unrelated to poverty
No of people consider this poverty limit	7	92	132	24	1

Table 6: Perturbation under nutrition levels

follow $\text{Bin}(224, p)$. If 'thrice a day' is more likely option then $p < 0.5$. So we perform the test of hypothesis with $H_0 : p = 0.5$ vs $H : p < 0.5$.

The test statistics is $\frac{\frac{x}{224} - 0.5}{\sqrt{\frac{1}{4 \times 224}}} = -2.67$ which follow $N(0, 1)$ approximately and $P(Z < -2.67) = 0.004$ so we reject H_0 at level 0.05.

So based on this data we conclude that a person who fail to get meal thrice a day should be 'poor'.

5.5.3 Access to Water

The question asked for this section is- "Whom of the following will you consider not poor?". The participants were told to choose from the following options.

1. Has to walk more than 30 minutes for getting water
2. Has to walk less than 30 minutes for getting water
3. Has water connection in the household but does not get adequate water
4. Has water connection in the household and gets adequate water

Like the previous case there is a clear ordering in these options. However we found 10 responses we found these kind of conflicting answer. Suspecting there must been some sort of miscommunication or misinterpretation, we remove those data sets. Out of the rest of the data we calculated total no of person who responded with a specific answer.

From the data we can see option 3 and option 4 classes are the only level that can be taken as poverty level. To see which level is more important we do the following test: Notice here this table does not represent the no of people who thinks each level is the threshold to mark someone 'poor'. So to find that we take consecutive differences. Assume a multinomial model, given a

Access to Water	Option 1	Option 2	Option 3	Option 4
No of people consider this poverty limit	10	35	85	87

Table 7: Perturbation under nutrition levels

person consider poverty limit to be either option 3 or option 4, no of person who consider option 3 is the minimum requirement for access of wate (call this x) should follow $\text{Bin}(172, p)$. If 'thrice a day' is more likely option then $p < 0.5$. So we perform the test of hypothesis with $H_0 : p = 0.5$ vs $H : p < 0.5$.

The test statistics is $\frac{\frac{x}{172} - 0.5}{\sqrt{\frac{1}{4 \times 172}}} = -0.1524986$ which follow $N(0, 1)$ approximately and $P(Z < -0.1524986) = 0.4394357$ so we reject H_0 at level 0.05.

So based on this data we conclude that a person who fail to get water connection and does not get enough water should be considered 'poor'.

5.5.4 Possession of Assets

The question asked for this section is- "Whom of the following will you consider not poor?". The participants were told to choose from the following options.

1. Has neither TV nor telephone nor computer
2. Has telephone but neither TV nor computer
3. Has TV, telephone but not computer
4. Has Telephone, computer but not TV

Unlike in the previous case there is no clear ordering in these options. However we know any response marking any of the first 3 options will also mark the last one and similarly those who mark the first response will also mark 2 and 3. So responses which don't follow this partial order are labeled conflicting. Analysing the data we found 24 such conflicting responses. Suspecting there must been some sort of miscommunication or misinterpretation, we remove those data sets. The following table summarises the remaining 247 responses :-

Table 8: Perturbation under levels according to Possession of Assets

Possession of Assets	Has neither TV nor telephone nor computer	Has telephone but neither TV nor computer	Has TV telephone but not computer	Has Telephone, computer but not TV
No. of responses in each category	34	135	191	244

From this table we can see that 3 and 4 options are picked by the most no. of valid respondents hence the poverty level must lie somewhere in between them. so we first subtract no. of responses in 1 cell from the no. of responses in 2 and 3 cells to get the actual count of responses who think that 'threshold' should be considered 'poor'. Doing so we get the following table ??.

Table 9: Perturbation under levels according to Possession of Assets

Possession of Assets	Has neither TV nor telephone nor computer	Has telephone but neither TV nor computer	Has TV telephone but not computer	Has Telephone, computer but not TV
No. of people who consider this as the threshold of poverty line	34	101	157	53

Assume a multinomial model, given a person consider poverty limit to be either option 2 or option 3, no of person who consider option 3 is the minimum requirement of assets (call this x) should follow $\text{Bin}(247, p)$. If 'Has TV telephone but not computer' is more likely option then $p < 0.5$. So we perform the test of hypothesis with $H_0 : p = 0.5$ vs $H : p < 0.5$.

The test statistics is $\frac{\frac{x}{247} - 0.5}{\sqrt{\frac{1}{4 \times 247}}} = -2.86328143$ which follow $N(0, 1)$ approximately and $P(Z < -2.86328143) = 0.00209639$ so we are unable to reject the null hypothesis H_0 at level 0.05.

So based on this data we fail to make a clear judgement to make the poverty line with respect to the indicator of possession of assets like TV, telephone and computer.

5.5.5 Access to Healthcare

The question asked for this section is- "Whom of the following will you consider not poor?". The participants were told to choose from the following options.

1.) Neither there is any nearby health center, nor has money to afford medicines
2. Nearby health center is not available but has money to afford medicines
3. There are nearby health center(s) but cannot afford medicines
4. There are nearby health center(s) and can afford medicines

Like in the previous case there is no clear ordering in these options. However we can see except the ordering between 'has access to healthcare with no money' and 'doesn't have access to healthcare without money' rest all others have have progressive consecutive options intuitively 'richer' with increasing option no. But we found there are zero such conflicting responses. The following table summarises all 271 responses ??:-

Now we subtract the consecutive cell frequencies from the one to the right except for option 3 for which we only subtract the freq of the first cell. Doing so we get the following table? ??:-

As we can see from the above table the largest 2 groups are 2 and 4 options and at 162 and 93 freq respectively. Assume a multinomial model, given a person consider poverty limit to be either option 2 or option 4, no of person who consider option 4 is poverty limit (call this x) should follow $\text{Bin}(271, p)$. If 'Has TV telephone but not computer' is more likely option then $p < 0.5$. So we perform the test of hypothesis with $H_0 : p = 0.5$ vs $H : p < 0.5$.

Table 10: Perturbation under levels according to Possession of Assets

Access to Healthcare	Neither there is any nearby health center, nor has money to afford medicines	Nearby health center is not available but has money to afford medicines	There are nearby health center(s) but cannot afford medicines	There are nearby health center(s) and can afford medicines
No. of responses in each category	0	162	85	255

Table 11: Perturbation under levels according to Possession of Assets

Access to Healthcare	Neither there is any nearby health center, nor has money to afford medicines	Nearby health center is not available but has money to afford medicines	There are nearby health center(s) but cannot afford medicines	There are nearby health center(s) and can afford medicines
No. of responses in each threshold	0	162	85	93

The test statistics is $\frac{\frac{x}{271} - 0.5}{\sqrt{\frac{1}{4 \times 271}}} = -5.163382$ which follow $N(0, 1)$ approximately and $P(Z < 4.0699602) = 1.212636e - 07$ so we reject the null hypothesis H_0 at level 0.05.

So based on this data we come to this shocking judgement that having access to healthcare without money is considered 'poor'.

5.5.6 Access to Housing

The question asked for this section is- "Whom of the following will you consider not poor?". The participants were told to choose from the following options.

1. Has no shelter
2. Living in a sustainable kaccha house
3. Living in an unsustainable pucca house
4. Living in a little less secured tenant, but a sustainable pucca house

Like in the previous case there is no clear ordering in these options. However we know any respondent marking the 1 response will also mark all other responses. So responses which don't follow this partial order are labeled conflicting. Observer we can't just say pukka houses are better than kuchha house as doing so will introduce our own bias. Indeed 79 respondents think pukka house owners are poor compared to kuchha house owners(79 is a pretty high no that we can't

ignore as misinterpretations so we aren't including this under the conflicting tag). Analysing the data we found 0 such conflicting responses as we recorded 0 response in 'Has no shelter' option to be considered 'not poor', as expected. So there's nothing to remove. The following table summarises all 271 responses ??:-

Table 12: Perturbation under levels according to Possession of Assets

Access to Housing	Has no shelter	Living in a sustainable kaccha house	Living in an unsustainable pucca house	Living in a little less secured tenant, but a sustainable pucca house
No. of responses in each category/threshold	0	179	148	169

As we can see from the above table the largest 2 groups are 3 and 4 options and at 179 and 169 they are too close so we expect the null hypothesis to be true here by a large margin. Assume a multinomial model, given a person consider poverty limit to be either option 3 or option 4, no of person who consider option 3 is poverty limit (call this x) should follow $\text{Bin}(271, p)$. If 'Has TV telephone but not computer' is more likely option then $p < 0.5$. So we perform the test of hypothesis with $H_0 : p = 0.5$ vs $H : p < 0.5$.

The test statistics is $\frac{\frac{x}{271} - 0.5}{\sqrt{\frac{1}{4 \times 271}}} = 4.0699602$ which follow $N(0, 1)$ approximately and $P(Z < 4.0699602) = 0.9999765$ so as expected we are unable to reject the null hypothesis H_0 at level 0.05.

So based on this data we fail to make a clear judgement to make the poverty line with respect to housing if we assume no preference between kuchha and pukka house or tenants.

6 Criticism of the World Multidimensional Poverty Index

The indices for the World Multidimensional Poverty Index are clearly faulty as is evident from the contrastive analysis. The poverty index, suffers from a major drawback. It fails to truly represent the common perception of poverty by enforcing hard boundaries on multiple dimensions of poverty. For example, the poverty index weighs drinking water at 1/18, but close inspection of the description yields that the accessibility of drinking water is at play here. Any individual is considered poor if safe drinking water takes more than a walk of 30 minutes for them. But any individual that takes a walk of more than 20 minutes to the closest source for safe drinking water is unlikely to be affluent. Hence, the hard boundary of thirty minutes is not perceived by the general population as the best measure of poverty. Hence, we look at the perturbation scores obtained in the survey and we put multiple weighted scores instead of one weighted score. We suggest the methodology to the alternative to the weight for drinking water at this point.

Our data consists of four columns titled the following :

Col. No.	Name
1	Walk_more_than_30_min
2	Walk_less_than_30_min
3	Water_connection_in_household_No_adequate_supply
4	Water_connection_in_household_Has_adequate_supply

The column names are self explanatory. The columns store 1 or 0 only, and 1 if the respondent considers an individual with the corresponding drinking water supply as **Not Poor**. Now, clearly, if the j th entry in column i is one, then the j th entry in column k should always be one for $k \geq i$. There were 39 responses that were anomalous, namely they had 0 after 1 in the sequence of columns, and they have been discarded from the dataset. We were left with 219 responses. The data were collected independently, and thus, we can assume that the responses are independent across rows.

6.1 Bernoulli Assumption

We assume that the first column entries are from a $\text{Bernoulli}(1 - q)$ distribution, where q is the probability of 0. Naturally we assume that q is large since the number of 0's is large for the first column. This assumption holds true on an intuitive stance, because this being the first question in this section of the survey, the responses can't be considered to represent the true perception. The subsequent questions are dependent on the first question, and how the respondent answers the subsequent questions given the answer to the first question is what we wish to examine. Thus, it is reasonable to assume that the first question is random, without an inherent prior or bias, and the distribution is as mentioned earlier.

6.2 Bayesian Setup

Following from the design of the questions, the answer to the survey tells us that a response of one means that the respondent surely believes that individual in question is not poor. But the confusion arises, if the response is 0, since then the respondent is not sure if the individual is poor or not. So, we model the data as follows. For every 1 as the response, the respondent believes that the concerned individual is not poor with probability one. If the response is 0, then the respondent believes that the individual is poor with probability p , and not poor with probability $1 - p$. But this probability also varies with every person, and since all sorts of variation are possible, we consider a prior of p to be the uniform distribution, that is, $p \sim U(0, 1)$.

6.3 Procedure

We shall consider the probabilities of an individual to be perceived as poor in the given four categories, and consider them to be the new weights in the poverty index for these categories. We therefore evaluate the probabilities first.

- The probability of an individual in the first category to be perceived as poor is first evaluated. Consider a person A in category one. Suppose that the scores that the person has received in the four categories are labelled as X, Y, Z and W respectively. Using the first Bernoulli Assumption, we observe that X is a random variable that follows Bernoulli Distribution that has been mentioned earlier. Now, the probability that a person is perceived to be poor under the assumption is

$$\begin{aligned} & \mathbb{P}[A \text{ is in group one and } A \text{ is perceived as poor}] \\ &= \mathbb{P}[A \text{ is perceived as poor in category one} | X = 0] \mathbb{P}[X = 0] + \\ & \quad \mathbb{P}[A \text{ is perceived as poor in category one} | X = 1] \mathbb{P}[X = 1] \end{aligned}$$

We now observe that the probability that if X is 1, then A is surely perceived as not poor, and hence, the probability of A being poor if X is 1 becomes 0. Finally, we observe that the probability becomes to be the following,

$$\begin{aligned} & \mathbb{P}[A \text{ is in group one and } A \text{ is perceived as poor}] \\ &= \mathbb{P}[A \text{ is perceived as poor in category one} | X = 0] \mathbb{P}[X = 0] \\ &= q \int_0^1 pdp = \frac{q}{2}. \end{aligned}$$

- We now look at A if he was in category 2. In category two, we find that the probability of A to be perceived as poor depends on the values of both X and Y . This can be observed as follows. If X is 1, then the value of Y must be 1 as well, in which case the probability of A being perceived as poor becomes 0. If only Y is 1, even then there is 0 probability that the

person is poor. Thus, we then are left only with the case that X and Y are both 0. Here, we find that the probability is just,

$$\begin{aligned} & \mathbb{P}[\text{A is in group two and A is perceived as poor}] \\ &= \mathbb{P}[\text{A is perceived as poor in category two} | X = 0, Y = 0] \mathbb{P}[Y = 0 | X = 0] \mathbb{P}[X = 0] \\ &= q^2 \int_0^1 pdp = \frac{q^2}{2}. \end{aligned}$$

We have both the outer probabilities to be q since, once the first person has been named to be poor, the respondent goes back to the initial state where there is no prior and the response is constructed back from scratch.

- Similarly we find that the probability for this case is also $q^3/2$
- Finally the probability for this case is just $q^4/2$.

We now assign the weights to the categories as the corresponding probabilities obtained here. But we need the most optimal value of q . For this, we look at the distribution of X , Y , Z and W . We observe that the distributions are just $\text{Ber}(1 - q)$, $\text{Ber}(1 - q^2)$, $\text{Ber}(1 - q^3)$ and $\text{Ber}(1 - q^4)$ respectively. But they are not independent. We evaluate the joint probability across all situations for these four variables, and we find that there are only five situations where the joint probabilities are 0's. We find that these situations are the following:

$$\begin{aligned} \mathbb{P}[X = 0, Y = 0, Z = 0, W = 0] &= q^4 \\ \mathbb{P}[X = 0, Y = 0, Z = 0, W = 1] &= (1 - q)q^3 \\ \mathbb{P}[X = 0, Y = 0, Z = 1, W = 1] &= (1 - q)q^2 \\ \mathbb{P}[X = 0, Y = 1, Z = 1, W = 1] &= (1 - q)q \\ \mathbb{P}[X = 1, Y = 1, Z = 1, W = 1] &= q \end{aligned}$$

Now, we just find the MLE for q . We have the likelihood function to be $L(q) = q^{508}(1 - q)^{201} \implies \hat{q} = \frac{501}{708}$. Hence, we shall use the new weights as $q/2$, $q^2/2$, $q^3/2$ and $q^4/2$.

6.4 Justification

We also observe that all of this must be done after testing the hypothesis that the World Multidimensionality Poverty Index is inaccurate. For in our case, since it gives 0 weight to the situations when the person does not fit in their description of poverty, we need to test, whether the population also divides the data into two parts with respect to poverty, where one of the parts has probability 0. We find that this hypothesis is soundly rejected in our data, and hence we proceed with the analysis.

7 Limitations of the Study

Some limitations of the study are as follows:

1. The topic, perception of poverty, seemed to be slightly hard to explain to common people, and it was found that some people were naively thinking that *they* had been put in the situation. So they inadvertently blended *their* socio-economic backgrounds with the profiles (in the contrastive comparison section) before coming to a conclusion. Also, since the questionnaire was quite lengthy, many people answered part of the questions and left, which resulted in loss of information and time.
2. This survey has been conducted on some selected areas near Kolkata and nearby suburban areas. Thus the collected data is not a good representative of perception of poverty of peoples' of West Bengal. Thus to get a better estimate of these indicators we should implement larger scale surveys.
3. In some rural places, getting response from a female was a bit harder, they were either due to shyness or other reason like fear of low literacy didn't feel comfortable to give their opinions to us. So there is a biasness of the data and so doesn't cover the actual perception of whole population.
4. We had planned to emulate linear systematic sampling by surveying a household and skipping a fixed number of households, say 40, and continuing the pattern. Such a sampling scheme was expected to give better results. But in many places, taking into account the circumstances, that was not possible and we had to settle for other plans.
5. We planned to include only one person from the household, selected as per convenience, in the survey. However, some people consulted others to give their opinions and what finally arose out of the situation was a mixed set of responses.
6. The questions were slightly complicated in nature, leading to people often ignoring two of the indicators kept at constant levels (in the profiles of the Contrastive Comparison section), and focussing only on the two indicators that were switched across the profiles.
7. The paper mentioned using prior information about factors not present in the two choice options to fill up the values of those factors rather than keeping them all at zero, this requires trustable prior information which wasn't available at our disposal to start with.

8 Results and Conclusions

The study aimed to capture people's perception of poverty through questionnaire design, surveys, and data analysis. It focused on understanding which requirements people deemed important compared to others. The analysis used a discrete choice model to rank eleven poverty indicators based on respondents' views. The study found that the perception of poverty varied across genders, professions, and education levels. Certain indicators, like maternal health and child mortality, held different levels of importance for men and women. Different professions also prioritized specific indicators. Education status influenced the perception of poverty as well. The analysis included perturbation performance, revealing that individuals experiencing water scarcity considered water access crucial for escaping poverty. The perception of housing varied based on the adequacy of housing conditions. Visualizations showed that water problems were more prevalent than cooking deficiencies, and housing problems were the most common source of deprivation. There was no overlap between cooking, electricity, and housing deficiencies. Electricity and road problems were more prevalent, while medical deficiencies, electricity, and road deficiencies were considered less significant reasons for poverty. The study also explored differences in perception across gender and education status regarding perturbation attributes, including opinions on leisure time, paid work time, unpaid work time, and variations in time use across professions. The study conducted a data analysis using a partial profile choice experiment to assess preferences and trade-offs related to poverty indicators. Participants were presented with hypothetical scenarios and asked to identify the more impoverished scenario, indicating their preferred options. By analysing the choices, the relative importance of each indicator was quantified. The analysis used a model to determine the effects of different indicators on participants' preferences. The results showed the estimated coefficients for each indicator and their significance. The preference order of the indicators was determined based on these coefficients. The study also compared the preferences across gender and educational levels. Significant correlations were found between the opinions of males and females, as well as among different educational levels. The ordering of preferred indicators varied among different groups. Additionally, perturbation data analysis was conducted for the education and nutrition indicators. The study examined the responses and identified the levels that could be considered as poverty thresholds based on the data. Statistical tests were performed to determine the significance of these thresholds. Overall, the study provides insights into the perception of poverty indicators and their relative importance among different groups.

9 Reference

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