

Description of Methodology

BARC India

July 2021

Version 1.3

Table of Updates

Version	Date	Summary of Updates
1	July 2020	Base document
1.1	July 2020	Corrections for formatting and typos
1.2	September 2020	Section 4.2. addition of LPA
1.3	July 2021	TV Universe Estimate (UE) 2021 Added and Removed details w.r.t. OOH

Table of Contents

TABLE OF UPDATES.....	ii
TABLE OF CONTENTS.....	iii
1. SAMPLING AND RECRUITMENT	1
1.1. TV PANEL SAMPLE UNIVERSE.....	1
1.2. HOUSEHOLD SAMPLE FRAME.....	1
1.3. TV PANEL SAMPLING PROCESS.....	1
1.4. PANEL TURNOVER AND DE-INSTALLATION.....	5
1.5. HOUSEHOLD MEMBERS INELIGIBLE TO PARTICIPATE.....	5
2. SAMPLE WEIGHTING.....	6
2.1. CELL WEIGHTING	6
2.1.1. TV PANEL WEIGHTING.....	7
2.2. MINIMUM AND MAXIMUM WEIGHTS	9
2.3. COLLAPSING.....	9
2.4. TYPES OF WEIGHTS.....	9
2.5. SAMPLE CONTROL CONFIGURATIONS.....	9
2.5.1. PRIMARY CONTROL VARIABLES.....	9
2.5.2. SECONDARY CONTROL VARIABLES.....	10
2.6. TV UNIVERSE ESTIMATES (WEIGHTING AND CONTROL).....	12
3. PANEL SIZE AND DESIGN.....	13
3.1. TV PANEL SIZE AND DESIGN	13
3.1.1. TV PANEL SIZE	13
3.1.2. TV PANEL DESIGN.....	13
4. DATA PROCESSING	14
4.1. PRE-PROCESSING.....	14
4.1.1. TV SET SESSION	14
4.1.2. MAGNETISATION	14
4.1.3. BRIDGING.....	14
4.1.4. INDIVIDUAL VIEWING SESSIONS WITHIN A CLOCK MINUTE.....	15
4.1.5. CHANNEL VIEWING SESSIONS WITHIN A CLOCK MINUTE.....	15
4.2. DATA VALIDATION	16
5. TECHNICAL DETAILS.....	17

5.1. METERING WATERMARK EMBEDDER.....	17
5.2. METERING UNIT.....	17
5.2.1. INDIVIDUAL VIEWER IDENTIFICATION	17
5.3. DATA CAPTURE, STORAGE, TRANSMISSION, AND COLLECTION	18
6. METHODOLOGICAL FLOW FOR TV PANEL	19
7. SOURCES OF ERROR IN BARC TELEVISION AUDIENCE ESTIMATES	20
7.1. ERROR OF NON-OBSERVATION.....	20
7.1.1. SAMPLING ERROR.....	20
7.1.2. COVERAGE ERROR.....	20
7.1.3. NONRESPONSE ERROR.....	20
8. FRAME EXCLUSIONS AND INELIGIBLES IN BARC'S TELEVISION PANEL.....	22
8.1. PANEL EXCLUSIONS.....	22
8.2. INELIGIBILITY	22
8.2.1. MEDIA INELIGIBILITY	22
8.2.2. HOUSEHOLDS WITHOUT A KITCHEN.....	22
8.2.3. OTHER INELIGIBILITY	23
APPENDIX 1. LIVE TESTING PROCEDURES.....	24
IMMATERIAL IMPACT TEST	24
MINOR IMPACT TEST	24
APPENDIX 2. NEW CONSUMER CLASSIFICATION SYSTEM (NCCS) ASSIGNMENT PROCESS.....	25

1. Sampling and Recruitment

1.1. TV PANEL SAMPLE UNIVERSE

BARC India's (BARC's) various measurement products cover distinct sample universes. A sample universe is the target population that various audience estimates are projected to, and hence, represent.

The sample universe for BARC's currency electronic measurement panel consists of individuals two years of age and older, residing in television households in all parts of India except certain geographies that are unreachable due to harsh terrain, distance, or political unrest and safety concerns. These uncovered areas include Andaman & Nicobar Islands, Lakshadweep, Kashmir Valley, Ladakh UT and Arunachal Pradesh (except Itanagar).

1.2. HOUSEHOLD SAMPLE FRAME

The sample frame for BARC's TV panel is designed to include private households in all parts of India except those within the uncovered areas of the Sample Universe (see section 1.3.1.1.1). Electoral rolls form the basis of BARC's sample frame.

1.3. TV PANEL SAMPLING PROCESS

The BARC India panel is recruited in a two-stage process. The first stage consists of the Broadcast India (BI) Establishment Survey (ES). This is a large-scale face-to-face survey of a sample of approximately 3 lakh households from the target population. The ES furnishes a list of households (i.e., sampling frame) from which the panel itself is drawn. In the case where there are not sufficient ES records to meet panel recruitment needs, additional households are added to the sampling frame through the process of a listing study (LS).

The second stage of the process is Recruitment. It is in the recruitment stage where the appropriate candidate households are approached to join the panel.

1.3.1.1. STAGE ONE: ESTABLISHMENT SURVEY AND LISTING STUDY

The first step in the sampling process is to *establish* each household in the sample. Each household is asked to complete a in-person survey that collects basic household demographics needed to control the panel such as television ownership, age and sex of household members, languages spoken in the household, mode of signal reception, and other variables. All households that complete the establishment process, except those who are excluded for occupational reasons (see section 1.5), are available for recruitment, provided the household has at least one working television set.

The ES is conducted annually with field work occurring over a period of several months. However, ES was suspended for the past 2 years because of the potential impact on Universe Estimates (UEs) by NTO in 2019 followed by nation wide lockdown due to COVID-19 in 2020 wherein it was not possible to conduct field work.

Between BI surveys, if the current ES does not furnish enough sample to meet panel recruitment needs, additional sample will be generated through a Listing Study. The Listing Study functions in a similar fashion to the ES, but is targeted only at regions where additional sample is needed.

1.3.1.1.1. SAMPLE SELECTION

The cluster head for ES sample clusters is randomly selected using a systematic random sampling approach from electoral rolls. Using this cluster head, households are selected to form sample clusters of a fixed size (c) for every sampling strata.

1.3.1.1.1.1. CLUSTER HEAD SELECTION

A 1-in-k systematic sampling selection procedure is used then to choose cluster heads. The household selected by the sampling procedure is thereby the basic household. Should the basic household not be found, or refuses to participate, an alternate household is selected. The first two alternate households are the immediately prior and latter households (i.e., k_{-1} , k_{+1}) from the electoral role. The third alternate household is the household immediately on the right from the closest intersection to households k_{-1} , k , and k_{+1} . Subsequent alternate households are obtained using the next household on the right until a successful complete is obtained – forming the cluster head.

1.3.1.1.1.2. SUBSEQUENT CLUSTER HOME SELECTION

Subsequent cluster homes are selected based upon the initially completed cluster head, be it a basic or alternate cluster head. From this initial household, subsequent households are selected using a right-hand-rule with a pre-determined skipping pattern.

1.3.1.1.2. SAMPLE TARGET

The total sample target for BI 2021 is set at 3,00,000 households and is set for two dimensions: Urban/Rural and Hindi Speaking Markets (HSM)/South (Table 1). The Urban/Rural split is based on market needs and determined by BARC’s Technical Committee (TechComm). The HSM/South split is based on the current Universe Estimates (UEs).

Table 1
BI target sample splits

		Region		
		HSM	South	Total
Region Type	Urban	<u>1,06,110</u>	<u>48,438</u>	<u>1,54,548</u>
	Rural	<u>1,15,710</u>	<u>29,742</u>	<u>1,45,452</u>
Total		<u>2,21,820</u>	<u>78,180</u>	<u>3,00,000</u>

ES targets are re-assessed prior to every survey and are adjusted accordingly.

Listing Studies have sample targets based on the shortfalls in available sample for recruitment and panel recruitment needs.

1.3.1.2. STAGE TWO: RECRUITMENT SAMPLE

Recruitment sample is randomly selected from homes that completed the ES or listing study. Sample can be selected from the most recent ES or listing study. Only in exceptional cases will sample be selected from older studies. This is to ensure that the information regarding the household, furnished by the ES or listing study, is as up to date as possible.

To ensure against any convenience sampling on the field, ‘clusters’ (or groups) of eligible HHs are created by BARC India based on panel control variables. All households in a single cluster are equally eligible to be recruited, and any single household is representative of the relevant cell that the cluster aims to fill. IDs of these HHs are fed into a central ID Master, which uploads the address and other relevant details of the household, along with a priority, to the mobile tablets used by assigned field executives. The field executives are expected to approach only the HHs which are in the cluster, and request them to join the panel. Once one household in a cluster agrees to be a panelist, the remaining un-attempted households move back into the main pool for future use, and households that are rejected/refused to be a panelist are churned out of the database.

1.3.1.2.1. PANEL TARGET

The current panel target is 50,000 households¹. The panel target is set for three dimensions: megacities/ Rest of Urban/Rural and HSM/South (Table 2). The megacities/rest of Urban/Rural split is based on market needs and is determined by BARC’s TechComm. The HSM/South split is based on the current UEs.

Table 2
Panel splits

		<u>Region</u>		
		<u>HSM</u>	<u>South</u>	<u>Total</u>
Region Type	Megacities	15%	18%	16%
	Rest of Urban	47%	38%	44%
	Rural	38%	44%	40%
Total		66%	34%	100%

1.3.1.3. RECRUITMENT PROCESS

The field recruiter goes to the household sample location assigned by BARC India Measurement Science, explains the purpose of the BARC India TV Measurement Service and then seeks consent from the chief wage earner and householder for registering with BARC India. If the household is eligible (i.e. no disqualifications basis media/research affiliations of household members, adequate GSM wireless signal strength, agreement to incentives provided by BARC India, confirmation of compliance) the field recruiter asks the householder to provide specific household and household member information via a standardized panel recruiting questionnaire administered by the recruiter using a computer tablet app.

¹ This target will be increased to 55,000 households in 2022

Presently, fieldwork for panel recruitment and ongoing maintenance is handled by Meterology Data Pvt. Ltd. (MDPL) as well as three independent agencies, hereinafter called the Panel Management Agency recruited by MDPL.

An integrated “Panel Management Software (PMS)” links the mobile tablet that the field executives carry to the server, thereby enabling capture and transfer of panel household details via the wireless cellular network directly to BARC’s central office server. Automated validation checks in-built in the PMS enable many quality control checks to ensure panel health. This provides BARC India with a fully automated data collection process for use at all stages of the panel household relationship.

Strict confidentiality is maintained at all steps of the panel recruitment, training and maintenance process. Ongoing hygiene checks are performed on Panel Management Application (PMA) fieldwork by BARC India and its Design and Quality Control partners.

1.3.1.4. PANEL MAINTENANCE

The viewing behaviour of panel homes is reported to BARC India daily. The BARC India validation process analyzes household and individual viewership behaviors, highlighting behaviors considered to be outliers (at individual/household level). Based upon validation results, Measurement Science asks the PMA to perform coincidental checks on these homes either telephonically or physically. Certain suspicious outliers are also checked directly by BARC India – bypassing the Panel Management Application (PMA). BARC India also involves a separate vigilance agency to check on outliers that it considers highly suspicious. Non-compliance is categorised as a behavioural issue of the household or a technical issue with the meter. Any discrepancy in information is noted at this stage. If it is a behavioural issue, the household is then re-trained. If non-compliance continues, then the panel home is dropped. If there is a technical issue with the meter, then the issue is resolved by the BARC India field and technical teams. Where needed, technical issues are raised with meter technology providers.

Panelist training and compliance maintenance are priority issues for the PMA. Pursuant to BARC India policy, those households that exhibit substandard compliance, when compared to BARC India standards, are retrained. However, if after retraining, a household continues to underperform, it will be churned out of the panel.

The training protocol specifies two post installation training visits. The first visit is generally made 3-5 days post installation and includes training household members in button pressing, observing the working condition of equipment, verifying that the user manual is provided and available for use, etc. The second visit, generally made 10-12 days post installation, includes coincidental checks – whether TV is ON or OFF, channel viewed and persons viewing with retraining as needed, in button pressing and confirming that the family member button assignments are correct. The PMS application also has a pre-loaded training module for this purpose.

To ensure up-to-date and correct household data as well as for periodic re-training, the Field SOP mandates a complete demographic check every six months of each panel household of all key variables.

1.3.1.5. REPLACEMENT SAMPLE

Recruitment of homes to the panel is done on a regular basis. Recruitment is required to replace homes that have been removed from the panel. Homes are removed for a variety of reasons, from household members' non-compliance to household's request. In order to maintain panel balance, homes selected for replacement sample are matched as closely to the current needs of the panel (see section 2.5 for control strata). Depending on the needs of the panel at the time of recruitment, homes selected for recruitment may not match the homes which were dropped from the panel.

1.4. PANEL TURNOVER AND DE-INSTALLATION

In line with the Ministry of Information and Broadcasting's (MIB's) Policy Guidelines for Television Rating Agencies in India, BARC India employs a panel rotation policy keeping the total annual rotation rate as 25% and maximum in-time sample of 7 years in the panel.

Panel rotation process includes natural attrition and forced churn. Panel replacement is thus the sum total of natural attrition and forced churn.

Panel rotation is typically achieved through a rotation policy. In case of TV panel, households on the panel have a maximum time-in-sample in which they can remain in the panel. Despite forced turnover incurring high costs and overall churn rates, forced churn is a simple and commonly used method in many global television audience measurement panels.

The forced churn at BARC India is planned in such a manner that older panel homes are removed first, while maintaining the representativeness of the panel. The rotation is conducted in a staggered manner by rotating panel homes every month.

1.5. HOUSEHOLD MEMBERS INELIGIBLE TO PARTICIPATE

All household members, 2 years of age or older, are recruited to participate in the panel. This method maximizes the use of sample and reduces the possible bias that may arise from using age/sex quotas. Additionally, participation in the panel is facilitated when all household members are involved.

Households with members employed by broadcasters, advertisers, broadcast distributors, media affiliates or market research, are ineligible to participate.

2. SAMPLE WEIGHTING

Sample weighting is a technique used to compensate for disproportionate representation of specific population groups in the in-tab sample. This approach guarantees the data will properly replicate the behavior of the population they represent.

Two conditions must be present for sample weighting to be used:

- a. Specific population groups are disproportionately represented in the sample; and
- b. The behavior that is measured is likely to be different for those specific population groups.

2.1. CELL WEIGHTING

BARC India uses a cell weighting technique designed to maximize the reliability of the sample data and minimize any statistical bias. This is achieved by performing the least amount of weighting required to correct for sample disproportionalities that may distort the estimates of the audience.

Cell weighting uses the interlaced cell universes across all weighting classes. Weights for all individuals or households within an interlaced weighting class are computed separately. For each interlaced weighting class, there is a universe estimate, which means that there is one population estimate for each interlaced weighting class. The sample is then weighted to the universe estimate by dividing the population estimate (N_i) by the sample count (n_i). Each individual, or household, within the same interlaced weighting class, therefore, carries the same weight.

$$w_i = \frac{N_i}{n_i}$$

The cell weighting technique will not produce reliable results if a weighting class is empty or if it falls well below the target in-tab for that weighting class. In cases where the number of respondents in one or more weighting classes is well below the target in-tab, weighting classes may be collapsed into a new single weighting class. For example, the weighting classes of NCCS A and B may be collapsed into a new weighting class of NCCS AB in order to produce reliable weighted in-tabs.

The panel is weighted separately for household and individual level ratings with each level carrying its own set of weighting variables.

2.1.1. TV PANEL WEIGHTING

BARC's panel is weighted at two levels: Individual and Household.

2.1.1.1. TV PANEL INDIVIDUAL LEVEL WEIGHTING

The sample in BARC's panel measurement service is weighted on five variables at the individual level, each with two or more weighting classes:

1. State group (Table 3);
2. Town class (Table 4);
3. New Consumer Classification System (NCCS) (Table 5);
4. Sex (Table 6); and
5. Age Group (Table 7)

Table 3

Individual state group weighting classes

- | | | |
|---------------------------------|------------------------------------|---|
| • Bihar – Jharkhand | • Kerala | • West Bengal |
| • Andhra Pradesh –
Telangana | • Madhya Pradesh –
Chhattisgarh | • Uttar Pradesh –
Uttarakhand |
| • Delhi Sales region | • Maharashtra – Goa | • North East-Sikkim ³ |
| • Gujarat - DNH ² | • Odisha | • Rajasthan |
| • Karnataka | • Tamil Nadu - Puducherry | • Punjab – Chandigarh |
| | | • Haryana – Himachal
Pradesh – Jammu &
Kashmir ⁴ |

Table 4

Individual town class weighting classes

- | |
|---------------------------|
| • Urban 75 lakh and above |
| • Urban 10 to 75 lakh |
| • Urban 1 to 10 lakh |
| • Urban below 1 lakh |
| • Rural |

Table 5

Individual NCCS weighting classes

- | |
|-------------------|
| • NCCS A |
| • NCCS B |
| • NCCS C, D, or E |

² Includes the Union Territories of Daman and Diu, and Dadra and Nagar Haveli.

³ Includes the States of Sikkim, Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Tripura and Mizoram.

⁴ Includes Jammu region from UT Jammu & Kashmir.

Table 6

Individual sex weighting classes

-
- Male
 - Female
-

Table 7

Individual age group weighting classes

-
- 2 to 21 years of age
 - 22 years of age or older
-

2.1.1.2. TV PANEL HOUSEHOLD LEVEL WEIGHTING

The sample in BARC's panel measurement service is weighted on three variables at the household level, each with two or more weighting classes:

1. State group (Table 8);
2. Town class (Table 9); and
3. NCCS (Table 10).

Table 8

Household state group weighting classes

-
- | | | |
|---------------------------------|------------------------------------|---|
| • Bihar – Jharkhand | • Kerala | • West Bengal |
| • Andhra Pradesh –
Telangana | • Madhya Pradesh –
Chhattisgarh | • Uttar Pradesh –
Uttarakhand |
| • Delhi Sales region | • Maharashtra – Goa | • North East ⁶ - Sikkim |
| • Gujarat - DNH ⁵ | • Odisha | • Rajasthan |
| • Karnataka | • Tamil Nadu - Puducherry | • Punjab – Chandigarh |
| | | • Haryana – Himachal
Pradesh – Jammu &
Kashmir ⁷ |
-

Table 9

Household town class weighting classes

-
- Urban 75 lakh and above
 - Urban 10 to 75 lakh
 - Urban 1 to 10 lakh
 - Urban below 1 lakh
 - Rural
-

Table 10

Household NCCS weighting classes

-
- NCCS A
 - NCCS B
 - NCCS C, D, or E
-

⁵ Includes the Union Territories of Daman and Diu, and Dadra and Nagar Haveli.

⁶ Includes the States of Sikkim, Arunachal Pradesh, Assam, Meghalaya, Nagaland, Manipur, Tripura and Mizoram.

⁷ Includes Jammu region from UT Jammu & Kashmir.

2.2. MINIMUM AND MAXIMUM WEIGHTS

In order to ensure that the Sum of Weights matches the Universe of the weighting strata, BARC India does not employ the concept of minimum or maximum weights.

2.3. COLLAPSING

If the sample size in a particular weighting cell is too small, erratic results can occur during cell weighting. Therefore, prior to the weighting algorithm starting, BARC India passes the sample counts through a 'cell collapse' check. If a weighting does not pass the check, it will be joined with another weighting cell in order to ensure an adequate sample size. The 'cell collapse' check is based upon a pre-determined minimum sample count.

2.4. TYPES OF WEIGHTS

In BARC's panel, there is only one basic weight type: Daily. The data for each day is weighted separately and then combined at the individual level.

2.5. SAMPLE CONTROL CONFIGURATIONS

For the panel, BARC India balances the recruited sample to one set of independent population estimates. Since entire households are recruited, balancing occurs at the household level. The panel is balanced against a set of Primary and Secondary Control variables. Maintaining the balance of Primary variables takes precedence over Secondary variables. These variables have been selected as they have been shown to have the most impact on the variability of television audience estimates.

The primary control variables (strata) for the panel are state group, town class, and NCCS. The secondary control variables for the panel are household size, languages spoken at home + language most often spoken at home, education of the highest educated individuals in the household and mode of signal reception (MOSR).

2.5.1. PRIMARY CONTROL VARIABLES

2.5.1.1. STATE GROUP

The state group demos in which BARC India balances the TV panel on are as follows (

Table 11).

Table 11

State group control strata

• Bihar – Jharkhand	• Kerala	• West Bengal
• Andhra Pradesh – Telangana	• Madhya Pradesh – Chhattisgarh	• Uttar Pradesh – Uttarakhand
• Delhi NCR	• Maharashtra – Goa	• North East ³
• Gujarat – DNH ²	• Odisha	• Rajasthan
• Karnataka	• Tamil Nadu – Puducherry	• North ⁴

2.5.1.2. POP STATA

The town class demos in which BARC India balances the TV panel on are as follows (Table 12).

Table 12: Pop strata

-
- Urban 75 lakh and above
 - Urban 10 to 75 lakh
 - Urban 1 to 10 lakh
 - Urban below 1 lakh
 - Rural
-

2.5.1.3. NCCS

The NCCS demos in which BARC India balances the TV panel on are as follows (Table 13).

Table 13

NCCS control strata

-
- NCCS A
 - NCCS B
 - NCCS C
 - NCCS D or E
-

2.5.1.4. PIN-CODE

Sample targets in all sampled towns are stratified proportionately across all known pin-codes to avoid cluttering of panel homes.

2.5.2. SECONDARY CONTROL VARIABLES

2.5.2.1. HOUSEHOLD SIZE

The household size demos in which BARC India balances the panel on are as follows (Table 14).

Table 14

Household size control strata

Household size	Number of members
Small	1 to 2 members
Medium	3 to 4 members
Large	5 or more members

2.5.2.2. LANGUAGES SPOKEN AT HOME + LANGUAGE MOST OFTEN SPOKEN AT HOME

This control variable is an interlace between the languages spoken at home (LSOH) and the language most often spoken at home (LMOS). The specific levels vary for each state group by townclass and are based upon the local languages and propensity for other languages. For example, the levels can be as simple as three languages as in the case of rural towns with a population of 2 to 5 lakhs in Kerala (Table 15) or can be as complicated as seven in the case of Mumbai Sales Region (Table 16).

Table 15

LMOS + LMOS control strata for rural towns with a population of 2 to 5 lakh in Kerala

- Languages spoken at home do not include English and language most often spoken is Malayalam
 - Languages spoken at home do not include English and language most often spoken is not Malayalam
 - Languages spoken at home includes English
-

Table 16

LMOS + LMOS control strata for rural towns with a population of 2 to 5 lakh in Mumbai Sales Region

- Languages spoken at home do not include English and language most often spoken is either Hindi or Bhojpuri
 - Languages spoken at home do not include English and language most often spoken is Marathi
 - Languages spoken at home do not include English and language most often spoken is Gujarati
 - Languages spoken at home do not include English and language most often spoken is not Hindi, Bhojpuri, Marathi, or Gujarati
 - Languages spoken at home includes English and language most often spoken is Marathi or Hindi
 - Languages spoken at home includes English and language most often spoken is Gujarati or English
 - Languages spoken at home includes English and language most often spoken is not Marathi, Hindi, Gujarati, or English
-

2.5.2.3. EDUCATION OF THE HIGHEST EDUCATED INDIVIDUAL IN THE HOUSEHOLD

The education of the highest educated individual in the household demos in which BARC India balances the TV panel on are as follows (Table 17).

Table 17

Education of highest educated individual in the household control strata

- Up to 9th standard
 - SSC/HSC, some college but not graduate
 - Graduate+
-

2.5.2.4. MODE OF SIGNAL RECEPTION

The mode of signal reception (MOSR) demos in which BARC India balances the TV panel on are as follows (Table 18).

Table 18

Mode of signal reception control strata

- Cable
 - Direct to Home (DTH)⁸ – Free
 - Direct to Home (DTH) – Pay
-

⁸ This includes Freedish Connection and analogue antenna

2.6. TV UNIVERSE ESTIMATES (WEIGHTING AND CONTROL)

Post Launch of the TV panel in 2015, BARC India has completed two BIs – one in the year 2016 followed by BI in 2018. Details for both the BIs along with implementation dates for UEs update in panel are in table no. 19.

2.6.1 TV UEs 2020 – IMPLEMENTED IN 2021

An alternate approach for estimating TV UEs was used for development of TV UEs and subsequently got implemented in first half of 2021. Projection and execution dates of alternate methodology are mentioned in table no.19.

Table 19: Details of TV UEs implemented

Study name	Field work period	TV UE Projection date	UE update into panel
BI 2016	October 2015 to January 2016	1 st March 2016	18 th February 2017 (i.e. Week 8)
BI 2018	November 2016 to March 2017	1 st January 2018	14 th July 2018 (i.e. Week 29)
TV UE 2020	NA	1 st March 2020	3 rd April 2021 (i.e. Week 13)

2.6.1.1 METHDOLOGY FOR TV UEs 2020

TV UEs have been developed by computing the linear growth of TV Households and TV Individuals from the past two Broadcast India studies (i.e., BI 2016, BI 2018) at geographic and demographic levels (i.e. State group, Population strata, Age group and Sex). The distribution of the TV population by NCCS was then taken from the latest Indian Readership Survey.

Linear growth is computed using the following formula

$$Y = b_0 + b_1x$$

Y = 2020 estimate

b_0 = BI 2018 estimate

b_1 = monthly growth rate between BI 2016 and 2018: (BI 2018 estimate – BI 2016 estimate) / number of months between projection points

x = number of months between 2020 and BI 2018 projection points

BARC India has updated universe for weighting and panel control from Week 14 of 2021.

3. PANEL SIZE AND DESIGN

3.1. TV PANEL SIZE AND DESIGN

3.1.1. TV PANEL SIZE

BARC's TV panel size is mandated by the Ministry of Information and Broadcasting's (MIBs) Policy Guidelines for Television Rating Agencies in India. The panel size is currently 44,000 households with a planned expansion to 50,000 households in the 2021 calendar year. The design for 50,000 panel expansion is planned basis the TV composition arrived from the new TV UEs 2020. As per the MIB's guidelines, an over-installation of 10% is required, thereby requiring the 45,500 household panel to effectively be contained within an installed base of 50,000 households.

3.1.2. TV PANEL DESIGN

The initial panel of 22,000 HHs was allocated per state group/metro based on Relative Errors (REs). RE is a type of statistical sampling error described as the potential deviation expressed as a percentage of the observed value from the actual/expected value due to using a sample. As the sample size is increasing (currently at 50,000 HHs), REs are naturally reducing. For the increased sample, BARC India has also considered improved weighting efficiencies for designing the panel (i.e., decreasing the variance in assigned individual weights).

All cities with a population above 5 lakhs as per Census 2011 are selected individually (except for Srinagar). Sample allocations for all other town classes within a State are based on the town-class group which is further allocated to Probability Proportionate to Size (PPS) among TV owning Households. Selection of actual Towns/Villages was performed by means of systematic random sampling after arranging available Towns/Villages in descending order basis their TV owning household populations.

The panel is statistically representative of the entire country.

3.1.2.1. OVERSAMPLING IN THE PANEL DESIGN

In order to ensure the usability of the BARC TV panel data, a minimum sample target of 180 households is maintained for each geographic weighting strata. Additionally, due to the heterogeneity of viewing and other market dynamics, BARC India oversamples megacities and urban India (Table 20).

Table 20
TV Universe and sample proportions by regions

Region	TV Universe 2020	Sample Design
Megacities	11%	16%
Urban India less megacities	32%	44%
Rural India	57%	40%

4. DATA PROCESSING

BARC India employs two primary data processing steps: pre-processing and validation.

4.1. PRE-PROCESSING

The data from the collection server is first pre-processed, where errors and inconsistencies that may creep in due to technical issues are cleaned up. In this state, attribution rules are applied.

Data collected from the meters is in seconds. However, in keeping with international standards, all validations rules are on viewing sessions (blocks of time of TV Set on in the HH – Tuning; and of each individual viewing TV - Viewing) and reported data is in clock minutes. Hence, all data needs to be converted to clock minutes (i.e. HH:MM format, e.g. 12:00:00 to 12:01:00, 12:01:00 to 12:02:00 and so on).

Attribution rules are applied on the statement file at the pre-validation stage, i.e. after the data is received from collection servers for production processing and validation.

There are five conditions under which viewing behaviour is to be attributed:

1. TV set session;
2. Magnetisation;
3. Bridging;
4. Individual viewing sessions within a clock minute; and
5. Channel viewing sessions within a clock minute.

4.1.1. TV SET SESSION

BARC India attributes viewing to the minute. If a TV set is on for 30 seconds or more in a clock minute, it is attributed as being on for the entire clock minute. In the BAR-O-Meter measurement system, TV On and Off status is determined by the presence or absence of a watermarked channel. Since viewership of non-watermarked channels is not captured by the BAR-O-Meter, any viewing of non-watermarked channels is considered as TV Off.

4.1.2. MAGNETISATION

There is generally a gap between the time viewers switch on the TV set, move to the channel intended to be viewed, and press their viewing buttons on the BARC India remote. Unless removed, this gap would depress viewing by the duration from the time the TV is switched on and the individual button is pressed. A Magnetisation algorithm is applied in such cases and viewership of these individuals is 'magnetised' or linked back to the time when the first watermarked channel was started to be viewed.

4.1.3. BRIDGING

Bridging applies only to TV sets measured with BAR-O-Meters for use when people put the TV set on mute for short durations (i.e., 3 minutes). Unless this gap is 'bridged', it would be considered as TV off and the time spent viewing during the gap would not be captured. In order to include the gap as viewing time, a bridging algorithm is applied when no watermark is present in between two watermarked channels for a certain maximum duration. For bridging, the following rules are applied on the TV set:

- In case the channel before and after the non-watermarked duration is the same, viewing duration of the non-watermarked period is attributed entirely to this channel.
- In case the channels before and after the non-watermarked duration are different, viewing duration of the non-watermarked period is attributed alternately to the earlier and later channel, i.e. the viewing is attributed to the channel being viewed before the non-watermarked duration in the first, third, fifth (and so on) instances observed in the system; and the viewing is attributed to the channel being viewed after the non-watermarked duration in the second, fourth, sixth (and so on) instances observed in the system.

4.1.4. INDIVIDUAL VIEWING SESSIONS WITHIN A CLOCK MINUTE

There are rules applied to the second by second events that attribute viewing to one and only one TV channel for an entire clock minute. In each system, only one channel is eligible to receive viewing credit for each clock minute throughout the viewing day. If an individual is viewing a TV channel for 30 seconds or more in a clock minute, the rules are straightforward and viewing is attributed to that channel for the entire clock minute.

The rules become more complex when viewing during a clock minute involves multiple channels for a total of 30 seconds or more. Additional rules are required as described below for processing BAR-O-Meter event data.

4.1.5. CHANNEL VIEWING SESSIONS WITHIN A CLOCK MINUTE

Individuals can view multiple channels within a single clock minute. However, only one channel will be assigned the viewing in each clock minute. To assign this viewing, the following rules are applied:

4.1.5.1. ONLY ONE CHANNEL WATCHED

The viewing for the entire clock minute gets attributed to that channel.

4.1.5.2. MULTIPLE CHANNELS WATCHED WITH DIFFERENT VIEWING DURATIONS

Viewing is attributed to the channel with the maximum viewing duration.

4.1.5.3. MULTIPLE CHANNELS WATCHED WITH TWO OR MORE CHANNELS HAVING THE SAME MAXIMUM VIEWING DURATION

There are two scenarios for this rule:

- Scenario A – one of the channels with the maximum viewing duration moves into the next clock minute. In this case, viewing is attributed to the channel moving into the next clock minute; and
- Scenario B – none of the channels with the maximum viewing duration moves into the next clock minute. In this case, viewing is attributed to a random channel from among those channels having the maximum viewing duration, using a random allotment algorithm.

It is pertinent to note that the 30 seconds or more rule, wherever applied, refers to a total of 30 seconds in a clock minute – whether consecutive or not.

4.2. DATA VALIDATION

Validation of viewership data is a daily process performed at three levels. The first is the identification and treatment of landing page activities, the second is the identification of statistical outliers, and the third is against channels that have been confirmed as having attempted tampering of panel households following a rigorous process of Vigilance investigations and raw data analyses by Data Scientists. These data validation procedures consist of documented and strictly controlled rules applied in a transparent and systematic manner during daily production processing.

Validation rules and their application are subjected to external audit and ongoing review by the BARC Oversight Committee, but not otherwise disclosed to prevent individuals who might attempt to tamper with panel HHs to gain valuable insights.

Further details on BARC's data validation processes can be found here:

<https://barcindia.co.in/whitepaper/data-processing-and-validation-processes.pdf>

5. TECHNICAL DETAILS

For capturing TV viewing, BARC India uses a TV set metering technology that captures watermarks embedded in the audio transmission of TV channel transmissions to identify the channel being watched.

The BARC BAR-O-Meter captures TV usage, TV station identification, and individual viewing through the use of two digital devices: one installed by the broadcaster (embedder) at the station head end/transmission site(s) and the other – referred to as the BAR-O-Meter – that is installed on each TV set in the panel households.

5.1. METERING WATERMARK EMBEDDER

Embedder equipment is placed at the Broadcaster’s headend where the Channel signal transmission begins. The device embeds a unique watermarked code in the audio component of the program content workflow. This code consists of the Channel ID & the time stamp. Each channel has its own unique code (or codes, in case the channel has taken a back-up). Once the unique watermark IDs are generated and assigned to each broadcast station cooperating with BARC India, the embedder is installed at the broadcaster’s headend transmission site and a special channel specific electronic card is inserted. This results in the embedder continuously placing a time stamped channel name and watermark ID in the channel’s content workflow. The watermark is an inaudible audio code made available to TV broadcasters that subscribe to and support the BARC India measurement of TV audiences. A master list of TV Channel Watermarked IDs is stored on the BARC India server and downloaded to BAR-O-Meters for the identification and measurement of TV Channel viewing.

5.2. METERING UNIT

Each meter system consists of a main unit, a display unit and probes that capture the audio output of the TV set for BAR-O-Meters.

Each main unit is equipped with a microprocessor and a modem. The main unit is placed near the TV set being measured in the panel household. Each main unit has a probe attached to it that is either placed near the TV set or connected to the line or audio out of the TV. The probe captures the identity of each tuned TV signal and feeds this information to the main unit where it is time stamped and stored for transmission as viewing events to BARC’s central site collection servers assigned to BAR-O-Meter measurement systems.

5.2.1. INDIVIDUAL VIEWER IDENTIFICATION

The method of an individual person’s viewer identification for the BAR-O-Meter is a button pushing remote, a handheld device. The measurement system provides one handheld remote control unit for each metered TV set. The handheld device has buttons made available for assignment to household members who are asked as part of their panel participation to press their assigned button when they are viewing TV. Each panel household member aged 2 years and older is assigned a button on the remote control handheld unit. Separate buttons on the remote handheld device are reserved for use by guests, entering their gender and age bracket when viewing TV.

Note. While it is captured, guest viewing is not considered in the BARC audience estimates.

5.3. DATA CAPTURE, STORAGE, TRANSMISSION, AND COLLECTION

The TV set metering systems continuously and passively capture TV viewing events in real time, recording the time and duration of channel tuning events and capturing the viewership events of individual members aged 2 years or older that have pressed their viewer ID button to confirm their presence in the audience.

The main unit stores the individual time stamped events in memory for transmission to the BARC India server at predetermined intervals throughout the viewing day. The BAR-O-Meter TV viewing event data is then received by the BARC India collection server where collected TV event data is simultaneously backed up and made available to pre-processing software.

6. METHODOLOGICAL FLOW FOR TV PANEL

BARC India follows a methodological flow consisting of twelve distinct steps (Figure 1).

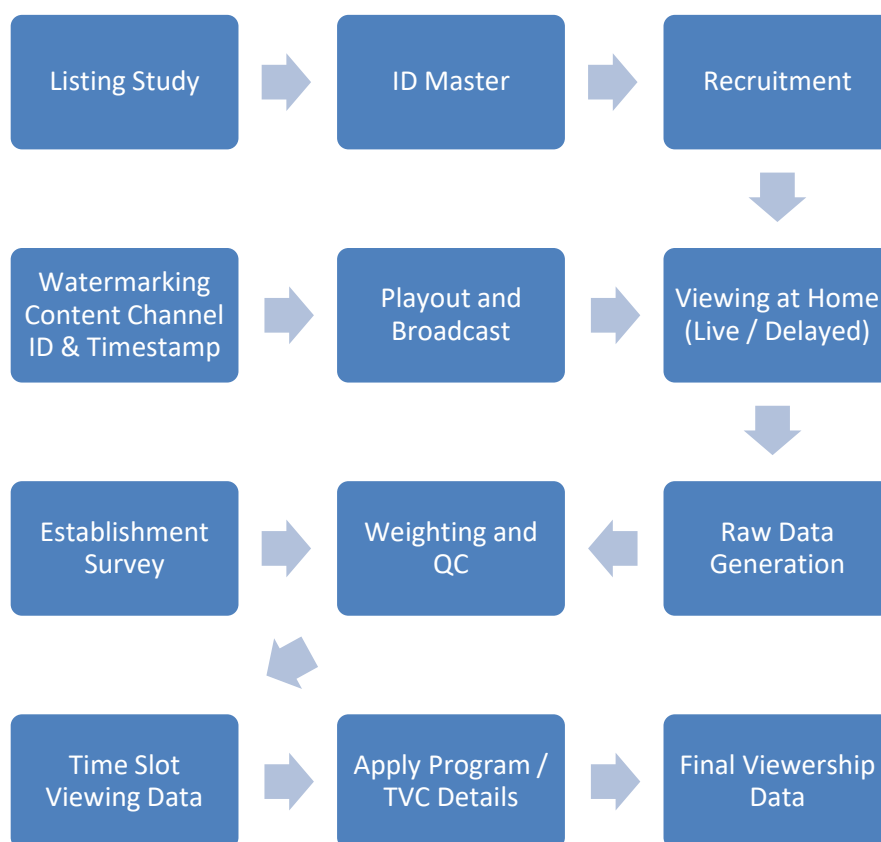


Figure 1. TV Panel Process Flow

7. SOURCES OF ERROR IN BARC TELEVISION AUDIENCE ESTIMATES

BARC's television rating services produces data which is used to produce ratings estimates. Since these estimates are based upon samples, there are several sources of error which they may be subject to. There are many ways to classify survey error, but in the scheme presented by Groves (1989)⁹ we can classify the potential errors associated with BARC's audience estimates as follows:

7.1. ERROR OF NON-OBSERVATION

There are three main areas where error of non-observation can be attributed to, namely: Sampling Error, Coverage Error and Nonresponse Error.

7.1.1. SAMPLING ERROR

Sampling Error (SE) can be defined as the error associated by observing a sample rather than a population. This type of error is the main cause of variation in estimates from sample to sample, or, in the case of BARC India, over time. Since BARC India employs probability samples, theoretically, the amount of possible sampling error in an estimate can be quantified through the Standard Error (SE), Confidence Interval (CI), or Relative Error (RE) of the estimate. BARC India encourages users to take the associated SE, CI, or RE into consideration for all estimates.

Information on BARC's REs can be found here:

<https://barcindia.co.in/whitepaper/barc-india-relative-error-whitepaper.pdf>

YUMI provides the option for SEs for the following audience estimates: Rat% and Rch%.

7.1.2. COVERAGE ERROR

Coverage Error specifically refers to the absence of certain populations in the sampling frame. In the case of BARC's television measurement service, the sampling process ensures that coverage error is minimized. Any non-sampled regions are excluded from the population UEs, thereby ensuring that the audience estimates are correctly projected.

7.1.3. NONRESPONSE ERROR

Nonresponse Error can be defined as any error which can be attributed to the inability to collect data from certain individuals. This error can include individuals who refuse to participate or individuals who are unable to be contacted (i.e., unit nonresponse) or missing data related to a sample element (i.e., item nonresponse). We can break both unit and item nonresponse into two main components: nonresponse Missing at Random (MAR) and nonresponse Not Missing at Random (NMAR).

⁹ Groves, R. M. (1989). *Survey Error and Survey Costs*. New York, NY: Wiley.

In the case of MAR, the nonresponse is non-systematic and therefore, not a problem. It can be accounted for through post-stratification, or weighting, techniques but will increase variance in responses. The case of NMAR is more serious since the Nonresponse is systematic and could result in biased estimates.

It is very difficult to measure nonresponse error. Typically, this error is measured through the Response Rate (RR) which is an indication of the success of a survey at representing the population of interest. However, the RR does not differentiate between MAR and NMAR nonresponse, or more specifically, quantify the amount of bias which may be present in the sample.

7.2. ERROR OF OBSERVATION

Errors of Observation are errors which can be attributed to the respondent, instrument or method of data collection. This includes, but is not limited to, panelist compliance, fraudulent behaviour or technical measurement issues.

BARC India monitors the panel for extreme tuning, viewing or behaviour and will remove panelists who are not complying properly. In extreme cases, data will be re-issued with the panelist removed.

8. FRAME EXCLUSIONS AND INELIGIBLES IN BARC'S TELEVISION PANEL

Television panel sampling frame excludes all Individuals below two years of age, Individuals residing in Non-TV owing homes and in uncovered areas[1], or geographies that are unreachable due to harsh terrain, distance, or areas with political unrest and safety concerns to the field workers.

BARC India uses a sampling process to establish and recruit households, and therefore has a limitation where the sampling frame is smaller than the Universe. This shortage, or gap, is referred to as frame exclusion. There are also cases where an household is ineligible or unable to be established or recruited. This is referred to as Ineligibility.

This section outlines the frame exclusions and ineligibilities in the BARC panel.

8.1. PANEL EXCLUSIONS

There are two primary exclusions in the panel, those related to uncovered areas and those related to other issues.

8.1.1 EXCLUSIONS DUE TO UNCOVERED AREAS

Certain areas of India are excluded from the sampling frame of the Panel. These uncovered geographies represent 0.6% of Indian households and 0.7% of Indian individuals. Since these areas are not covered in the study, BARC India also excludes their estimated population from the BARC India TV Universe Estimates. Therefore, this exclusion will have no impact on the accuracy of BARC's television audience estimates.

8.1.2. OTHER EXCLUSIONS

Due to technology reasons, households with either five or more television sets, or more than 13 members are not included on the panel. This represents an immaterial portion of the population, estimated to be 0.5%.

8.2. INELIGIBILITY

There are three cases which result in Ineligibility to be established or recruited, specifically Media Ineligibility, Households without a Kitchen, and Other Ineligibility.

8.2.1. MEDIA INELIGIBILITY

The following households are ineligible to participate for reason of media affiliation:

1. Households with members employed by Television Broadcasters, or Advertising Agencies (including repeat houses) are ineligible to participate; and
2. Households with members who are current or former employees of TAM Ltd. or BARC India.

8.2.2. HOUSEHOLDS WITHOUT A KITCHEN

BARC India requires a residential dwelling to have a kitchen in order for the household to be eligible for recruitment. Households living in a residential dwelling without a kitchen would therefore be considered an exclusion. According to the 2011 Census, about 38.7% of the Indian households (i.e., 9.6 crores) does

not have a kitchen. This exclusion is 47.2% and 20.6% in Rural and Urban India respectively. Television households are more likely to be of greater economic means and therefore the percentage without a kitchen is expected to be significantly lower.

8.2.3. OTHER INELIGIBILITY

Occasionally households are unable to be established or recruited due to language barriers or sickness/health issues. These households are treated as In-scope non-responding units for the purpose of Response Rate calculations.

APPENDIX 1. LIVE TESTING PROCEDURES

BARC India rarely conducts “live” tests in the panel. If a “live” test is requested either internally by staff or externally by members, the potential impact of the test is assessed by BARC’s Measurement Science Department, Management Assurance Department and the field team (i.e., MDPL) before proceeding with the plan. Within BARC India, the authority to run any Research or Operational test live, or to change current Standard Operating Procedures on the live panel lies with the Chief Executive Officer and the Chief of Measurement Science & Business Analytics, BARC India.

IMMATERIAL IMPACT TEST

Objectives and procedures are reviewed by and findings reported to BARC’s Technical Committee.

MINOR IMPACT TEST

Objectives and procedures are discussed, **approved by** and findings reported to BARC’s Technical Committee.

BARC India will communicate to all members that a test is to be conducted and will include the test in the Journal of Changes.

APPENDIX 2. NEW CONSUMER CLASSIFICATION SYSTEM (NCCS) ASSIGNMENT PROCESS

The New Consumer Classification System (NCCS) is a means of socio-economically classifying consumers in India. The NCCS classification of a household is based on two main variables:

1. Education of the household's Chief Wage Earner (CWE), defined as the person who contributes the most to the payment of household expenses; and
2. The ownership within the household of 11 specific durable goods. These durable goods are as follows:
 - a. Electricity connection;
 - b. Ceiling fan;
 - c. LPG stove;
 - d. Two-wheeler;
 - e. Colour TV;
 - f. Refrigerator;
 - g. Washing machine;
 - h. Personal computer / Laptop;
 - i. Car, Jeep, or Van;
 - j. Air conditioner; and
 - k. Agricultural land.

Based upon the above two variables, households are assigned an NCCS grade ranging from A1, being the highest, to E3, being the lowest. The assignment is based upon the grid in Table .

Table 21
NCCS assignment grid

<u>Education of the CWE</u>	<u>Illiterate</u>	<u>Illiterate but no formal schooling /up to 4th standard</u>	<u>Schooling between 5th and 9th standard</u>	<u>SSC / HSC</u>	<u>Some college but not graduated</u>	<u>Graduate /Post- graduate General</u>	<u>Graduate/ Post- graduate Professional</u>
None	E3	E2	E2	E2	E2	E1	D2
1	E2	E1	E1	E1	D2	D2	D2
2	E1	E1	D2	D2	D1	D1	D1
Number of Durables Owned	3	D2	D2	D1	D1	C2	C2
	4	D1	C2	C2	C1	C1	B2
	5	C2	C1	C1	B2	B1	B1
	6	C1	B2	B2	B1	A3	A3
	7	C1	B1	B1	A3	A3	A2
	8	B1	A3	A3	A3	A2	A2
	9+	B1	A3	A3	A2	A2	A1