@CASESGUESSTIMATES

# GUESSTIMATES

by Varun Khullar
Former Civil Servant
IIM Calcutta Alumnus

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knowledge solutions

# GUESSTIMATES

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Guesstimates are estimates based on a mixture of guesswork and calculation. They can be given independently or as a part of a case. The interviewer is generally looking to assess:

- Structure of your approach
- Comfort level with numbers and quick calculations
- Ability to make back of the mind checks to validate the numbers

As a part of the guesstimate you will required to make reasonable and logical assumptions, it is important to state them clearly and seek confirmation from the interviewer. You will not be expected to calculate the exact value, but a rough number.

## Approaches to solving guesstimates:

<u>Top-Down approach</u>

Involves starting with an entire population (in other words, the "top" level) and then breaking it down until you arrive at an answer.

The major elements of a top-down approach are:

- Identifying the correct starting universe
- Applying the right set of filters and relevant conditions. Segmentation can be carried out as follows:
    - Demographics (age, sex, income, ethnicity, etc.)
    - Psychographics (attitudes, behaviour, values, e.g. smoker vs non-smoker, dog vs cat person, etc.)
    - Geography (urban vs rural, Tier I/II/III cities, country, continent, etc.)
    - Channels (offline vs online, mobile app vs website, etc.)

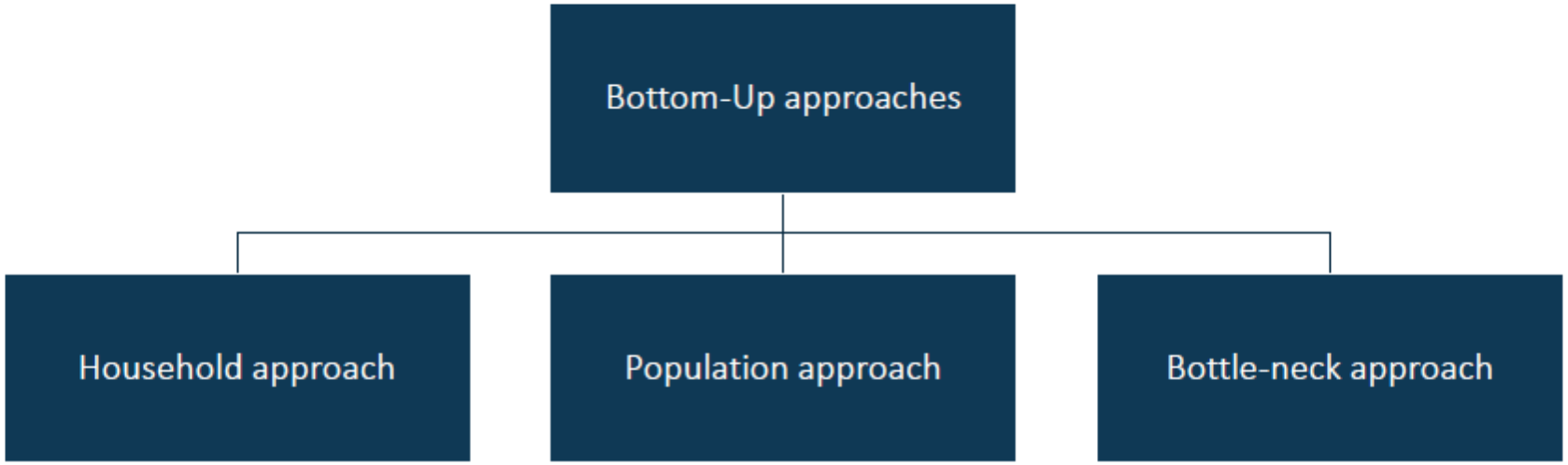
# GUESSTIMATES

Bottom-Up approach

For this approach, rather than starting from the "top" with a high-level figure such as population, the best approach is to start from the "bottom"—some low-level statistic, such as Revenue per customer, and build your way up to the answer.

Some common bottom-up approaches:

- Household approach
  - Example: For a guesstimate involving the number of cars, washing machines etc driving calculation using a household approach is easier
- Population approach
  - Example: For estimating the number of mobile phones, chocolates consumed, apparel bought a population approach can be used
- Bottle-neck approach
  - Example: For estimating the number of flights per day in a busy airport the number of available runways would serve as a handy bottleneck to base your calculations. There could also be a limitation on the production capacity of the manufacturer in certain cases



# APPENDIX A

## GUESSTIMATE STATISTICS

Following are some important statistics to keep in mind for solving guesstimates for market sizing and otherwise.

### Population Distribution in India (in Millions)

| Total Population | 1300 |
|---|---|

| Gender | (in Millions) | %Total |
|---|---|---|
| Males | 684 | 53% |
| Females | 616 | 47% |
| Sex Ratio (M/F) | 1.11 | |

| Geography | (in Millions) | %Total |
|---|---|---|
| Urban | 390 | 30% |
| Rural | 910 | 70% |

| Age Groups | (in Millions) | %Total |
|---|---|---|
| 0-14 | 390 | 30% |
| 15-24 | 260 | 20% |
| 25-34 | 195 | 15% |
| 35-44 | 195 | 15% |
| 45-54 | 130 | 10% |
| 55-64 | 130 | 10% |
| 65+ | 65 | 5% |

Note: 50% of the population is under 25, 65% under 35

| Income | (in Millions) | %Total |
|---|---|---|
| Below poverty line | 260 | 20% |
| Low income | 520 | 40% |
| Middle income | 390 | 30% |
| High income | 130 | 10% |

### Area wise Distribution of India (in '000 sq. kms)

| Total Area | 3300 |
|---|---|

| Terrain | (in '000 sq. kms) | %Total |
|---|---|---|
| Land | 2310 | 70% |
| Water | 330 | 10% |
| Forrests | 660 | 20% |

### Population Distribution by Religion

| Religion | (in Millions) | %Total |
|---|---|---|
| Hindu | 1040 | 80% |
| Muslim | 195 | 15% |
| Christian | 26 | 2% |
| Sikh | 19.5 | 1.5% |
| Others/Unspecified | 19.5 | 1.5% |

### Population and Area of Major Cities

| Cities | Population (in Mn) | Area (in sq. kms) |
|---|---|---|
| Mumbai | 13 | 600 |
| New Delhi | 11 | 1500 |
| Kolkata | 5 | 200 |
| Chennai | 4 | 400 |
| Bangalore | 5 | 750 |
| Hyderabad | 4 | 600 |

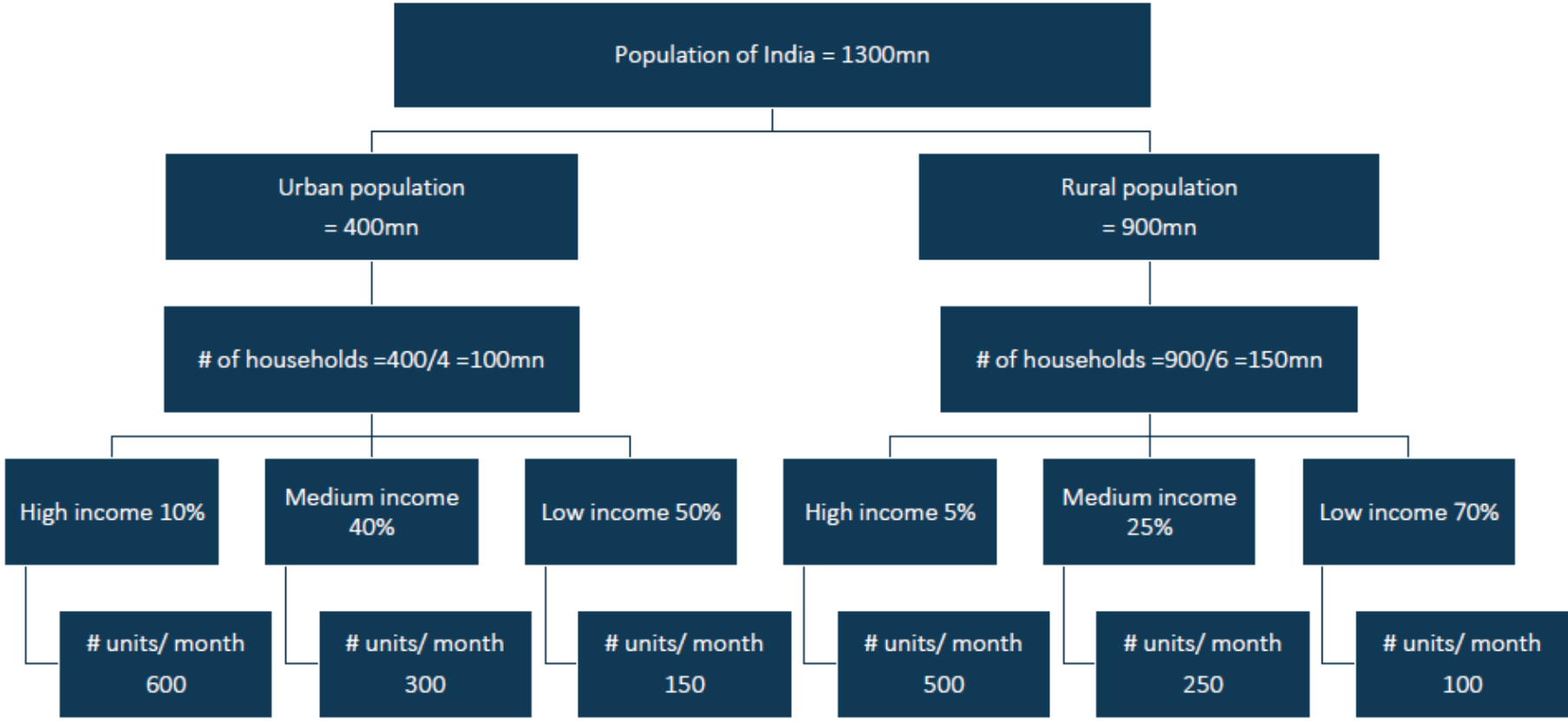
| Tiers | Population (in Mn) | %Urban |
|---|---|---|
| Tier 1 (Top 10) | 60 | 15% |
| Tier 2 (Next 50) | 60 | 15% |
| Tier 3 (Next 100) | 45 | 12% |

# GUESSTIMATE 1: Monthly residential electricity consumption in India

## Notes and assumptions

- The 30/70 split of urban/rural population has been considered
- The average household size assumed for urban and rural areas is 4 and 6 respectively
- Additionally, division of the income groups into high, medium and low has been considered. The candidate can confirm the same with the interviewer before proceeding

## Approach

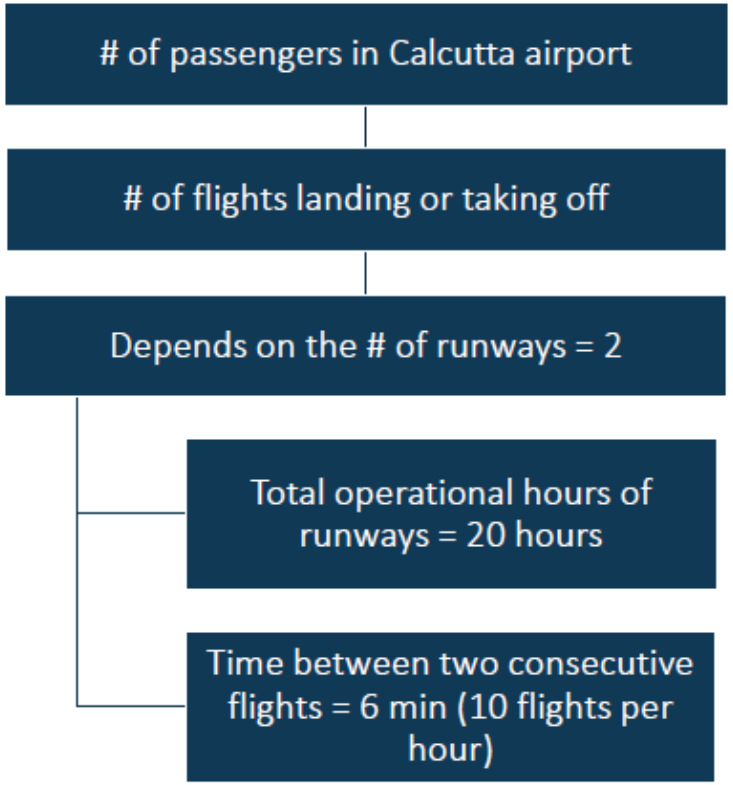


# GUESSTIMATE 2: Daily passengers in Calcutta airport

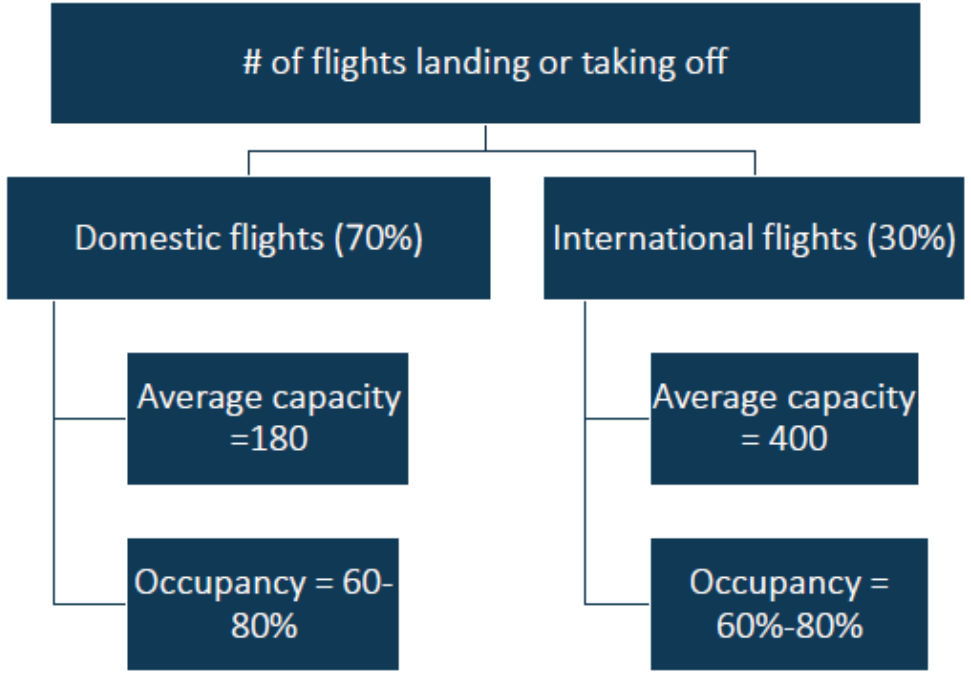
## Notes and assumptions

- The daily # of passengers depends on the # of flights handled which in turn depends on the # of runways
- The total operational hours of each runway has been considered to be 20 hours ( an alternate approach can be considering peak hours for the runway)
- Split of domestic vs international flights is 70/30

## Approach




Hence total flights handled in a day= 2*20*10 = 400 flights



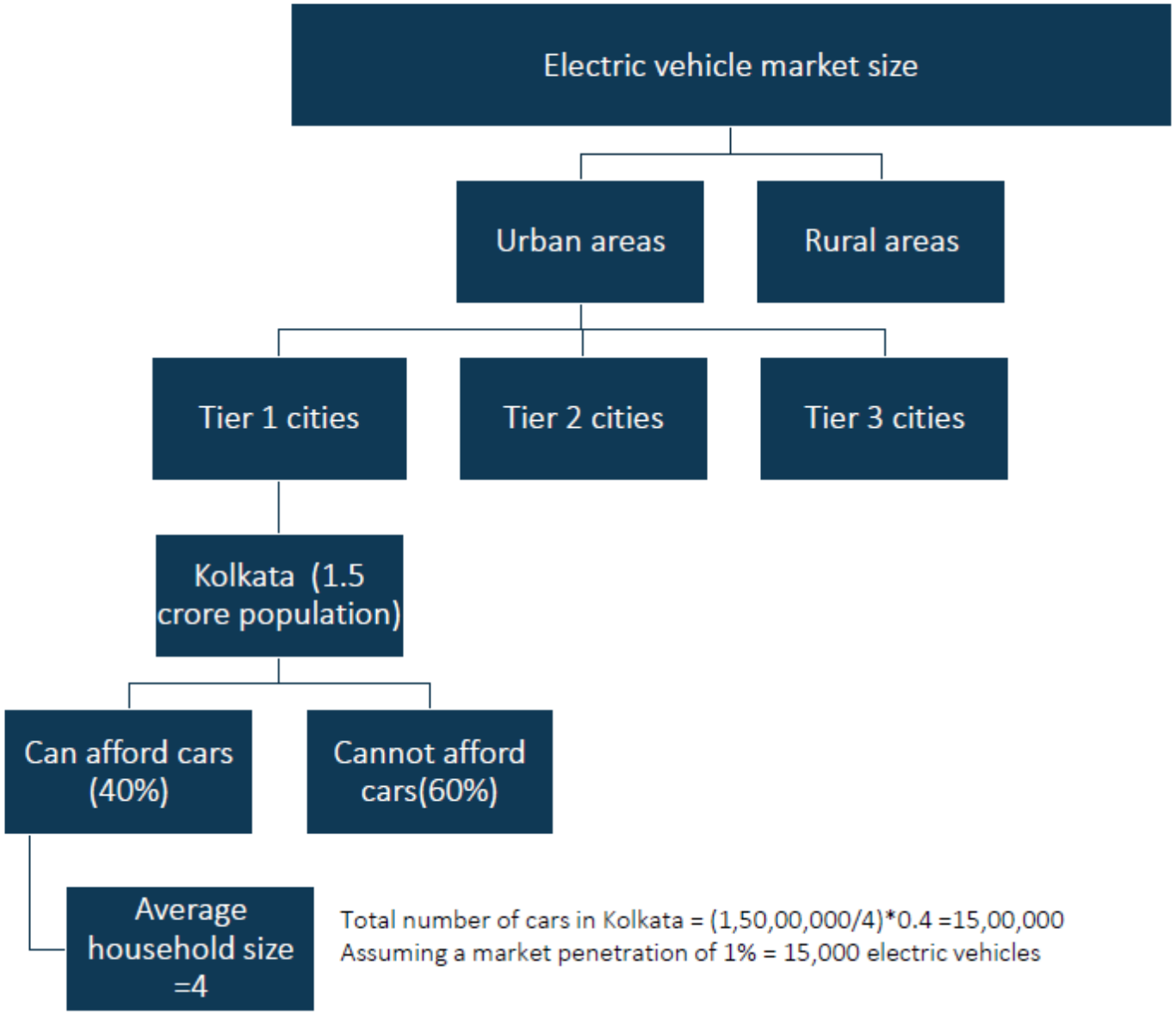

Total domestic passengers per day = 400*70%*180*70% = ~35,300
Total International passengers per day= 400*30%*400*70%= 33,600
Hence total daily passengers = 69,000

# GUESSTIMATE 3: Estimate the electrical car market size in India/ any city

## Notes and assumptions

- The calculations have been performed for a specific example of Kolkata, the same approach can be extrapolated to other Tier 1 cities
- Rural areas, tier2 and tier3 cities can be neglected stating a 80/20 rule, that majority of the electric vehicle penetration would be in Tier 1 cities

## Approach



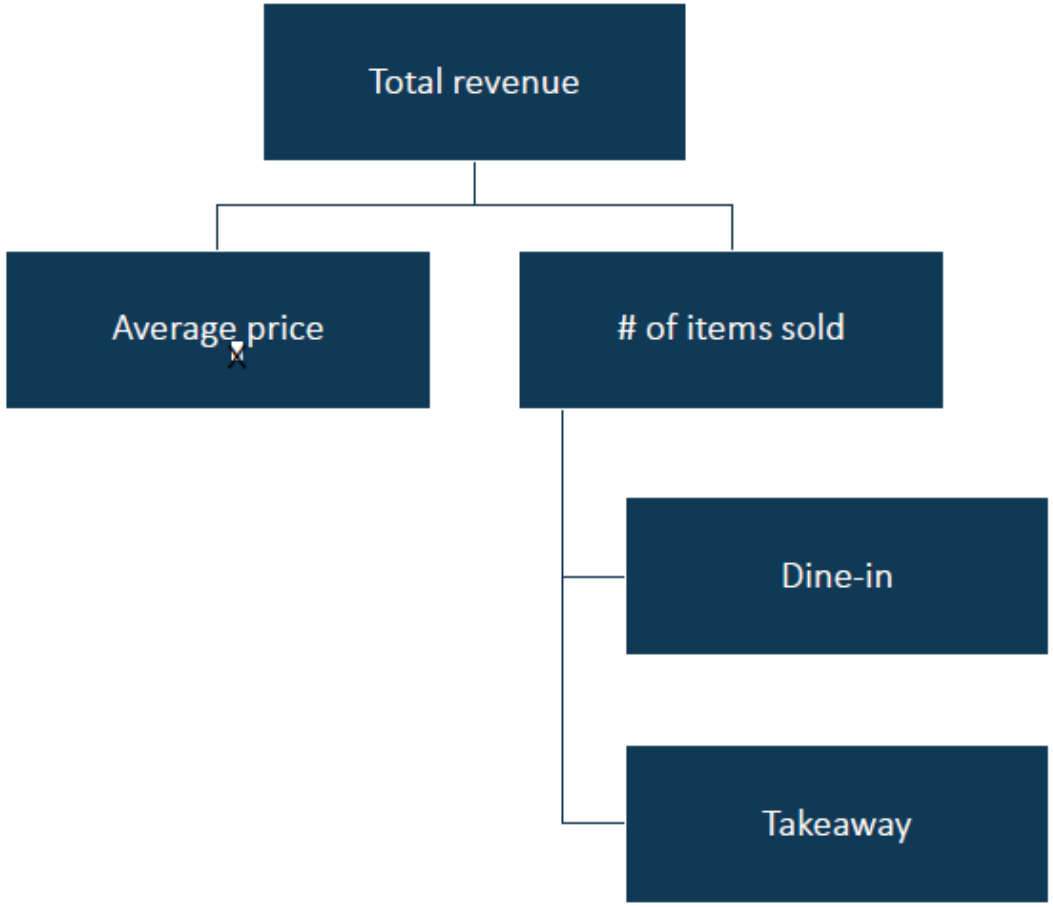

Total number of cars in Kolkata = (1,50,00,000/4)*0.4 =15,00,000
Assuming a market penetration of 1% = 15,000 electric vehicles

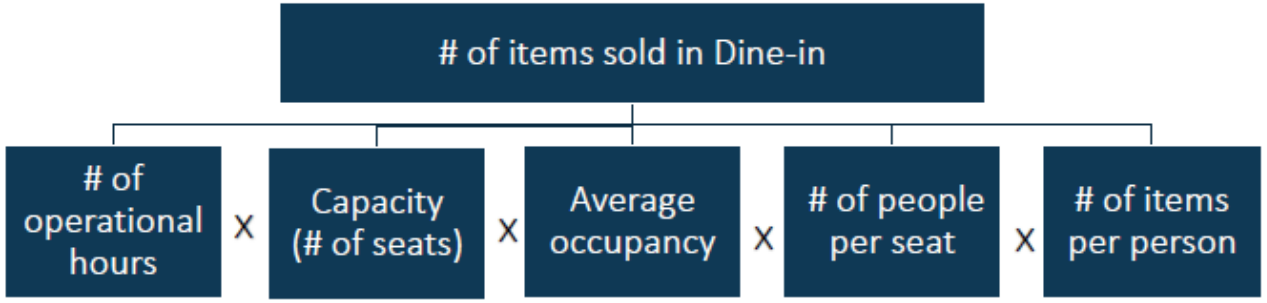
# GUESSTIMATE 4: Total revenue of a fast food chain/restaurant

Notes and assumptions:

- The total revenue of a fast food chain is through two sources dine-in and takeaway
- MECE to calculate the # of items sold through drive-in can be handled through a comprehensive mathematical formula

## Approach




**# of operational hours** = 12 hours
**Capacity (# of seats)** = 50
**Average occupancy**= 70%
**# of items per person** = 2
**# of people per seat/ hour** =2
[The average time every person eats at a fast food restaurant =30 min, therefore 2 (60min/30min) people occupying a seat per hour]

=12*50*0.70*2*2
=1680 items

# GUESSTIMATE 5: Foreign Nationals in Commonwealth Games

During the Commonwealth Games in 2006, how many foreign nationals entered India?

Do you want me to calculate the total foreign nationals coming during that period or those coming exclusively due to the games?

Exclusively due to the games.

I would like to split the total number into two broad segments: Spectators and Non-Spectators. Non Spectators can be divided into the organising officials for the overall games, Neutral Staff and country-wise contingents. Does that seem like a good way to go about it?

Yes, you can proceed.

Okay. Starting with the organising officials, I would assume five major functions like sports, liaisons, events etc. and consider roughly 5 officials per function in addition to 5 more at the top making it roughly 30 members. There are approximately 20 individual sports and 10 team sports in the games. In the initial phases, we can assume each individual sport will have 4 games running simultaneously and each game requiring a panel of 3 judges and 2 referees, which makes it 400 neutral staff. For the team sports, we can assume 2 games per sport, 3 referees and 3 judges, giving us 120 neutral staff. In total, we can expect about 500 neutral staff.

That's good. How would you estimate the number of people in the contingents?

I will assume roughly 15 countries participating in the games. First, I will count the players. For each individual sport, I will assume there are 3 players in the squad, 2 support staff and 1 coach. For the team sports, we can approximate 10 players + 3 more in the squad, 5 support staff + 2 coaches. Apart from this, we can assume 3 administrative officials from each country to manage the contingent and act as liaisons. This would give us 20*(3+2+1) + 10*(13+7) or 320 per contingent. 15 contingents would mean 4800 individuals. Does this seem decent enough?

It is fine. How would you estimate the spectators coming in to watch the games?

Since it would be difficult to measure on a per game basis due to repetition and absence, I would like to consider the opening ceremony and work forwards from there. I will first assume that a majority of the foreign nationals who come to India, would plan to attend either the opening or closing ceremonies or both. Let's say 75% of all foreign nationals attend the opening ceremony. In a stadium with a capacity of 100,000; We can assume one stand to be filled with foreigners. This is about 1/10$^{th}$ of the stadium capacity or about 10,000 individuals. Going forward, it gives us a total of 13000 foreign nationals as spectators.

That is good. Can you give me your total estimate?

Sure. Organising Officials ~30, Contingents ~ 4800, Spectators ~ 13000 for a total of ~18000 foreign nationals who come to India for CWG.

The guesstimate is done. Thanks!

Thank you!

## Estimate the annual demand for Gold flake cigarettes in Mumbai

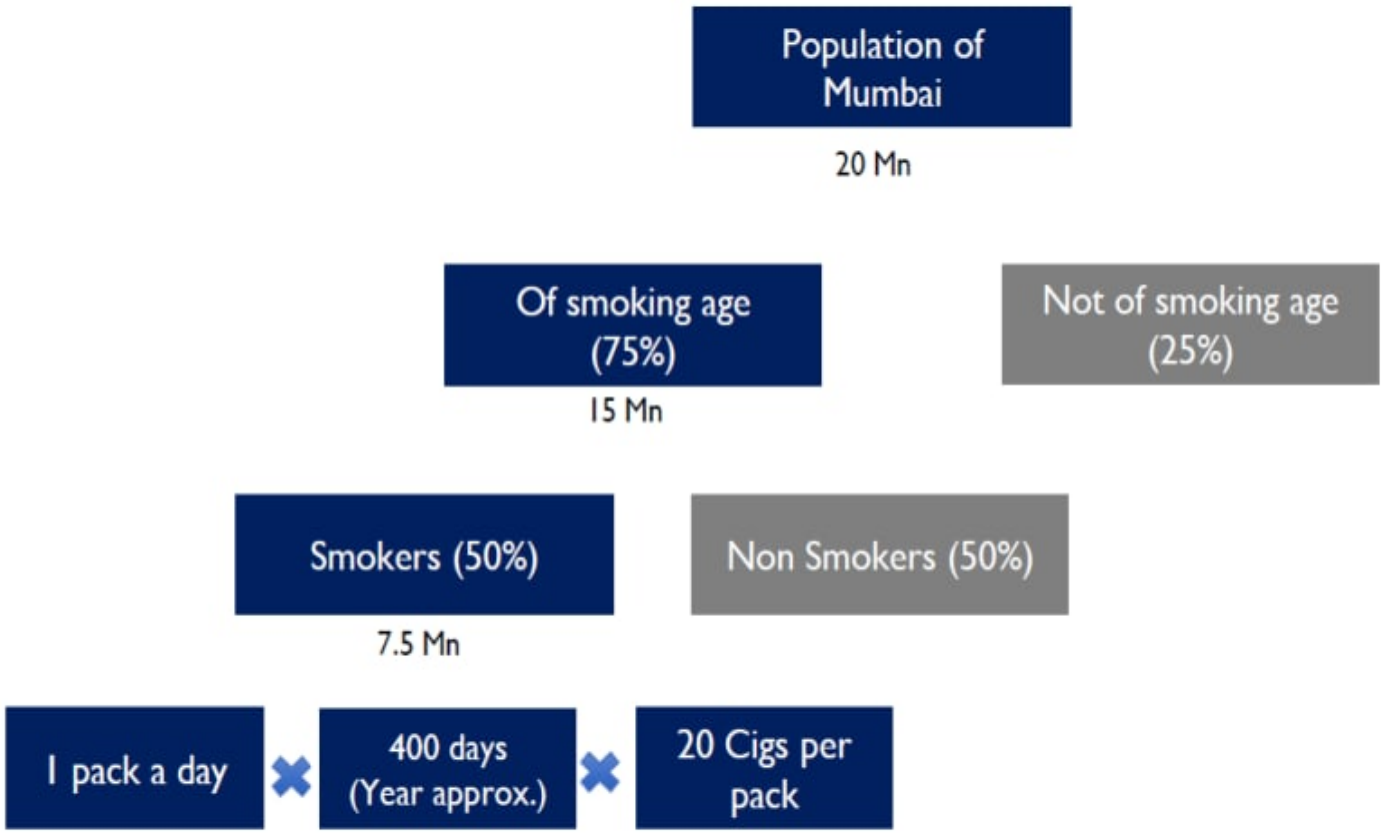
### Interviewee Notes

- Begin by understanding total market for cigarettes in Mumbai
- Market share for gold flake would be similar to other metropolitan cities such as Delhi and Bangalore

### Case Facts

- Market share for Gold flake in Delhi is 20%, Bangalore is 22%

### Approach/ Framework




7.5Mn * 400 * 20 = 60,000 Million Cigarettes a year
Approx. market share of Gold flake = 20%
Demand for Gold flake = 20* 60,000 Million = 12,000 Million Cigarettes a year

# Estimate the number of dairy cows in the state of Maharashtra

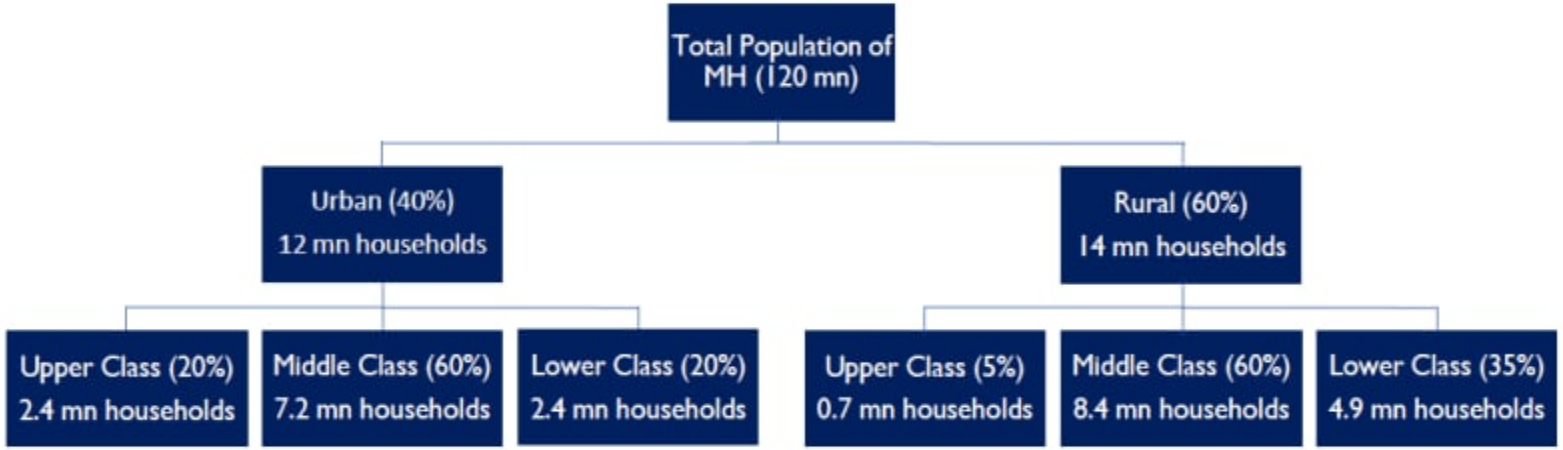
## Interviewee Notes

- Estimate the number of dairy cows by finding the volume of milk consumed per day.
- Consider proportion of cows and buffaloes in milk production.
- Distribute total milk consumption between household and commercial consumption.
- Segment the total population into rural and urban demographics, and further classify based on income.

## Case Facts

- Total milk demand is met by domestic production; No milk is being imported or exported.
- Urban households include 4 people and rural households include 5 people.
- Milk consumption per day is highest in middle class households is 2 L, followed by 1.5 L in upper class & 0.5 L in lower class.
- Commercial milk consumption is 10% of household consumption.
- Ratio of milk production by buffaloes and cows = 1:2
- Each cow produces 5 litres of milk each day.

## Approach / Framework




| | Urban Upper Class | Urban Middle Class | Urban Lower Class | Rural Upper Class | Rural Middle Class | Rural Lower Class |
|---|---|---|---|---|---|---|
| Average Milk consumption per household | 1.5 Litres | 2 Litres | 0.5 Litres | 1.5 Litres | 2 Litres | 0.5 Litres |
| Milk consumption in segment | 3.6 mn Litres | 14.4 mn Litres | 1.2 mn Litres | 1.05 mn Litres | 16.8 mn Litres | 2.45 mn Litres |

Total household consumption = 39.5 mn Litres ; Total Commercial consumption = 3.95 mn Litres

Total milk production = ~45 mn Litres

Total cow milk production = (2/3)x(45) = 30 mn Litres

**Total number of dairy cows in Maharashtra = 30/5 = 6 mn**

## Observations / Suggestions

- This guesstimate considers milk consumption per household to be uniform across rural and urban regions.

# Estimate the annual revenue of a multiplex

## Interviewee Notes

- Only cover the substantial revenue streams
- The footfall will depend on whether it is a weekday or weekend
- Price can also be considered different for weekday and weekend, here although average price has been taken
- Assume that the revenue from advertising primarily comes from billboards and digital ads between movies.
- This is average revenue per screen, can be multiplied by number of screens to obtain revenue of multiplex

## Case Facts and calculations

Average daily revenue/screen

1. Ticket Sales Revenue per day= (Average footfall per day)*(Average price per show)*(No of shows/day) =200*250*4=Rs 2,00,000

2. Revenue from parking per week: (Average footfall per show)*(% people using parking)*No of shows/day)* (Average ticket size) 200*0.5*4*50=Rs 20,000

3. Advertising Revenue= Assuming it is 10% of the total revenue

4. Food & Beverage= (Average footfall per show)*(% people buying)*No of shows/day)* (Average ticket size) 200*0.5*4*150=Rs 60,000

Average daily revenue/screen =Rs 4.2lac

Total Revenue = Average daily revenue/screen*No of screens*No of days

=4.2*4*300 = 5040 lacs =50.4 Cr

(Taking into account some days when the footfall will be extremely low)

| | Weekdays | Weekends |
|---|---|---|
| Seating Capacity | 300 | 300 |
| Average occupancy rate | 60% | 75% |
| Average footfall | 180 | 225 |

Average footfall per day = (180*4+225*3)/7~200

# Estimate the value of a coffin maker's business in Ahmedabad

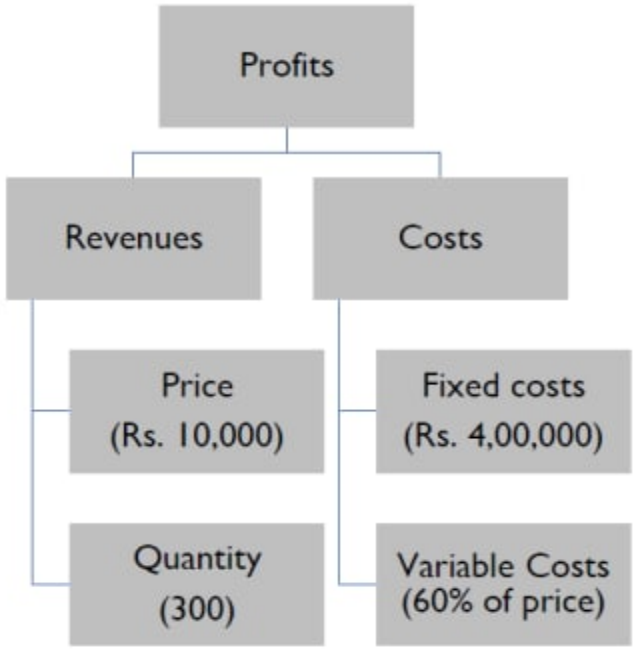
## Interviewee Notes

- NPV analysis
- 1% of Ahmedabad assumed to be Christian
- Life expectancy assumed to be 70 and population growth rate of Christians assumed to be 0%
- Only 3 coffin makers in Ahmedabad (info received from interviewer) so market share assumed to be 1/3
- FC and VC provided by interviewer when asked
- Discount rate assumed to be 10% (chosen for ease of calculation and reasonable since risk free rate is ~7%)
- Profits assumed to stay constant into perpetuity

## Approach / Framework

**Estimating quantity**

- Population (60,00,000)
- % Christian (1%) = 60,000
- No. of deaths per year = (1/70)*60,000 = ~900
- Market Share = 1/3
- Quantity = 300




**NPV = (10,000*300 – 4,00,000 - .6*10,000*300)/0.1 = Rs. 80,00,000**

## Observations / Suggestions

- This guesstimates tests the basics of finance (NPV, PV of perpetuity)
- Common mistakes include not account for the % of population that is Christian (assuming everyone that dies needs a coffin) and errors in calculating no. of deaths

## *Estimate the spend on bedsheets for self use by households in India*

***Interviewee Notes***

- The guesstimate has been solved to estimate the amount spent on bedsheets by households for self use, hence it excludes bedsheets bought for gifts etc.
- Quantity bought is an assumption based on the income of the given class, number of rooms in the house and assuming households also purchase few spare bedsheets. Replacement rate also follows the same assumption.
- Prices are taken on an average for a particular segment.

***Case facts***

- Spend = No. of households * Price * Quantity
- Per year spend = Total spend on both segments/replacement rate
- Average family size of 4 people.

**Population of India**

**~1.4bn**

**No. of households**

**~35.0mn**

| | | Below Poverty Line (30%) | Lower Middle class (40%) | Upper Middle class (20%) | Upper class (10%) |
|---|---|---|---|---|---|
| | | ***1RK*** **~11.0mn** | ***1BHK*** **~14.0mn** | ***2BHK-3BHK*** **~7.0mn** | ***4BHK+*** **~3.0mn** |
| Single Bedsheet | Price per unit | Rs. 100 | Rs. 200 | Rs. 500 | Rs. 1,000 |
| | Quantity | 1 | 2 | 5 | 10 |
| | Spend | Rs. 1.1bn | Rs. 5.6bn | Rs. 17.5bn | Rs. 30.0bn |
| Double Bedsheet | Price per unit | Rs. 200 | Rs. 400 | Rs. 1,000 | Rs. 3,000 |
| | Quantity | 1 | 3 | 8 | 15 |
| | Spend | Rs. 2.2bn | Rs. 16.8bn | Rs. 56.0bn | Rs. 135.0bn |
| Replacement rate | | Every 3 years | Every 2 years | Every 1 year | Every 1 year |
| Per year spend | | 3.3/3 = ~Rs. 1.0bn | 22.4/2 = ~Rs. 11.0bn | 73.5/1 = ~Rs. 74.0bn | 165.0/1 = Rs. 165.0bn |

**Total Demand = ~Rs. 251.0bn**

## Estimate the monthly revenue for the Big Basket Instant vending machine in your society (Wadhwa – The Address, Ghatkopar, Mumbai)

***Interviewee Notes***

- How many different SKUs in categories are present?
- What is the consumption time for each SKU?
- What is the avg. price of each SKU?

***Case Facts***

- Max units in each row, = width of compartment/width of product
- Max. units/SKU = (Total no. of SKUs) X (distribution) % X (max no. units/row)
- Assuming the service provider comes every 3 days to refill X% of product, refill rate is assumed per category
- Per day unit consumption= (units/SKU) X (X)/3
- Revenue / day = Units consumed/day X Average Price / Unit

**Total no. of SKUs**

No. of compartments — SKUs/compartment

6 X 5 X 4

120 SKUs

| | Snacks/Biscuits | Milk/Dairy | Vegetables/ Bakery | Grains/Flours | Household Essentials |
|---|---|---|---|---|---|
| | 20% | 30% | 20% | 20% | 10% |
| Units in each row | 30" / 2" = 15 | 30" / 5" = 6 | 30" / 6" = 5 | 30" / 5" = 5 | 30" / 3" = 10 |
| Max. units/SKU | 360 | 216 | 120 | 240 | 120 |
| Refill rate | 80% | 90% | 90% | 50% | 30% |
| Per day unit consumption | 96 | ~65 | 36 | 40 | 12 |
| Average price | 40 INR | 60 INR | 30 INR | 80 INR | 200 INR |
| Revenue/day | 3840 INR | 3900 INR | 1080 INR | 3200 INR | 2400 INR |

**14,400 INR / Day**

### Observations/Tips/Suggestions

- Total no. of households in the Society :
- No. of Apartments X No. of Floors X No. of Apartments/Floor X Occupancy = (16 X 20 X 4 X 80%) = 1024 households = ~1000 households
- Total no. of units sold/month = ~7500 units; No. of units consumed/ Month / Household = 7500/1000 = ~7 units
- Total Revenue/ Month = 4.3 L INR/Month; Revenue / Month / Household = 430 INR/Month
- This makes sense because BB Instant acts as a substitute in case of emergencies, but has not yet replaced the traditional ways of buying groceries which is through supermarkets, vegetable vendors, etc.

# Estimate the yearly revenue of an IPL team

## *Interviewee Notes*

Only cover the most substantial revenue streams
IPL revenue only receives a small fraction of the revenue (35% for home games, 5% for away), the rest is paid to the league
The circumference of a cricket pitch is approximately 400 meters
The probability of winning the league is the same for each team (1/8)
A league season consist of 14 matches
Merchandise is only a minor revenue stream for an IPL team, and hence, can be skipped

## Case Facts and Calculations

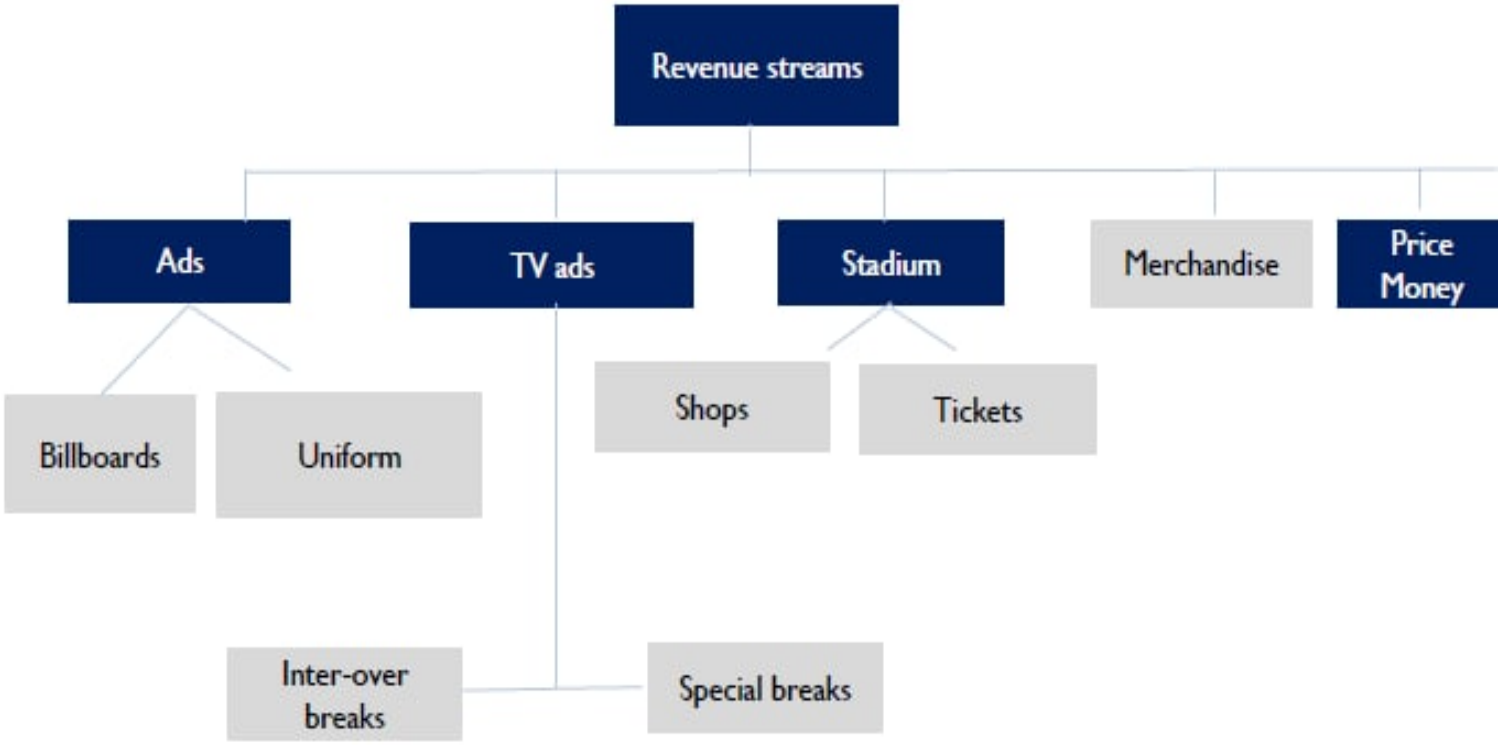
***Revenue advertising:***
(Price per m of billboard * length)* Matches
5000*400*7= 1.4 Crore
(Small shirt ads*Price +shirt sponsor)* matches
(10*5 Lakh +20 Lakh)*14= 10 Crore

***Revenue tickets:***
No. of home matches*Tickets*Ticket price*% of revenue (same for away matches)
7*50k*500*0.35+7*50k*500*0.05≈7CR

***Prize Money***
Probability of winning * price money
(1/8) * 5 Cr ≈ 60 Lakh

***TV ads (See Framework)***

## Approach/ Framework



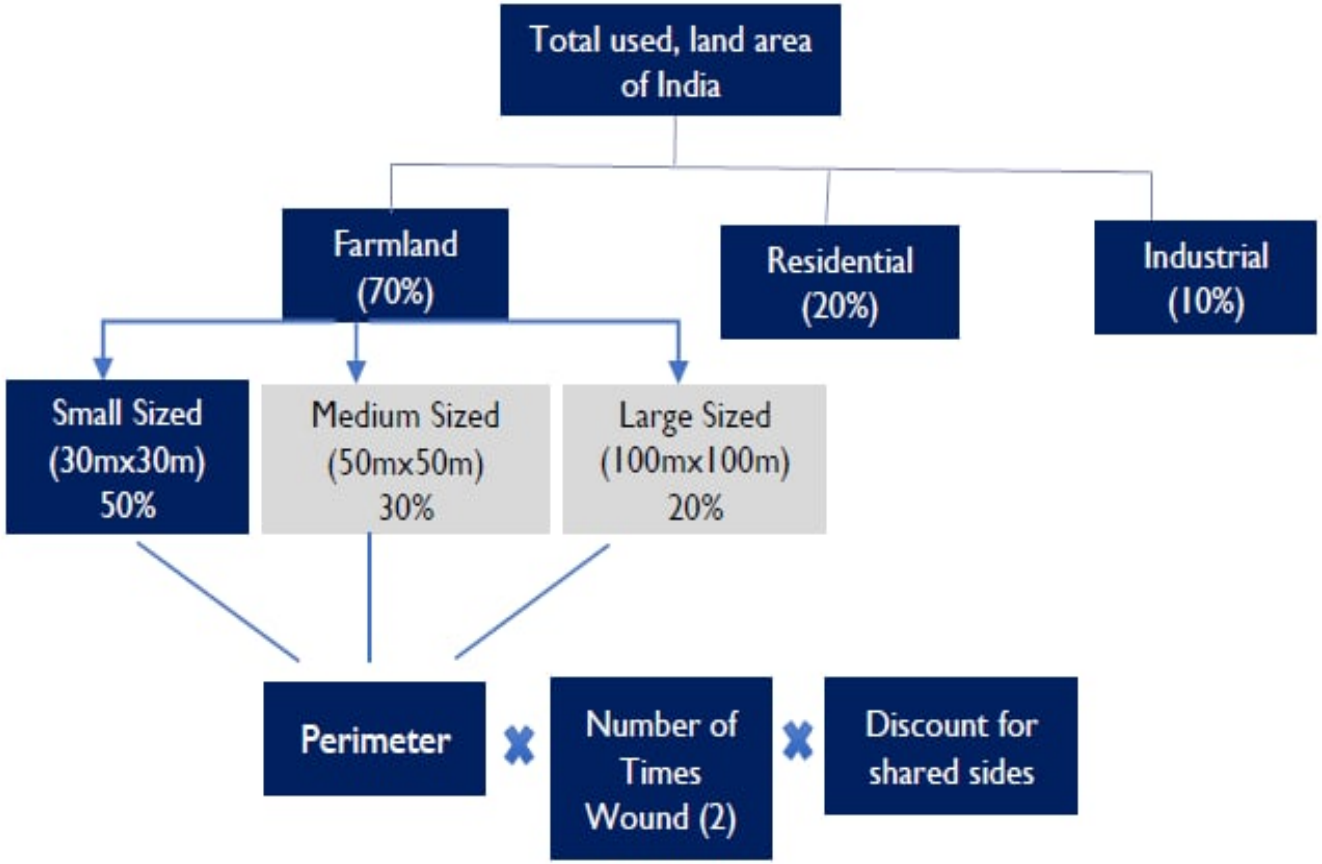

| Type of Advertisement | Inter-over Breaks | Special Breaks |
|---|---|---|
| No. Of slots | 40 | 3 |
| Price per slot | 20 Lakh | 5 Crore |
| Total | 8 Cr | 15 Cr |

## Estimate the total length of barbed wire used in India

### Interviewee Notes

- Assume square farmlands
- Find the average perimeter of each size of farmland
- Barbed wire needed = perimeter * number of times the wire is wound
- Adjacent farmlands would be sharing a common side of barbed wiring.
- Multiply the total number with a factor to account for how barbed wire is usually used: circled through the perimeter

### Approach/ Framework



# Estimate the monthly revenue of Tata Sky subscribers in Delhi per month

## Interviewee Notes

- Begin by understanding total market for TV viewership in Delhi
- Understanding the demographics of Delhi (income/affordability)
- Market share of Tata Sky
- Making sure that we incorporate affordability of TV among income groups
- Market penetration and revenue per subscriber of Tata Sky within the income groups
- Understanding of Tata sky subscribers as households and possibility of multiple Tata sky boxes in a household

## Case Facts

- Market Share of Tata sky in Delhi is 33%
- Only residential subscribers to be considered
- Average household size is 5

## Approach/ Framework

**Delhi Tata Sky Subscribers**

**Residential Population** — 20 million

**Office Subscribers**

| | High Income (20%) | Middle Income (30%) | Low Income (30%) | BPL (20%) |
|---|---|---|---|---|
| | 4 million | 6 million | 6 million | |
| Households | 0.8 million | 1.2 million | 1.2 million | |
| Affordability | 0.8 million (100%) | 1.08 million (90%) | 0.6 million (50%) | |
| Market Share | 0.32 million (40%) | 0.324 million (30%) | 0.120 million (20%) | |

| Income Category | Monthly Revenue per Household (Rs) | No. of Connections |
|---|---|---|
| Low Income | 250 | 1 |
| Middle Income | 500 | 1.25 |
| High Income | 750 | 1.5 |

**Total monthly revenue from an income category = Market Share * Monthly Revenue per Household * No. of Connections**

Total monthly revenue from High Income category = 0.32 million * Rs. 750 * 1.5 = Rs. 36 crores

Total monthly revenue from Middle Income category = 0.324 million * Rs. 500 * 1.25 = Rs. 20.25 crores

Total monthly revenue from Low Income category = 0.120 million * Rs. 250 * 1 = Rs. 3 crores

**Totally monthly revenue of Tata Sky subscribers in Delhi = 36 + 20.25 + 3 = Rs. 59.25 crores**

## Observations/Tips/Suggestions

- Assume a top-down approach to solve such questions. Start with the basic equation and break into smaller equations.
- Exhaust all possible scenarios and make reasonable assumptions for the same. Clarify with the interviewer at each stage.
- Don't need to be too precise. Interviewer looks for the assumptions called out and adaptability with Math.

Estimate the revenue of a typical post office in India.

## Calculations

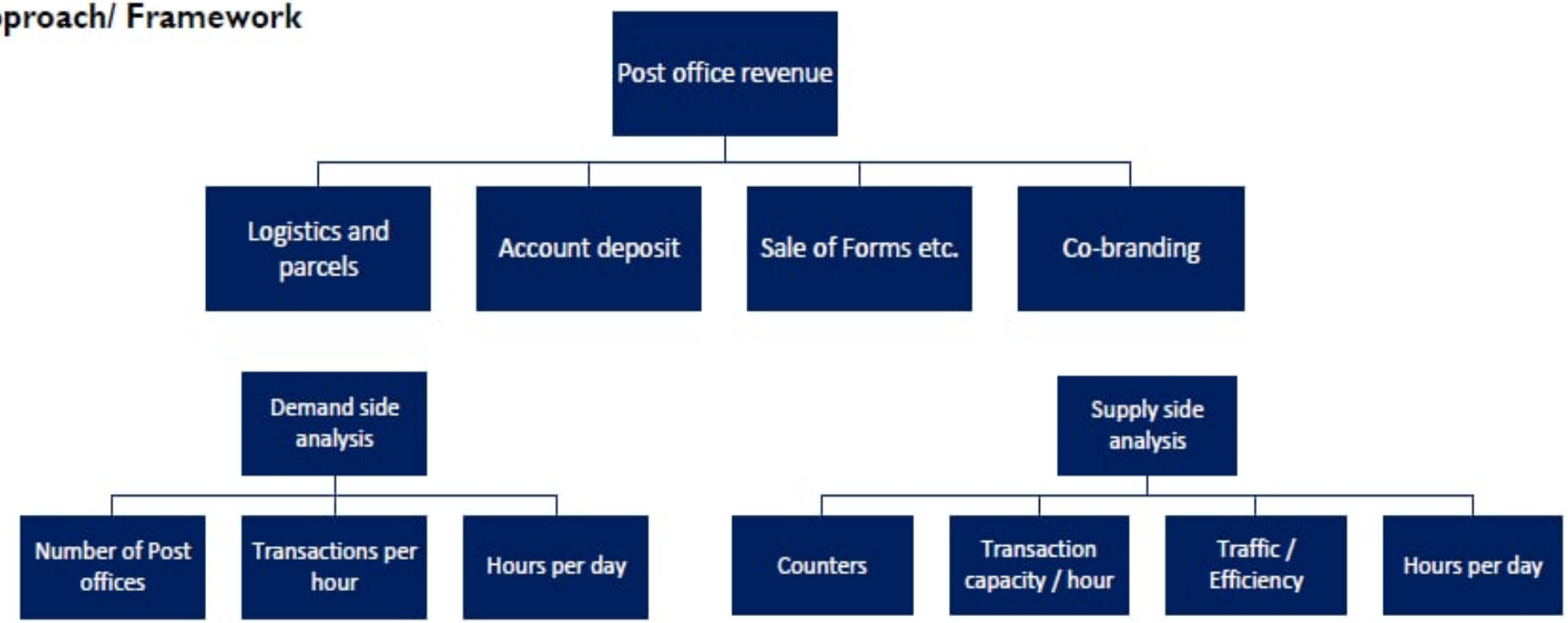
Major portion of revenue – logistics and parcels. Others ignored

Typical circle of coverage for a metro post office ~ 2 km radius or 12 km2
Typical metro area = 500 km2
Thus, 40 post offices in the metro
Assume, high volume – 20 and medium, low - 10

Two approaches – demand side (number of transactions) and supply side (number of counters, utilisation in a day)
Revenue per parcel ~ 50, neglect any charges for extra weights etc

Total parcels ~20000
Total revenue ~ INR 10 lakh

## Approach/ Framework




| Traffic | High | Medium | Low |
|---|---|---|---|
| # PO | 20 | 10 | 10 |
| Transaction/hour | 80 | 30 | 15 |
| Hours / day | 10 | 10 | 10 |
| Total | 16000 | 3000 | 1500 |

| Traffic | High | Medium | Low |
|---|---|---|---|
| # PO | 20 | 10 | 10 |
| Counters | 10 | 5 | 3 |
| Hourly capacity / transaction | 10 | 10 | 10 |
| Hours / day * Utilisation | 10 * 30% | 10* 20% | 10* 50% |
| Total | 18000 | 3500 | 1500 |

# Golf balls in the air in an average second in India

## Calculations

- #golf players : assume only people earning ₹15 lakh and above will play golf as it is an expensive hobby to pursue. The #people above that income threshold is around 5 million. Out of these 50 lakh, assume 70% live in urban areas and have access to a golf course
  - Out of remaining 3.5 million, 1.5 million will be children and senior citizens. Hence 2 million people eligible
  - Out of these 2 million, assume 50% play any sport (assumption on basic fitness)
  - The remaining 1 million can play one out of upto 20 sports (cricket, badminton, tennis, swimming etc). Thus 5% on average will end up playing golf i.e there are 50,000 players
- Frequency of play
  - We assume that the average player plays once a month *(expensive and time consuming sport)*
- Number of hits
  - We assume that the average game is one round, 18 hole
  - *The average number of hits per game* is 108 (18 holes, par score is 4 and everyone hits 2 above par as players are not professionals)
  - We assume that the average ball spends about 1 second in the air
  - Thus the number of ball seconds in the air is ~1,80,000 per day
  - The average number of balls/second is 2.08

## *Approach/ Framework*

| | |
|---|---|
| Income eligible players | 5 million |
| Facility eligible players (urban) | 3.5 million |
| Age eligible population | 2 million |
| Population that plays sports | 1 million |
| Population that plays golf | 50,000 |
| Avg # of players/week | ~1666 |

| Avg number of hits/game | Number of hits/day | # of balls in the air/second |
|---|---|---|
| 108 (18 holes, 4 par, 2 above) | 1,80,000 | 2.08 per second |
| | =108*1666 | =180000/86400 |

## Recommendations

- This case can also be approached from the supply side. The supply side in this case is the number of golf courses, their average utilization etc

## Tips / Suggestions

- It is essential to reverse ladder the population to arrive at the number of golf players. You can clarify your assumptions with the interviewer at all points of time
- Lay out your approach upfront for the interviewer so that if a different approach is to adopted, course correction can happen at the earliest

# Calculate the annual market for medical X-ray machines in India

## Calculations

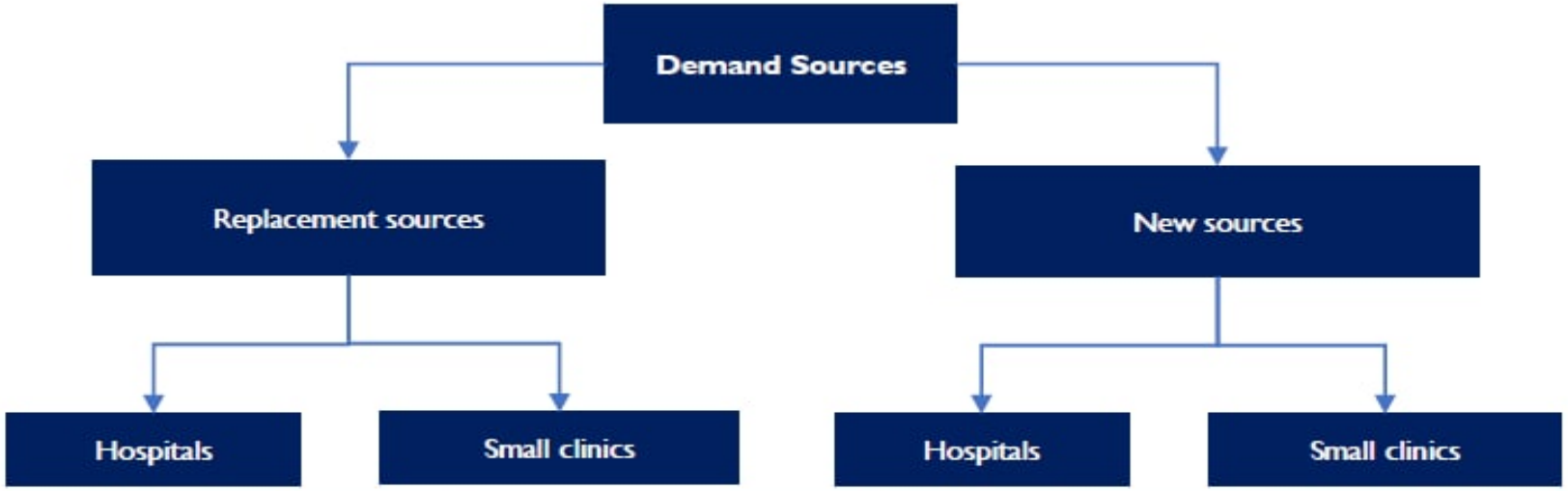
### Replacement demand

- Calculate the stock of X-Ray machines in India
- Break India into rural and urban areas
- Estimate bed per thousand people in urban and rural areas separately and make assumptions about average hospital size and #X-Ray machines per hospital (2.5 for urban and 1 for rural)
- This will give you the stock of X-Ray machines at hospitals
- Do similar exercise for clinics by calculating the stock of orthopaedicians in private practice
- Demand: Divide the stock by life cycle to get the 1 year demand for X-Ray machines

### New demand

- Estimate the growth in healthcare expenditure and use that as a growth rate for hospital bed availability. Then calculate the number of hospitals and the number of X-Ray machines/hospital
- Differentiate this rate for urban and rural areas and calculate the new demand for X-Ray machines coming from hospitals
- Calculate the new demand coming from clinics by : (Doctors graduating - #Doctors joining public sector)*Proportion of Orthopaedicians
- This will give the number of new orthopaedicians who will join private services every year and buy an X-ray for their clinic

## Approach/ Framework




| Beds/Thousand | | #Hospitals | #Xray Machines | Growth (#Number of Machines) | Total annual market (hospitals only) |
|---|---|---|---|---|---|
| Rural | 0.5 (800m) | 4000 (100 beds avg) | 4000 (Stock) Replacement Demand : 400 | +10% per year (400) | 800 |
| Urban | 2 (400m) | 4000 (200 bed avg) | 10000 (Stock) Replacement demand : 1000 | +15% per year (600) | 1600 |

## Recommendations

- Can be approached from the patient demand side in this case. The demand case in this guesstimate is the number of injuries and use cases

## Tips / Suggestions

- It is essential to structure the demand into different brackets first.
- Interviewer will automatically guide you to focus on the most important bracket

# THANK YOU

For Further Queries regarding Mentorship or any other doubts

Contact -+919815114690

varunk2012@email.iimcal.ac.in

https://t.me/CasesGuesstimates

@CASESGUESSTIMATES

A **guesstimate** is a combination of guess and estimate. Solving a guesstimate involves using a structured approach to reach the solution while making sound assumptions, performing back-of-the-envelope calculations and communicating the process effectively during an interview.

## Types of Guesstimates

### Market Sizing

This type of guesstimates involve estimation of size of a market or revenue of a company. This is solved by both estimation of quantity and selection of price for each type of product.

### Unconventional

This type of guesstimates may not have a defined structure. Such guesstimates are typically asked in interviews to test the approach rather than the specific calculations.

## Splits & Filters

When, guesstimates are solved by using top-down approach, following are various splits commonly used to drill down –

- **Rural-Urban Split:** Geography based approach
- **Gender Split**: Split between male and female
- **Age Split**: Split the population into various age ranges
- **Income Split**: Based on individual or household income

## Methodology

### Top-Down Approach

This approach starts with a large set such as total population and then works on adding different splits and filters making reasonable assumptions to reach to an estimate.

### Bottom-Up Approach

This approach starts with forming an estimate for a specific representative unit and later extrapolating with reasonable assumptions to reach to an estimate.

## Demand & Supply Approach

### Demand Approach

This approach for market sizing is based on estimating the number of customers in the target market and units consumed per customer in a given time period.

### Supply Approach

This approach for market sizing uses the supply value chain to estimate production quantity based on raw materials or number of factories and further extrapolating.

# Estimate the total amount of toll tax collected annually across India

## Interviewee Notes

- Split of Small, Medium and Large Vehicles in the traffic is as given in Table A.
- Toll tax for different types of vehicles is as given in Table B.
- Processing time at a plaza against the time of the day is as given in Table C.

Note: The processing time used here is including the idle time for the plaza. At night when the load is lower idle time will be high so average processing time is higher.

## Facts/Assumptions

- Daily toll collection from 1 lane of a toll plaza ~ ₹3.6L
- On an average there are 4 active lanes in a plaza.
- Daily toll collection from 1 plaza ~ ₹15L
- Daily toll collection from 560 plazas ~ ₹85 Crores
- Annual toll collection ~ ₹30,000 Crores

## Approach/Framework

**Number of Toll Plazas in India**

Approximate distance between consecutive toll plazas ~80km

Land area served by a single toll plaza = 3.14*40*40 sq. km
(Assuming 80km length is shared by 2 plazas)

Total land area of India ~ 4 million sq. km
Assuming 70% roadways coverage. Serviced area ~ 2.8 mn sq. km

Total toll plazas in India = 2.8 * 10^6 / 3.14 * 40 * 40= ~ 560

Table A: Load distribution of vehicles types Vs Time of the day

| Vehicle Type\Time | 10AM – 6PM | 6PM – 2AM | 2AM – 10AM |
|---|---|---|---|
| Small | 50% | 40% | 10% |
| Medium | 30% | 50% | 20% |
| Large | 10% | 30% | 60% |

Table B: Average toll Tax for each vehicle type

| Vehicle Type | Toll Tax |
|---|---|
| Small | ₹100 |
| Medium | ₹200 |
| Large | ₹400 |

Table C: Vehicle Processing time

| Time of the Day | Processing Time |
|---|---|
| 10AM – 6PM | 30 seconds |
| 6PM – 2AM | 60 seconds |
| 2AM – 10AM | 90 seconds |

Table 1: Toll collection in a single lane of a single toll plaza

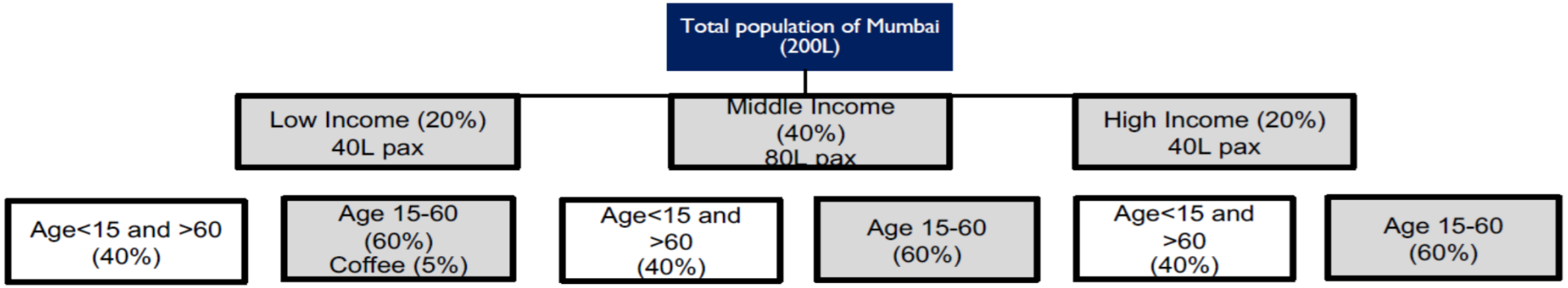
| Time of the Day | No of Vehicles Processed | Average Toll Price | Total Toll Collected |
|---|---|---|---|
| 10AM – 6PM | 8 hrs / 30 sec = 960 | ₹(0.5*100 + 0.4*200 + 0.1*400) = ₹170 | ₹170*960 ~ ₹1.6L |
| 6PM – 2AM | 8 hrs / 60 sec = 480 | ₹(0.3*100 + 0.5*200 + 0.2*400) = ₹210 | ₹210*480 ~ ₹1.0L |
| 2AM – 10AM | 8 hrs / 90 sec = 320 | ₹(0.1*100 + 0.3*200 + 0.6*400) = ₹310 | ₹310*320 ~ ₹1.0L |
| **Total Toll Collection** | | | **~ ₹3.6L** |

## Estimate the revenue from consumption of Nestle Coffee on a Weekday in Mumbai

### Interviewee Notes

- Four variants of coffee
1. Chicory + coffee = Rs. 2/cup
2. Only coffee = Rs. 4/cup
3. Freeze-dried coffee= Rs. 20/cup
4. Coffee pods= Rs. 50/cup
- At-home coffee drinkers – Buyers of coffee sachets/ jars & coffee pods
- Roadside stalls– Sales made to small owners who buy at retail price.
- Commercial includes sales for owners of commercial coffee machines & cafes (franchises and others)
- Prices for commercial factor quality & implicit service

### Approach/Framework




| | At home | Stalls |
|---|---|---|
| % drinkers | 50% | 50% |
| # cups/day | 2 | 2 |
| Price/cup | 2 | 2 |
| Market Share | 1/2 | 1/2 |
| Total Revenue | 1.2L | 1.2L |

| | At home | Shops |
|---|---|---|
| % drinkers | 60% | 40% |
| # cups/day | 2 | 2 |
| Price/cup | 2 | 2 |
| Market Share | 50% | 50% |
| Total Revenue | 11.5L | 9.6L |

| | At home | Shops |
|---|---|---|
| % drinkers | 20% | 80% |
| # cups/day | 2 | 2 |
| Price/cup | 50 | 50 |
| Market Share | 50% | 10% |
| Total Revenue | 120L | 96L |

Total Revenue on Weekday= Rs. 240 L

### Observations/Inferences

- This guesstimate estimates revenue from the final consumption of soluble coffee (sachets/ jars/ pods) by Nestle. This includes retail sales through traditional channels as well as e-commerce. This guesstimate excludes sales of coffee machines, milk, sugar, installation services, etc. Costs are not considered at this stage.
- For age range and coffee preference: the age range 15-30 and 31-60 has been clubbed and the weighted average based on population and preferences is taken
- For roadside stalls, revenue is Re.1/ cup as such stalls generally use ½ the amount of standard serving size. It is assumed that 1 pod = 1 cup.

# Estimate the number of pairs of shoes sold in Mumbai daily

## Interviewee Notes

- Estimate by finding the total number of shoes worn by people in Mumbai
- Segment the total population based on income, gender and age
- Consider appropriate number of pairs of shoes owned by people in each category and their expected life
- Assume an average day of shopping (not affected by weekends, holidays, sales, etc.)

## Facts/Assumptions

- Only covered shoes are considered; not including footwear like slippers, flip flops, crocs, etc.
- Shoes can be categorized based on usage: Office wear/formal, school shoes etc. Every population category will have a combination of these based on income and need
- BPL population has the lowest number of shoes per person and highest life of shoe
- Kids are the population <15 years

## Approach/Framework

| | Distribution by Income | Distribution by Gender & Age | Avg. Pairs of Shoes Owned | Life of Shoes (Years) | Pairs of Shoes bought per year |
|---|---|---|---|---|---|
| Total Population of Mumbai (20mn) | Upper Class (10%) 2mn | Men (35%) - 0.7mn | 5 | 3 | 1.17mn |
| | | Women (35%) - 0.7mn | 5 | | 1.17mn |
| | | Kids (30%) - 0.6mn | 4 | | 0.80mn |
| | Middle Class (30%) 6mn | Men (35%) - 2.1mn | 4 | 4 | 2.10mn |
| | | Women (35%) - 2.1mn | 4 | | 2.10mn |
| | | Kids (30%) - 1.8mn | 3 | | 1.35mn |
| | Lower Middle Class (40%) 8mn | Men (35%) - 2.8mn | 3 | 5 | 1.68mn |
| | | Women (35%) - 2.8mn | 2 | | 1.12mn |
| | | Kids (30%) - 2.4mn | 2 | | 0.96mn |
| | Below Poverty Line (20%) 4mn | Men (30%) - 1.2mn | 1 | 6 | 0.20mn |
| | | Women (30%) - 1.2mn | 0 | | 0 |
| | | Kids (40%) - 1.6mn | 0.5 | | 0.13mn |

Pairs of shoes bought in 1 year = Population * Avg. Pairs of shoes owned / Life of shoes
Total number of shoes bought in Mumbai in 1 year = 12.78mn
Total number of shoes bought in 1 day = 12.78mn/365 = ~ 35k

## Observations/Inferences

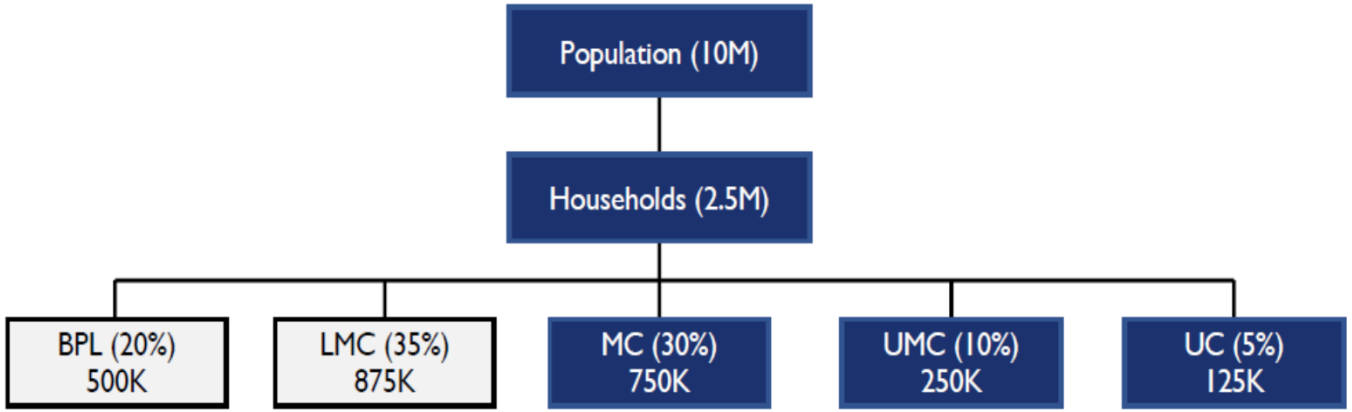
- Life of shoe has been assumed to be constant in an income category. It is dependent on the desire and need (due to wear and tear) to change
- Sanity Check from supply side: Number of shoes sold by a shop in a day ~5-10 (avg. 8) and area of Mumbai ~600 sq km
- Number of footwear shops in Mumbai per sq km = 35000/8/600 = ~ 7 (reasonable)
- On an average, an upper-class person buys a shoe in ~8 months, middle class person in ~13 months, lower middle class in ~26 months
- Out of the 12.78mn shoes bought in Mumbai in a year, 3.13mn (25%) is bought by the upper class which shows the market size for high end branded shoes in a city like Mumbai

# Estimate the size of the Home Renovation Market in Hyderabad

## Interviewee Notes

- Population of Hyderabad is 10M
- Only considering the residential market where the customer is directly getting the work done
- Average Household Size = 4
- Target Segments: Middle Class (MC), Upper Middle Class (UMC) and Upper Class (UC)
- Renovation Cycle: Years after which renovation takes place is 15 for MC, 12 for UMC and 10 for UC
- Average House Price: Rs. 25L for MC, Rs. 75L for UMC and Rs. 150L for UC
- Renovation Spend as a % of House Price: 6% (MC), 8% (UMC) and 10% (UC)

## Approach/Framework




| | MC | UMC | UC |
|---|---|---|---|
| Number of Houses | 750K | 250K | 125K |
| Renovation Cycle (Years) | 15 | 12 | 10 |
| Number of Houses for Renovation Per Year | 750K/15 = 50K | 250K/12 = 20.8K | 125K/10 = 12.5K |
| Average House Price | Rs. 25L | Rs. 75L | Rs. 150L |
| Renovation Spend % | 6% | 8% | 10% |
| Renovation Expenditure Per House | Rs. 1.5L | Rs. 6L | Rs. 15L |
| Renovation Market | Rs. 750 Cr | Rs. 1250 Cr | Rs. 1880 Cr |

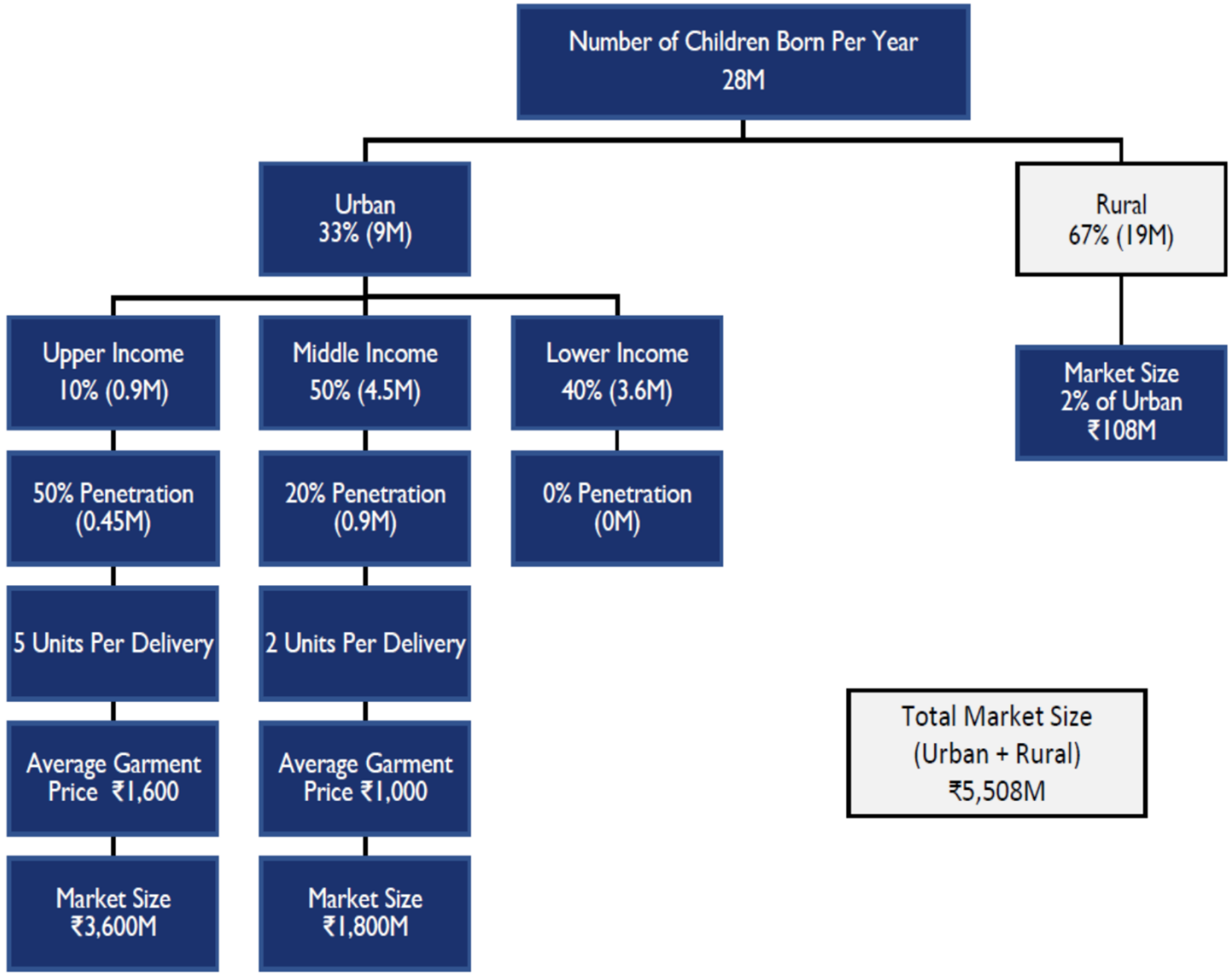
**Market Size = Rs. 3880 Cr**

# Estimate the size of the Maternity Wear Market in India

## Interviewee Notes

- Single pregnancies only – no twins/ triplets
- Product used only for 1 birth cycle – no reuse from the previous births
- 28M children born per year
- 33% babies born in Urban and 67% born in Rural
- Very limited Rural demand. Assumed as 2% of Urban demand
- Urban Upper-Income Group = 10%, Urban Middle-Income Group = 50% and Urban Lower-Income Group = 40%
- Penetration of 50% for Urban UIG, 20% for Urban MIG
- Assume only 1 variety of garment in the market. Average price is Rs.1600 for UIG and Rs.1000 for MIG

## Approach/Framework

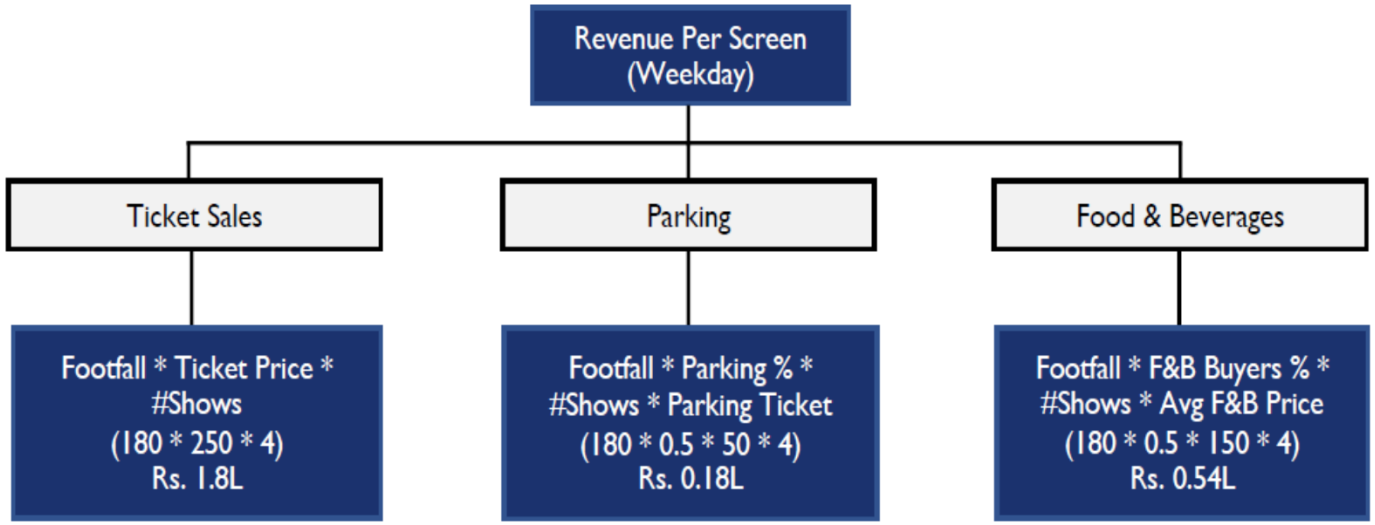


# Estimate the Annual Revenue of a Multiplex

## Interviewee Notes

- Three Main Drivers of Revenue: Ticket Sales, Parking Charges and F&B orders
- Assume 4 Screens Per Multiplex
- Assume 300 Seats Per Screen
- Occupancy on Weekdays is 60% and Occupancy on Weekends is 90% (1.5x)
- Equal Ticket Price of Rs. 250 for all shows
- Parking Charge of Rs. 50 for all shows
- Average Order Value of Rs. 150 for F&B orders
- Assume 50% of customers use parking facility and 50% buy F&B

## Approach/Framework




| | Weekday | Weekend |
|---|---|---|
| Occupancy | 60% | 90% |
| Revenue Per Screen Per Day | Rs. 2.52L | Ra. 3.78L |
| Number of Screens | 4 | 4 |
| Total Revenue Per Day | Rs. 10.08L | Rs. 15.12L |
| Number of Days | 260 | 105 |
| Total Revenue Per Day Type | Rs. 26.2 Cr | Rs. 15.9 Cr |
| Total Revenue | Rs. 42.1 Cr | |

# Estimate the total amount of toll tax collected annually across India

## Interviewee Notes

- Split of Small, Medium and Large Vehicles in the traffic is as given in Table A.
- Toll tax for different types of vehicles is as given in Table B.
- Processing time at a plaza against the time of the day is as given in Table C.

Note: The processing time used here is including the idle time for the plaza. At night when the load is lower idle time will be high so average processing time is higher.

## Facts/Assumptions

- Daily toll collection from 1 lane of a toll plaza ~ ₹3.6L
- On an average there are 4 active lanes in a plaza.
- Daily toll collection from 1 plaza ~ ₹15L
- Daily toll collection from 560 plazas ~ ₹85 Crores
- Annual toll collection ~ ₹30,000 Crores

## Approach/Framework

**Number of Toll Plazas in India**

Approximate distance between consecutive toll plazas ~80km

Land area served by a single toll plaza = 3.14*40*40 sq. km
(Assuming 80km length is shared by 2 plazas)

Total land area of India ~ 4 million sq. km
Assuming 70% roadways coverage. Serviced area ~ 2.8 mn sq. km

Total toll plazas in India = 2.8 * 10^6 / 3.14 * 40 * 40= ~ 560

Table A: Load distribution of vehicles types Vs Time of the day

| Vehicle Type\Time | 10AM – 6PM | 6PM – 2AM | 2AM – 10AM |
|---|---|---|---|
| Small | 50% | 40% | 10% |
| Medium | 30% | 50% | 20% |
| Large | 10% | 30% | 60% |

Table B: Average toll Tax for each vehicle type

| Vehicle Type | Toll Tax |
|---|---|
| Small | ₹100 |
| Medium | ₹200 |
| Large | ₹400 |

Table C: Vehicle Processing time

| Time of the Day | Processing Time |
|---|---|
| 10AM – 6PM | 30 seconds |
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Table 1: Toll collection in a single lane of a single toll plaza

| Time of the Day | No of Vehicles Processed | Average Toll Price | Total Toll Collected |
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| 6PM – 2AM | 8 hrs / 60 sec = 480 | ₹(0.3*100 + 0.5*200 + 0.2*400) = ₹210 | ₹210*480 ~ ₹1.0L |
| 2AM – 10AM | 8 hrs / 90 sec = 320 | ₹(0.1*100 + 0.3*200 + 0.6*400) = ₹310 | ₹310*320 ~ ₹1.0L |
| **Total Toll Collection** | | | **~ ₹3.6L** |

## Estimate the revenue from consumption of Nestle Coffee on a Weekday in Mumbai

### Interviewee Notes

- Four variants of coffee
1. Chicory + coffee = Rs. 2/cup
2. Only coffee = Rs. 4/cup
3. Freeze-dried coffee= Rs. 20/cup
4. Coffee pods= Rs. 50/cup
- At-home coffee drinkers – Buyers of coffee sachets/ jars & coffee pods
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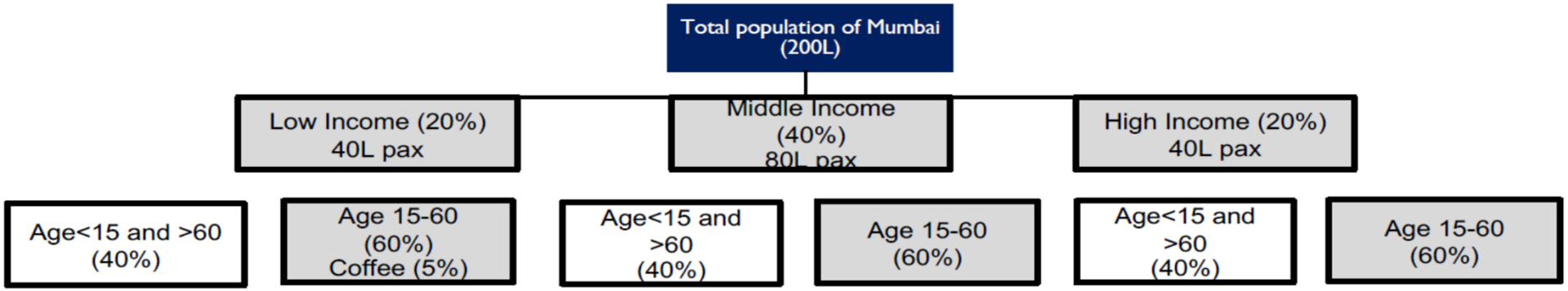
- Prices for commercial factor quality & implicit service

### Approach/Framework




| | At home | Stalls |
|---|---|---|
| % drinkers | 50% | 50% |
| # cups/day | 2 | 2 |
| Price/cup | 2 | 2 |
| Market Share | 1/2 | 1/2 |
| Total Revenue | 1.2L | 1.2L |

| | At home | Shops |
|---|---|---|
| % drinkers | 60% | 40% |
| # cups/day | 2 | 2 |
| Price/cup | 2 | 2 |
| Market Share | 50% | 50% |
| Total Revenue | 11.5L | 9.6L |

| | At home | Shops |
|---|---|---|
| % drinkers | 20% | 80% |
| # cups/day | 2 | 2 |
| Price/cup | 50 | 50 |
| Market Share | 50% | 10% |
| Total Revenue | 120L | 96L |

Total Revenue on Weekday= Rs. 240 L

### Observations/Inferences

- This guesstimate estimates revenue from the final consumption of soluble coffee (sachets/ jars/ pods) by Nestle. This includes retail sales through traditional channels as well as e-commerce. This guesstimate excludes sales of coffee machines, milk, sugar, installation services, etc. Costs are not considered at this stage.
- For age range and coffee preference: the age range 15-30 and 31-60 has been clubbed and the weighted average based on population and preferences is taken
- For roadside stalls, revenue is Re.1/ cup as such stalls generally use ½ the amount of standard serving size. It is assumed that 1 pod = 1 cup.

# Estimate the number of snapchat streaks shared in a day

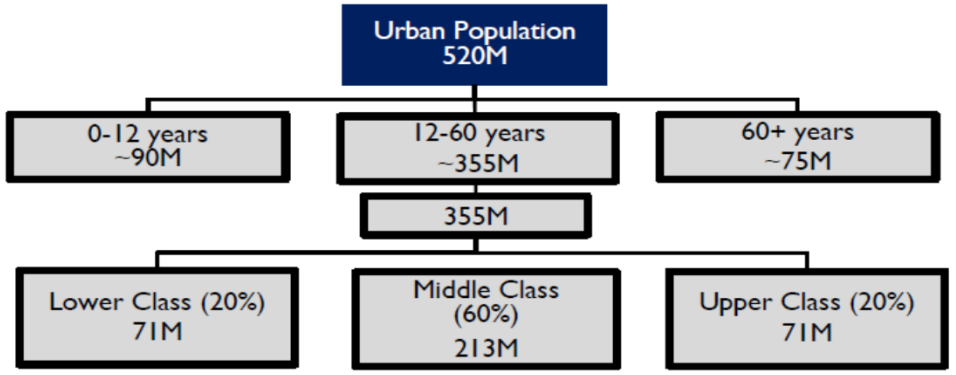
## Interviewee Notes

- Estimate the number of daily snapchat users.
- Consider the propensity to maintain streaks.
- Segment the urban population by age brackets and further by income class.
- Apply various filters to arrive at the guesstimate of snapchat streaks sharing in a day

## Facts/Assumptions

- A person would send streaks to someone in India only.
- Only snapchat streaks and no other snaps is considered.
- 0-12 years age bracket is discounted as they are expected to not have phones and 60+ as they won't use phones much.
- Life Expectancy = 70 years, No. of people in each bracket is distributed proportionately as per life expectancy.
- Urban households include 4 people: parents and children, In middle and upper class households, ¾ members would use social media whereas in lower class households ½ would use it. (basis age and income).

## Approach/Framework




| | | | |
|---|---|---|---|
| % using phones | 60% | 80% | 95% |
| % using smart phones | 30% | 80% | 100% |
| % using social media | 50% | 75% | 75% |
| Calculation | =159M | | |
| % using snapchat | 30% | | |
| % mantaining streaks | 33% | | |
| Calculation | 15.9M | | |
| # of streaks sent in a day | 8 | | |

| Formula used | Population | X | % using smart phones | X | % using social media | X | % using snapchat | X | % maintaining streaks | X | # of streaks sent in a day |
|---|---|---|---|---|---|---|---|---|---|---|---|

~140M

## Observations / Suggestions

- Urban population = Population of India (1300M) * 40% = 520M
- Number of snapchat users in rural India and those who maintain streaks would be comparatively insignificant, therefore a multiple (1.1) is taken at the end for the sake of simplicity.
- A person who maintains streaks on Snapchat sends a snap everyday to fulfil the requirements of a streak. Ignoring breaking of streak anytime.

# Litres of paint used annually in India to paint private cars

## Interviewee Notes

- Used cars included in calculation to account for repair work conducted to make car resalable
- Proportion of new car to used car sales assumed to be higher for higher income levels
- Liters of paint per car is higher for high income due to larger sized vehicles and better-quality finishing
- Totals may not match due to rounding

## Approach/Framework

Total Households in India
1.4 Billion/4 per family = ~350 Million

| | Low & Lower Mid Income 75% (~250M) | Upper-Mid Income 20% (~70M) | High Income 5% (~20M) |
|---|---|---|---|
| % households owning cars | 2% (5M) | 20% (14M) | 50% (10M) |
| # of years car is used | 7 | 6 | 5 |
| Annual replacement | 5/7 = 0.7 M | 14/6 = 2.3 M | 10/5 = 2 M |
| Demand split by new/used | New: 0 M<br>Used: 0.7 M | New: 0.3 M<br>Used: 2 M | New: 0.5 M<br>Used: 1.5 M |
| Liters of paint per car | New: 5 Lit<br>Used: 1 Lit | New: 5 Lit<br>Used: 1 Lit | New: 5.5 Lit<br>Used: 1.5 Lit |

**Total litres = (0*5 + 0.7*1) + (0.3*5 + 2*1) + (0.5*5.5 + 1.5*1.5) = 9.2 M Litres**

## Observations/Inferences

Additional refinements possible:

- Expanding scope to include commercial vehicles, taxis, buses etc. to gauge size of the larger market
- Segregating rural and urban demand for greater accuracy
- Estimating use for general maintenance and repainting of already running cars
- Accounting for high income families with more than 1 car

# Estimate the number of bullets fired in India annually

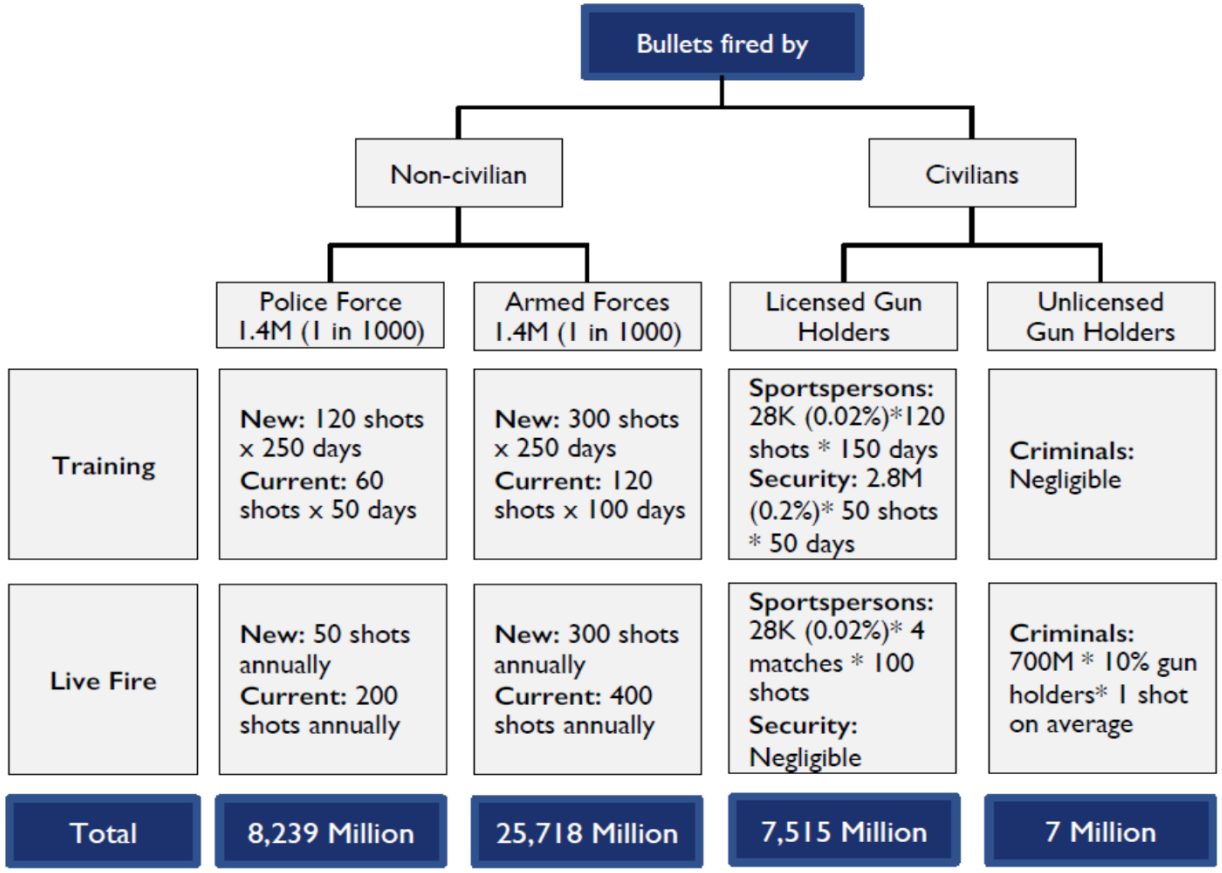
## Interviewee Notes

- India's population is rounded off to 1.4 billion
- Only bullets used in rifle and pistols are included. No other ammunition
- Non material avenues like firing at ceremonies, are ignored

## Facts/Assumptions

- On an average, 60 shots are fired in one hour
- Hours in training are higher for new recruits and lower for existing employees for both police and armed forces
- Live fire is higher for existing employees as compared to new recruits for both police and armed forces
- A sportsperson's single match includes 60 shots for a match + practice shots
- Not calculated figures where numbers were too small to be material

## Approach/Framework




## Observations/Inferences

- Based on the 80-20 rule, only non-civilians need to be focused upon extensively
- Non-civilians would include police force and the armed forces
- We can further segment this as new-recruits and old employees

# Estimate the total number of chess moves played in a day in India

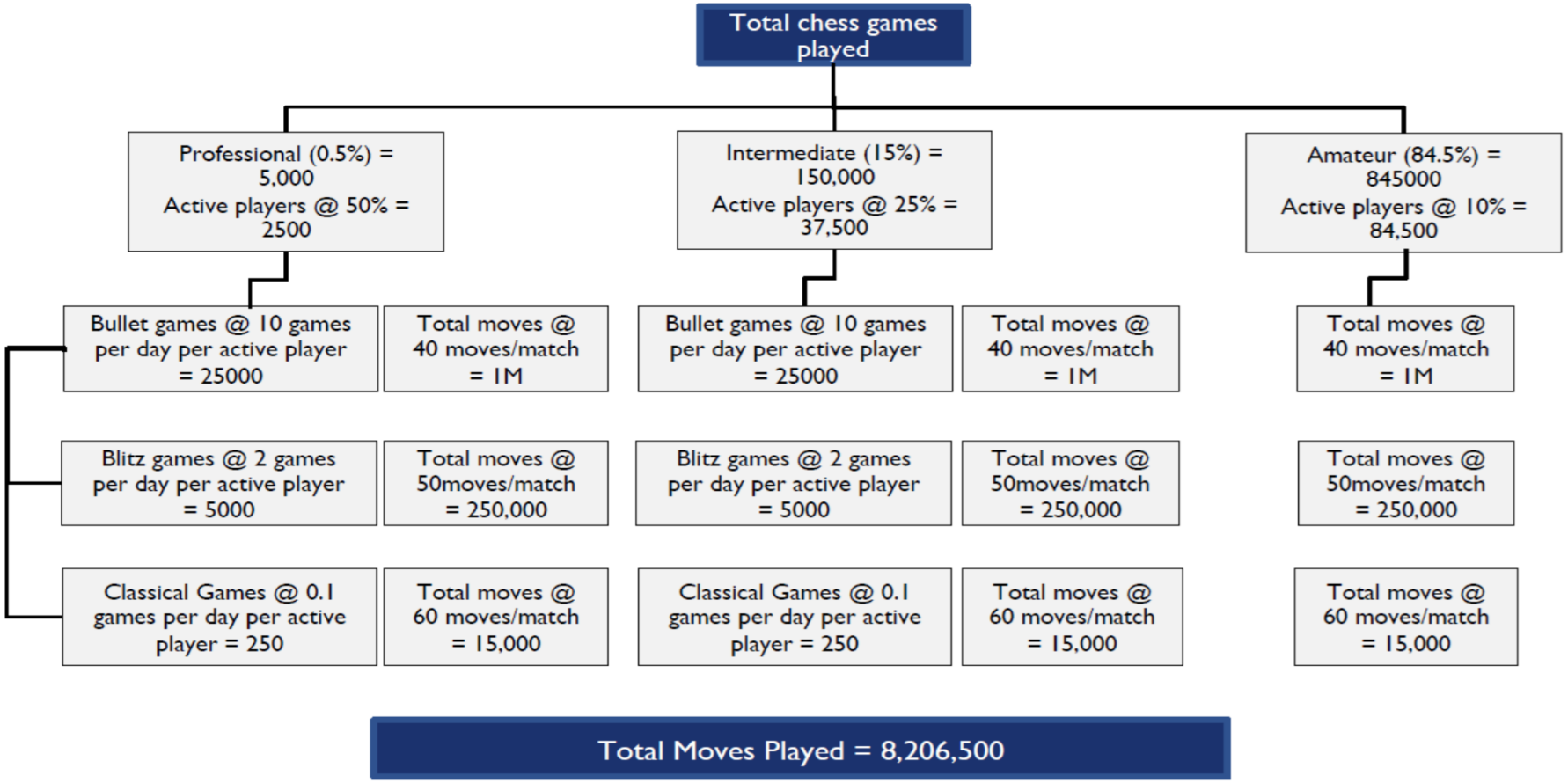
## Interviewee Notes

- Differentiate among the professional, intermediate and amateur as per the strength of a chess player.
- Among all chess games approximate the proportion of Classical, Blitz, and Bullet games.
- Estimate the average number of games of each variant played by each type of chess player and also the total number of moves in each types.

## Facts/Assumptions

- Total chess players in India is taken as 1M
- In Bullet game time control is <=1 min; Blitz >1 & <= 5 min and in classical game >5min.
- Games of higher rating category players are assumed to be more complicated and have more number of moves in general.
- As the strength of player decreases, they tend to play with higher time control.
- Case counts moves of games only played in 3 variants i.e. Bullet, Blitz and classical. Other variants, puzzles and game with computer is neglected while doing these calculations

## Approach/Framework



# Estimate the number of injections administered in Ahmedabad

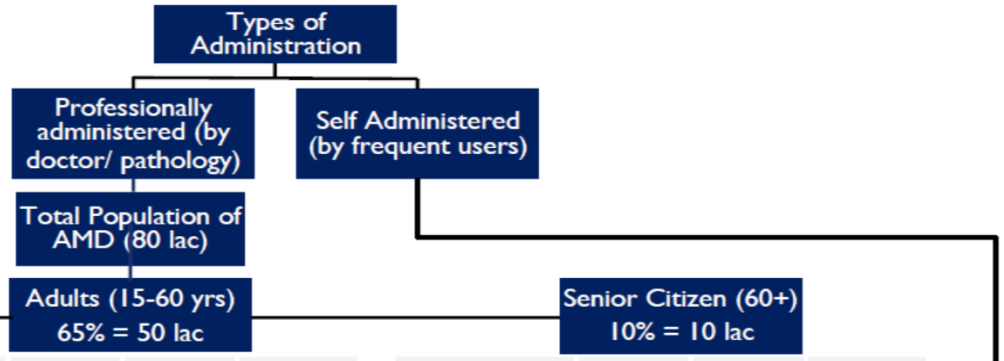
## Interviewee Notes

- Senior citizens are expected to visit the doctor more often
- Children and seniors are most likely to get medicines administered through injections
- Senior citizens would require blood tests most frequently
- Calculations for total injections : [weighted avg. of income dist. and injections/ individual * age population]

## Facts/Assumptions

- Population of Ahmedabad is ~80 lac
- Average visits to doctors is 2.5 per year by children (1-14 yrs) in US (non-vaccine). Estimating 40% for lower income and 70% for upper income India.
- Average visits to doctor by adults (15+) is 2 per year. Average visit is 4 by senior citizens.
- Diabetic population is 5%.

## Approach / Framework




**Children (1- 14 yrs) 25% = 20 lac**

| Instance | Lower income (30%) | Middle & upper income (70%) |
|---|---|---|
| Visits to doctor | 1 | 2 |
| % for blood tests required | 10% | 10% |
| % for injections administered | 30% | 40% |
| Injection per individual | 0.4 | 1.0 |
| Additional injections for Vaccines | 0.5 | 1 |

**Adults (15-60 yrs) 65% = 50 lac**

| Instance | Lower income (30%) | Middle income (60%) | Upper income (10%) |
|---|---|---|---|
| Visits to doctor | 1 | 2 | 4 |
| % for blood tests required | 10% | 10% | 10% |
| % for injections administered | 5% | 10% | 15% |
| Injection per individual | 0.15 | 0.4 | 1.0 |

**Senior Citizen (60+) 10% = 10 lac**

| Instance | Lower income (30%) | Middle income (60%) | Upper income (10%) |
|---|---|---|---|
| Visits to doctor | 1 | 4 | 6 |
| % for blood tests required | 20% | 20% | 20% |
| % for injections administered | 20% | 30% | 40% |
| Injection per individual | 0.4 | 2.0 | 3.6 |

| Number of injections | % needing insulin | % diabetic | population | Insulin patients |
|---|---|---|---|---|
| 100 | 10% | 5% | 80 lac | |

Total Injections: Children (Normal + Vaccine) + Adults (15-60 yrs.) + Senior Citizens + Insulin Patients

= 1.67 * 20 + 0.385 * 50 + 1.68 * 10 + 0.4 * 80

= 101 lac (101,00,000)

## Observations / Suggestions

- A normal scenario is assumed, where vaccinations are only applicable to children from 0-14.
- In case of children, injection per individual and vaccine injection are added together.
- % for blood test required and % for injections administered are mutually exclusive and can be added since we are considering the total number of injections.

# THANK YOU

For Further Queries regarding Mentorship or any other doubts

Contact -+919815114690

varunk2012@email.iimcal.ac.in

https://t.me/CasesGuesstimates

@CASESGUESSTIMATES