

Executive Summary

NCD Mobile Phone Survey

1. Overview

This report summarizes results from the Mumbai Noncommunicable Diseases (NCD) Mobile Phone Survey conducted in 2022. NCDs are the leading cause of death worldwide and according to the World Health Organization country profiles in 2017, NCDs are estimated to account for 61% of all deaths in India [1]. It is estimated that the probability of Indians aged 30-70 years dying from one of the four main NCDs is 23% (cancer, cardiovascular diseases, diabetes, and chronic respiratory disease) [1]. The high human costs due to NCDs contribute to rising health-care costs and social care and welfare resulting in reduced productivity. A 2014 report from the World Economic Forum estimated economic loss due to NCDs between the years 2012-2030 to be \$3.55 trillion (based on 2010 dollars) [2]. Though NCDs result in high human and economic costs, the impact can be reversed by modification of population behavior including reducing tobacco use, harmful use of alcohol, unhealthy diet, and physical inactivity.

Efficient monitoring and surveillance efforts to track the progress of the NCD burden, related risk factors, and policy interventions are key to an effective response to combat NCDs. The systematic monitoring of risk factors to generate accurate and timely data is essential for Mumbai's ability to prioritize crucial resources and make sound policy decisions to address the growing NCD burden.

Globally increasing access and use of mobile phones provide opportunities to use mobile phone technology as an interim method to collect data and supplement household surveys. As of 2020, India had a mobile phone penetration rate of 84 mobile cellular subscriptions (per 100 people) [3]. In 2018 the Municipal Corporation of Greater Mumbai (MCGM) spear-headed one of the first city-specific surveys on NCD risk factors using mobile phone technology.

In the 2022 NCD mobile phone survey, 3,418 individuals subscribed to Airtel, MTNL, Reliance Jio, and Vodafone Idea mobile phone networks participated in the survey using interactive voice recording (IVR).

The survey was the culmination of significant work by the MCGM, including but not limited to telecommunications approval from the Telecom Regulatory Authority of India and an agreement with the mobile network aggregator Twilio. The Department of Health, Epidemiology Bureau led questionnaire development, sampling, the mass media campaign, data collection, and analysis. Technical assistance was provided by the US Centers for Disease Control and Prevention, RTI International, and InSTEDD. Bloomberg Philanthropies Data for Health Initiative provided financial support through the CDC Foundation.

This report is structured as follows:

- Goals (Section 2)
- Design and Implementation (Section 3)
- Results (Section 4)
- Conclusions (Section 5)

2. Goals

The goal of the Mumbai 2022 NCD mobile phone survey is to provide nationally representative estimates of indicators that can provide information on NCDs to help make programmatic recommendations to improve and enhance NCD prevention and response in Mumbai. In addition to providing data to inform NCD prevention and response strategies, findings from the 2022 survey may be used to supplement results of key behavior risk factors assessed in the WHO Stepwise survey or other national surveillance systems.

The NCD Mobile Phone Survey included 18 core questions on the following topics:

- Demographics
- Tobacco Use
- Alcohol Use
- Diet (Fruit, Vegetable, and Salt Consumption)
- Diabetes
- Hypertension

3. Design and Implementation

3.1 Design

The design parameters used for the NCD Mobile Phone Survey are shown below in Table 1.

Component	Design
Mode	IVR
Mode Strategy	The primary mode of contact was IVR with no fallback.
Sample	A two-phase sample of mobile phone numbers generated via random digit dialing (RDD), using the mobile phone prefixes for Airtel, MTNL, Reliance Jio, and Vodafone Idea stratified by age and sex in the second phase.
Number of Interviews	3,418 interviews, allocated proportionally across strata to the general population distribution.
Strata	6 strata, created by crossing sex (male, female) with age (18-29, 30-44, 45+)
Questionnaire	The NCD Mobile Phone Survey questionnaire, which included 20 questions in 3 languages: Marathi, Hindi, and English
Contact times	All 7 days of the week, between 8am and 8pm each day
Contact attempts	<ul style="list-style-type: none">• Contact #1: IVR• Contact #2: IVR, 26 hours after Contact #1• Contact #3: IVR, 26 hours after Contact #2
Cost to Respondents	None. Incoming phone calls are free.
Incentives	Every person who completed the survey was sent 75 Rupees free internet data.
Tool and Hosting	Surveda, with data hosted using Amazon Cloud Services.

3.2 Implementation

The Mumbai NCD Mobile Phone Survey implementation process consisted of four stages: Planning and Pre-Test, Full-scale Data Collection, Data Management and Analysis, and Data Release and Use.

Data collection was conducted in a phased approach starting with half of the sample for each of the four mobile phone networks (Airtel, MTNL, Reliance Jio, and Vodafone Idea), so as not to overload the Twilio channel connected to Surveda. Subsequent sample was loaded periodically throughout the survey. Full data collection was launched on the 15th of November 2021 and ran through the 21st of January 2022. A total of 3,418 individuals completed or partially completed (defined as answering at least five NCD behavior or risk factor questions) the survey through the four major mobile network operators in 68 days.

4. Results

This section presents the following results:

- Demographics and Response Rates (section 4.1)
- Tobacco Use (section 4.2)
- Alcohol Use (section 4.3)
- Diet (section 4.4)
- Diabetes (section 4.5)
- Hypertension (section 4.6)

4.1 Demographics and Response Rates

The Mumbai Mobile Phone Survey included 3,418 interviews across 6 age by sex groups. Table 2 shows the Mobile Phone Demographic distribution compared to the 2011 MCGM Public Health Department Census for sex and age.

	Mobile Phone Sample	National*
Sex	3,418	9,151,235
Male	61.4%	54.3%
Female	38.6%	45.7%
Age		
18-29	36.2%	34.3%
30-44	35.3%	32.7%
45+	28.6%	33.0%

*2011 MCGM Public Health Department Census

To achieve the 3,418 interviews, we sent invitations to 401,278 mobile phone numbers. Due to the nature of the RDD (random digit dialing) sampling, it was expected that many of these mobile phone numbers were invalid or non-working. Out of these, 84,873 provided some sort of response: 13,663 were ineligible due to residency outside of Mumbai; 18,361 consented and provided the age and sex information necessary to be eligible to participate (3,787 females and 14,574 males). Of these, 2,068 were ineligible due to age, and 7,538 respondents of eligible age were rejected due to stratum sample size being full. The result was 8,755 eligible respondents, of which 3,418 provided interviews (completed

or partial) with known sex. Completed interviews were defined as answering all survey questions. Partial interviews were defined as answering at least five NCD questions but not finishing the survey. The interview rate was 39.0% and the overall response rate was 3.1%, which is described in detail below.

The final disposition codes for this sample are shown in Table 3.

Table 3. Final disposition codes for all dialed mobile phone numbers

Disposition	Definition	n	Percent
1. Complete (I)	Answered all survey questions	2,102	0.5%
2. Partial (P)	Answered at least five NCD question but did not finish the survey	1,316	0.3%
3. Breakoff: Eligible (O)	Answered age and sex questions but did not answer five or more NCD questions	5,337	1.3%
4. Ineligible: Residency	Did not reside in Mumbai	13,663	3.4%
5. Ineligible: Age	Under age 18	2,068	0.5%
6. Ineligible: Quotas	Answered age and sex questions but quotas were full	7,538	1.9%
7. Refused	Refused consent	26,215	6.5%
8. Breakoff: unknown eligibility	Answered some questions but stopped before completing eligibility	26,634	6.6%
9. No answer	No answer, possibly nonworking number	316,405	78.8%
Total		401,278	

In this project, the sampling design involved two Phases. Each phase had a response rate. The final response rate was the product of Phase I and Phase II response rates.

$$\text{Phase I Response Rate} = \frac{\text{Number MPNs screened}}{\text{Number MPNs dialed}}$$

Or,

$$\text{Phase I Response Rate} = \frac{32,024}{401,278} = 0.0798$$

$$\text{Phase II Response Rate } RR6_s = \frac{IP_s}{IP_s + O_s} \text{ for stratum } s.$$

RR₆ was derived from the 2016 Standard Definitions of the [American Association for Public Opinion Research \(AAPOR\)](#). Phase II stratum-specific response rates (RR #6) are in Table 4:

Age	Males	Females
18-29	RR6 ₁ = 34.0%	RR6 ₂ = 40.3%
30-44	RR6 ₃ = 36.8%	RR6 ₄ = 42.7%
45+	RR6 ₅ = 41.5%	RR6 ₆ = 47.6%

The overall response rate is the product of Phase I and Phase II response rates, resulting in an overall response rate for the entire NCD Mobile Phone Survey in Philippines:

$$RR6_{overall} = \frac{IP_{overall}}{IP_{overall} + O_{overall}} * RR_{Phase I} = \frac{3,418}{3,418 + 5,337} * 0.0798 = 0.0312$$

4.2 Tobacco Use

Overall, 28.8% of adults (aged 18 years and older) reported current tobacco use in the form of smoked or smokeless tobacco products (43.6% among men and 11.2% among women). The prevalence of current tobacco smokers among all adults was 24.4%, and the prevalence of current smokeless tobacco users was 19.7% for all adults. Men reported higher rates of current tobacco smoking compared to women (36.9% among men and 9.6% among women), as well as for current smokeless tobacco use (30.2% among men and 6.8% among women). Men also reported higher rates of daily tobacco smoking compared to women (16.9% vs. 3.8% respectively).

Table 5 shows key outcomes from the 2021 NCD Mobile Phone Survey on tobacco use.

Table 5. Tobacco Use Overall and by Sex

Tobacco Use	Overall		Males		Females	
	%	(95% CI)	%	(95% CI)	%	(95% CI)
Tobacco Smokers						
Current tobacco smokers	24.4	(23.0 - 25.8)	36.9	(34.7 - 39.1)	9.6	(7.9 - 11.4)
Daily tobacco smokers	10.9	(9.8 - 12.0)	16.9	(15.2 - 18.6)	3.8	(2.6 - 4.9)
Smokeless Tobacco Users						
Current smokeless tobacco users	19.7	(18.3 - 21.0)	30.2	(28.2 - 32.3)	6.8	(5.3 - 8.3)
Daily smokeless tobacco users	10.4	(9.4 - 11.5)	16.3	(14.6 - 18.0)	3.3	(2.2 - 4.4)
Tobacco Users (any use)						
Current tobacco users	28.8	(27.3 - 30.3)	43.6	(41.4 - 45.8)	11.2	(9.4 - 13.1)

4.3 Alcohol Use

Three in ten adult Mumbaikars consumed alcohol in the past 30 days (31.0%), with males reporting higher rates of alcohol consumption than females (48.0% vs. 11.1% respectively). One in four adult Mumbaikars (26.7%) reported drinking six or more drinks in a single drinking occasion. Men reported higher rates of heavy drinking occasions than females (42.5% vs. 9.1%).

Table 6 shows reported alcohol use overall and by sex from the NCD Mobile Phone Survey.

Table 6. Alcohol Use overall and by Sex

Alcohol Use	Overall		Males		Females	
	%	(95% CI)	%	(95% CI)	%	(95% CI)
Current alcohol users (past 30 days)	31.0	(29.2 - 32.8)	48.0	(45.3 – 50.7)	11.1	(9.0 – 13.2)
Heavy episodic drinkers (percentage of drinkers had 6+ drinks)	26.7	(25.0 – 28.5)	42.5	(39.8 – 45.3)	9.1	(7.1 – 11.1)

4.4 Diet

Regarding salt consumption, one out of four (24.5%) adult Mumbaikars always or often added salt or salty sauces to their food before eating. Slightly more (27.3%) adults reported always or often adding salt in some form to food when cooking or preparing foods. Fewer than one out of seven (15.1%) of adult Mumbaikars reported always or often eating processed foods high in salt.

For fruit and vegetable consumption, 79.1% of all adult Mumbaikars consumed less than five servings of fruit or vegetables per day with an average of 2.3 servings of vegetables and 1.4 servings of fruits per day. Less than 1% reported consuming no fruits or vegetables per day.

Table 7 presents salt, fruit, and vegetable consumption overall and by sex.

Table 7. Diet Overall and by Sex

Diet	Overall		Males		Females	
	%	(95% CI)	%	(95% CI)	%	(95% CI)
Salt Consumption						
Always or often add salt or salty sauce to food before eating or as they're eating	24.5	(22.9 - 26.0)	27.4	(25.3 - 29.4)	21.1	(18.8 - 23.5)
Always or often add salt or salty seasoning when cooking or preparing foods	27.3	(25.6 - 28.9)	31.2	(29.1 - 33.4)	22.7	(20.3 - 25.2)
Always or often eat processed foods high in salt	15.1	(13.8 - 16.4)	18.4	(16.6 - 20.2)	11.3	(9.4 - 13.1)
Fruit Consumption	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
Average number of days per week fruits are consumed	3.2	(3.1 - 3.3)	3.1	(3.0 - 3.1)	3.3	(3.2 - 3.5)
Average number of servings of fruit consumed per day	1.4	(1.3 - 1.4)	1.4	(1.3 - 1.5)	1.3	(1.2 - 1.4)
Vegetable Consumption	Mean	(95% CI)	Mean	(95% CI)	Mean	(95% CI)
Average number of days per week vegetables are consumed	4.3	(4.3 - 4.4)	4.2	(4.1 - 4.3)	4.5	(4.4 - 4.6)
Average number of servings of vegetables consumed per day	2.3	(2.2 - 2.4)	2.3	(2.2 - 2.4)	2.3	(2.2 - 2.5)
Fruit and Vegetable Consumption	%	(95% CI)	%	(95% CI)	%	(95% CI)
Consume less than five servings of fruits OR vegetables per day	79.1	(77.6 - 80.7)	79.6	(77.7 - 81.5)	78.6	(76.1 - 81.1)

Consume no fruits and vegetables per day	0.4	(0.2 - 0.6)	0.5	(0.2 - 0.8)	0.3	(0.0 - 0.6)
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4.5 Raised Blood Glucose or Diabetes

Overall, 10.1% of adult Mumbaikars indicated they were ever told they had raised blood glucose or diabetes (10.2% among men and 9.9% among women). Of those, approximately three out of four (72.3%) reported that they were currently taking medication for raised blood glucose or diabetes.

Table 8 shows the rates of self-reported raised blood sugar or diabetes.

Table 8. Raised Blood Glucose/Diabetes Overall and by Sex

Raised Blood Glucose/Diabetes	Overall		Males		Females	
	%	(95% CI)	%	(95% CI)	%	(95% CI)
Diagnosed by doctor or health care professional with raised blood glucose/diabetes	10.1	(9.0 - 11.2)	10.2	(8.9 - 11.5)	9.9	(8.1 - 11.7)
Currently taking medication for raised blood glucose/diabetes	72.3	(66.8 - 77.7)	74.3	(68.1 - 80.6)	69.7	(60.4 - 79.1)

4.6 Raised Blood Pressure or Hypertension

One out of seven adult Mumbaikars (14.4%) reported that they had ever been diagnosed by a doctor or health care professional with raised blood pressure or hypertension (14.3% among men and 14.6% among women). Among those who reported they were diagnosed with raised blood pressure or hypertension, 60.3% were currently taking medication for raised blood pressure or hypertension.

Table 9 shows the rates of self-reported raised blood pressure or hypertension.

Table 9. Raised Blood Pressure/Hypertension Overall and by Sex

Raised Blood Pressure/Hypertension	Overall		Males		Females	
	%	(95% CI)	%	(95% CI)	%	(95% CI)
Diagnosed by doctor or health care professional with raised blood pressure/hypertension	14.4	(13.2 - 15.7)	14.3	(12.7 - 15.8)	14.6	(12.5 - 16.8)
Currently taking medication for raised blood pressure/hypertension	60.3	(55.6 - 65.1)	59.7	(53.8 - 65.6)	61.1	(53.4 - 68.7)

5. Conclusions

Conclusions:

NCDs and their associated risk factors have profound consequences on the individual and Mumbai society-at-large. The data presented in the 2022 Mumbai NCD mobile survey will help MCGM as they improve and enhance NCD prevention and response efforts. The timely reporting of mobile phone survey results such as these will also facilitate comparisons over time. Some key outcomes included:

- Overall, 24.4% of adult Mumbaikars reported as current tobacco smokers, with 10.9% being daily tobacco smokers. Men were more likely to report current or daily tobacco smoking than women.
- Overall, almost one in three (31.0%) reported current alcohol consumption, of whom approximately one fourth reported heavy episodic drinking (26.7%). Almost half of men (48.0%) reported drinking alcohol in the past 30 days compared to only 11.1% of women, and men were four and a half times more likely than women to report being heavy episodic drinkers (42.5% versus 9.1%, respectively).
- Approximately eight in ten adults (79.1%) reported consuming less than five servings of fruits or vegetables per day.
- One in four adults (24.5%) reported always or often adding salt or salty sauces to food before or as they are eating it, and slightly more (27.3%) reported adding a form of salt as they prepared a meal. Only 15.1% reported always or often eating processed foods high in salt.
- One in ten adults (10.1%) reported ever receiving a clinical diagnosis of raised blood glucose or diabetes, and almost three out of four (72.3%) of those with diabetes reported currently taking medication for their diabetes.
- One in seven adults (14.4%) reported ever receiving a clinical diagnosis of raised blood pressure or hypertension. Six in ten of those (60.3%) with diagnosed hypertension reported currently taking medication for their hypertension.

Limitations:

The main limitation of any mobile phone survey includes the population's access to a mobile phone. Therefore, the population who do not have access to mobile phones was not represented in this survey. The results of the mobile phone survey were based on self-reports and may be influenced by recall or social desirability bias.

6. *References*

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