

Morbidity profile and prevalence of diabetes and high blood pressure among truck drivers in three regions of India

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Abstract

Background Truck drivers in India are one of the groups experiencing a disproportionate health burden. Understanding the distribution of morbidities is essential to plan and mitigate the risk of premature mortality among this subgroup. Paper aims to describe the health morbidities and prevalence of diabetes and high blood pressure among truck drivers in three regions of India.

Methods Data were routinely collected from a community-based healthcare program for truck drivers. Electronic medical health records (July 2018 to February 2019) of truck drivers were accessed and analyzed. The sociodemographic, health risk and morbidity profile of the truck drivers with an emphasis on diabetes, and high blood pressure in East, West, and South, regions of India were studied. Significance level was reported at p-values less than 0.05.

Results A total of 15725 truck drivers were identified, of which 10247 (65%) were from the south region alone. Majority of truck drivers were male and middle-aged (median age 44 years). Over two-third (>62%) truck drivers in all regions were tobacco users. Half of the truck drivers reported smoking in the South (53%) compared to smokeless tobacco use in the West (53%) and East (41%) regions. Alcohol use alone and both alcohol and tobacco use were significantly lower in the West (23%, 15%) compared to the East (51%, 50%) and South (68%, 52%) regions.

A significant number of truck drivers were either overweight 3485 (22%) or obese 6772 (49%). The prevalence of obesity among truck drivers ranged 55% in the South and 47% in the East compared to 32% in the West region. Of all truck drivers, 6991 (44%) had non-communicable diseases; 3350 (21%) had musculoskeletal conditions, and 1954 (12%) were suffering from communicable diseases. The prevalence of diabetes differed significantly in the three regions ($p < 0.05$). Nearly half of the truck drivers (7326/15725) 47% had high blood pressure ($\geq 140/90$ mm Hg) and regional differences were not significant.

Conclusions Truck drivers in India suffer from multiple health and lifestyle-related diseases. Early identification of high risk and tailored behavioral and occupational interventions are needed urgently.

Background

The logistics sector is one of the key sectors contributing to the economic development in India. As per an estimate, this sector is expected to become a \$215 billion industry employing 40 million people by 2020 (1,2). Among all modes of logistics, the contribution of road transport is highest (60.2%) compared to railways (32.1%), major port coastal shipping (7.4%) and inland waterways transportation (0.2%) (3,4).

Truck drivers in India are the leading players in the road transport market. Nearly five million truck drivers drive twelve hours on an average per day on an extensive spread of national highways (2). However, most of the times, they work in informal and unorganized settings with minimal attention to self-health. Compared to the general population, truck drivers experience higher on-the-job morbidity and mortality

besides increased risk for sexually transmitted infections, metabolic syndromes, and cardiovascular diseases (5–9).

A few studies have evaluated the health and morbidity profile among Indian truck drivers. Existing literature have documented the prevalence of common health problems such as as hypertension (46%), overweight (31%), visual problems (17%) (10), diabetes (13%), (11) and lower back pain (62%) (12) among Indian truck drivers. However, these studies have used a small convenience sample from around their geographies, scattered in scope, and lack generalizability (10,12). Besides, all these studies have focussed on sexual health or ergonomics conditions or assessing of the truck drivers knowledge and awareness on key health conditions (10,12–14). Moreover, the existing literature discussing the prevalence of diabetes, hypertension, and associated risk factors among truck drivers are mostly from developed countries (5,15,16). Hence, the present study fulfils an important literature gap to document health morbidities among truck drivers and assesss the differences in this group of population in three different regions of India.

Piramal Swasthya Management and Research Institute (PSMRI)- a national Non-Government Organization, in 2017, launched a community based mobile medical unit (MMU) health program. Initiated in partnership with Shriram Transport Finance Company Limited (STFCL), the program provides basic primary care services to truck drivers, their families, and helpers, jointly referred to as program beneficiaries, on major national highways of the country. Onwards, henceforth, we will call this program, “STFC-MMU.” The STFC-MMU program design and service delivery offer a unique opportunity to study the changing health problems of truck drivers and helpers in India

Aim

We aimed to describe the socio-demographic, health risk, and morbidity profile among truck drivers availing the STFC-MMU program services with focus on prevalence of diabetes and high blood pressure

Methods

Study Design and Settings

In the present paper, we present a secondary analysis of routinely collected STFC-MMU program data. The program currently operates in 22 cities (program locations) across 12 states of India. In each city, a particular MMU covers specific program service sites (average 11 per site). The program service sites are selected based on truck driver’s density, closeness to major national highways, and after discussion with truck union leaders and the respective state governments. Figure 1 gives an overview of the program locations in different states. For analysis purpose, we divided program locations into three regions namely East (Odisha, Bihar, Assam, Jharkhand & West Bengal), West (Maharashtra, Gujarat & Rajasthan), and South (Karnataka, Tamil Nadu, Andhra Pradesh & Telangana).

STFC-MMU Program Description

The scope of STFC-MMU program is to provide beneficiaries preventive (screening for diabetes and hypertension through random blood glucose and blood pressure monitoring, and oral precancerous conditions), promotive (counseling on life-style related, and locally prevalent diseases including sexually transmitted diseases chiefly HIV & AIDS), diagnostic (urine albumin, haemoglobin and malaria testing), curative (treatment for minor ailments, injuries, including illnesses such as diarrhoea and acute respiratory infections) and referral services (for complicated and high risk cases). PSMRI manages the design and implementation of the program while the STFCL provides funds to deliver the health care services to truck drivers. The program has two essential elements: physical and operational.

Physical Elements

Manpower: Each MMU has four staff members (Medical doctor, nurse, pharmacist, and driver). The role of the doctor is to provide preventive, promotive, curative care and referral services; nurse takes care of registration, captures the anthropometrics, basic lab testing, and assists doctor; pharmacist maintains the drug inventory, dispenses medicine, and responsible for data entry and management. The driver takes care of the vehicle and accompanies other staff members.

Equipment: Every vehicle is equipped with essential medicines and medical equipment such as digital blood pressure machine, glucometer, thermometer, weighing and height meter scale and torchlights to perform simple clinical investigations. Also, each MMU has an internet-enabled tablet and a preloaded software application for data collection and documentation purpose.

Operational Elements

Field Operations: All MMUs operate 24 days (Monday to Saturday; 10.00 AM to 5:00 PM) in a month. Every day, each MMU visit two program service sites (morning and evening) as per fixed-day service delivery schedule and pre-defined route maps. On a routine day, MMU nurse registers the beneficiary using software application and records their basic demographics, vitals, anthropometrics, biochemical, and clinical parameters. Next, the doctor performs the routine physical examination, prescribe laboratory tests as needed, and diagnose the health problems. The doctor then either prescribe the required medicine or refer the beneficiary to the next level of the healthcare facility as per assessed need. The doctor also counsels the beneficiary to maintain a healthy lifestyle.

In the next counter, a pharmacist dispenses the prescribed medicines free of cost based on the doctor's prescription. The pharmacist also manages the drug and data inventory of his MMU. Finally, nurse and pharmacist enter the beneficiary data using software application, synced daily on to centrally placed data servers. Figure 2 describes the services flow on any day.

Analytical Frame for Analysis

We accessed and analyzed routinely collected health records of truck drivers who availed STFC-MMU program services between July 2018 to February 2019. Variable filters such as age range (15 to 75 years), body mass index range (10 to 75 kg/square meter) random blood sugar ranges (40 to 600 mg/dl)

were applied considering possible theoretical values of medical metrics (17–19). Figure 3 explains the procedure for calculating the final analytical frame.

Inclusion Criteria

The analysis was restricted to routinely collected health records of truck drivers, defined as “someone who drives the heavy/medium/small truck” and is utilizing STFC-MMU program services. The data include variables and information of the truck driver captured on their first visit to MMU.

Exclusion Criteria

Health records of helpers, support staff, or family member of the truck drivers.

Variables, Definitions, and Measures

From the final set of routine health records, we extracted the data on demographics (age, sex, marital status, and occupation), habits (tobacco and alcohol consumption), anthropometric measures (height, weight), clinical parameters (blood pressure and random blood sugar) and types of health problems. Health problems among truck drivers were either self-reported or diagnosed on-site by MMU doctor during their first consultation visit.

We used “Systematized Nomenclature of Medicine-Clinical Terms (SNOMED CT)” for consultation classification (20). We classified consultations further into six problem categories:

1. The non-communicable disease (NCDs) includes diabetes mellitus, hypertension, asthma, cataract, chronic obstructive pulmonary disease (COPD), and acid peptic disease
2. Musculoskeletal problems include arthralgia, arthritis, injury/trauma, myalgia, and osteoarthritis
3. Communicable diseases include acute bronchitis, acute diarrhea, acute rhinitis, amebiasis, conjunctivitis, dengue fever, dysentery, gastroenteritis, giardiasis, influenza (flu), lower respiratory tract infection, malaria, otitis media, pharyngotonsillitis, sinusitis, typhoid fever, urinary tract infection, viral fever, viral hepatitis and worm infestation
4. Skin problems include allergic rash, boils, fungal infections, impetigo, pyoderma, scabies, and wounds
5. Problems related to the oral cavity include aphthous ulcers, dental caries, dental fluorosis, febrile blisters, gingivitis, glossitis, gum abscess, oral ulcers, and stomatitis & cheilitis
6. Other category includes anything not specified as above

We used standard definitions of body mass index for Asian Indians for risk profiling (17). Random blood sugar (RBS) values were categorized into “Normal” (RBS < 140 mg/dl); “Impaired glucose level”(RBS between 140 – 199 mg/dl) and “Diabetic” (RBS \geq 200 mg/dl) with classic symptoms of hyperglycemia” (21). National Family Health Survey-4 definitions for “Normal” (Systolic <140 mm Hg and/or Diastolic <90 mm Hg); “Slightly above normal” (Systolic 140-159 mm Hg and/or Diastolic 90-99 mm Hg); “Moderately

high” (Systolic 160-179 mm Hg and/or Diastolic 100-109 mm Hg) and “Very high” (Systolic \geq 180 mm Hg and/or Diastolic \geq 110 mm Hg) were used for blood pressure categorization (22).

Statistical Analysis

We report central frequency measures (mean, median, standard deviations) for continuous variables and frequency percentages for categorical variables. Chi-square and analysis of variance tests were used. Significance level at p-values less than 0.05 was considered. For the analytical purpose, we used the Statistical Package for Social Science version 25 (23).

Results

A total of 15,725 health records of truck drivers had complete data. Region-wise, South had the highest (65%) numbers of truck drivers records compared to the West (23%) and East (12%). The average age of truck drivers in the three regions did not differ significantly (mean 44 years). Almost all truck drivers were married (98.4%) and males (99%). Nearly two-thirds male driver (62.4%) were taking tobacco in any form, highest in the East region (76%). Smoking was high among truck drivers of South (53%) and East (30%) region while smokeless tobacco consumption was high in the West (53%) and East (41%). Nearly 7% of truck drivers in the West region were both smokers and smokeless tobacco users. More than half (56%) of the truck drivers reportedly were consuming alcohol and little less than half (43%) were consuming both alcohol and tobacco.

The mean BMI of truck drivers in three regions did not differ significantly (25.2, SD \pm 4.32). A significant number of truck drivers were either overweight (22%) or obese (49%), and only one-fourth (25%) had normal BMI. High obesity rates were observed in the South (76%) and East (70%). Table 1 summarizes the region-wise sociodemographic and risk factors profiling of the truck drivers.

Table 1: Sociodemographic and risk profile of truck drivers in East, West and South India (2018-2019)

Regions	East (N=1866) (12%)	West (N=3612) (23%)	South (N=10247) (65%)	Total (N=15725) (100%)	p-value
Age (years) (Mean, SD)	(44 9.6)	(46 9.4)	(43.5 10)	(44 9.9)	
Gender					
Male	1856 (99.5)	3571 (99.0)	10157 (99.0)	15584 (99.0)	0.07
Female	10 (0.5)	41 (1.0)	90 (1.0)	141 (1.0)	
Marital Status					
Married	1850 (99.0)	3545 (98.0)	10057 (98.1)	15452 (98.4)	0.01
Single	14 (0.8)	52 (1.6)	164 (1.6)	230 (1.5)	
Separated/Widower	2 (0.2)	14 (0.4)	26 (0.3)	43 (0.3)	
Tobacco use (Yes)	1424 (76.0)	2280 (63.0)	6116 (60.0)	9820 (62.4)	0.00
Smoke	566 (30.0)	125 (3.3)	5378 (52.5)	6069 (38.6)	
Smokeless	758 (41.0)	1914 (53.0)	559 (5.5)	3231 (20.5)	
Both	100 (5.0)	241 (6.7)	179 (2.0)	520 (3.3)	
Alcohol use (Yes)	946 (51.0)	835 (23.0)	7012 (68.0)	8793 (56.0)	0.00
Tobacco & Alcohol use	932 (50.0)	533 (15.0)	5346 (52.0)	6811 (43.0)	
BMI (Mean, SD)	(25.2 4.2)	(23.7 4.1)	(25.8 4.2)	(25.2 4.3)	0.00
Underweight	49 (2.0)	276 (7.6)	258 (2.0)	583 (4.0)	
Normal	515 (28.0)	1285 (35.6)	2185 (22.0)	3985 (25.0)	
Overweight	426 (23.0)	901 (25.0)	2158 (21.0)	3485 (22.0)	
Obese	876 (47.0)	1150 (32.0)	5646 (55.0)	7672 (49.0)	

Non-communicable diseases (44%) and musculoskeletal conditions (21%) were the top two observed morbidities. NCDs, communicable, and musculoskeletal conditions were the dominant health morbidities in the South and West regions, respectively. Table 2 summarizes the distribution of health morbidities among truck drivers in different regions.

Table 2: Distribution of health problems among truck drivers in East, West and South India (2018-2019)

Health problem consultations for	Regions			
	East	West	South	Total
	(N=1866) n (%)	(N=3612) n (%)	(N=10247) n (%)	(N=15725) n (%)
¹ Non Communicable	773 (41.0)	1224 (34.0)	4994 (49.0)	6991 (44.0)
² Musculoskeletal conditions	122 (7.0)	866 (24.0)	2362 (23.0)	3350 (21.0)
³ Communicable diseases	83 (4.0)	585 (16.0)	1286 (13.0)	1954 (12.0)
⁴ Skin diseases	46 (2.5)	169 (5.0)	430 (4.0)	645 (4.0)
⁵ Problems related of Oral cavity	10 (0.5)	27 (1.0)	144 (1.0)	181 (1.0)
⁶ Other category	832 (45.0)	741 (20.0)	1031 (10.0)	2604 (17.0)

¹Non-communicable diseases: Asthma, Cataract, COPD, Diabetes Mellitus, Hypertension and Diabetes Mellitus & Hypertension both.

²Musculoskeletal problems include Arthralgia, Arthritis, Injury/Trauma, Myalgia and Osteoarthritis

³Communicable diseases: Acute Bronchitis, Acute Diarrhoea, Acute Rhinitis, Amebiasis, Conjunctivitis, Dengue Fever, Dysentery, Gastroenteritis, Giardiasis, Influenza (Flu), Lower Respiratory Tract Infection, Malaria, Otitis Media, pharyngotonsillitis, Sinusitis, Typhoid Fever, Urinary Tract Infection, Viral Fever, Viral Hepatitis, and Worm Infestation

⁴Skin problems: Allergic Rash, Boils, Fungal Infections, Impetigo, Pyoderma, Scabies and Wounds

⁵Problems related to the oral cavity: Aphthous Ulcers, Dental Caries, Dental Fluorosis, Febrile Blisters, Gingivitis, Glossitis, Gum Abscess, Oral Ulcers, and Stomatitis & Cheilitis

⁶Other category: Anything not specified as above

Overall, 16% of the truck drivers had diabetes (random blood sugar level of 200 mg/dl or more with other classical symptoms), and the prevalence rates were significantly different in the three regions ($p < 0.05$). Significant proportions of truck drivers were pre-diabetic in the West compared to the other two regions. Almost half (47%) of the truck drivers had raised blood pressure above normal. Approximately 4% of the truck drivers had both high RBS (> 200 mg/ dl) and high blood pressure ($\geq 160/100$ mm Hg). Table 3 describes region-wise variations in diabetes and high blood pressure prevalence rates.

Table 3: Prevalence of Diabetes & high blood pressure among truck drivers in East, West and South India (2018-2019)

Health condition	Regions				p-value
	East (N=1866)	West (N=3612)	South (N=10247)	Total (N=15725)	
Diabetes (18)	n (%)	n (%)	n (%)	n (%)	0.00
Normal (less than 140 mg/dl)	1258 (67.0)	2594 (72.0)	6405 (63.0)	10257 (65.0)	
Impaired glucose level (between 140 - 199 mg/dl)	270 (15.0)	617 (17.0)	2098 (20.0)	2985 (19.0)	
Diabetic (more than 200 mg/dl)	338 (18.0)	401 (11.0)	1744 (17.0)	2483 (16.0)	
High Blood Pressure (19)					0.79
Normal	1002 (54.0)	1947 (54.0)	5449 (53.0)	8398 (53.0)	
Slightly above normal	525 (28.0)	1024 (28.0)	3026 (30.0)	4575 (29.0)	
Moderately high	214 (11.0)	404 (11.0)	1116 (11.0)	1734 (11.0)	
Very high	125 (7.0)	237 (7.0)	656 (6.0)	1018 (7.0)	
Diabetic & High Blood Pressure (Moderate and very high blood pressure)					0.00
	84 (4.5)	93 (2.6)	450 (4.4)	627 (4.0)	

Discussion

To our knowledge, our study is the first large study in India describing health morbidities among truck drivers who are increasingly prone to lifestyle-related diseases. (15). Our analysis found truck drivers were suffering largely from lifestyle-related and musculoskeletal health conditions with a high prevalence of diabetes (16%) and moderately and very high blood pressure (18%). We observed mainly middle-aged male truck drivers who are disproportionally obese within regions could be due to irregular food habits and addiction to substance use, mainly tobacco and alcohol use as evident among this population. We observed the highest proportion of truck drivers records from the South (65%) and few from the West (23%) and East (12%) region due to the fact the STFC-MMU program has more program service sites in the South region. Moreover, the program initiated early in the South region and recently expanded in the other two regions. We saw a majority of truck drivers in their late productive age group, which is no different, as found in other studies (10–12,24)

The prevalence of NCDs risk factors like tobacco (62.4%) and alcohol (53%) consumption were higher in our study compared to the existing literature (10,25,26). Region-wise high consumption of alcohol and tobacco may be related to the easy availability of indigenous and raw products in East and West region where smokeless tobacco products such as gutkha, pan, and betel nuts are widely available and probably high net disposable income, education, and other social factors in the South (27,28)

Globally, it has been established that cardiovascular diseases are serious health issues among obese/overweight people with a sedentary lifestyle (29). As per guidelines, a BMI of 23.0 kg/m² or more reflects increased risk for Asian Indians for diabetes and cardiovascular diseases (17). The prevalence of

obesity (a BMI of 25.0 kg/m² or more) among truck drivers (49%) in our analysis was found to be nearly 2.5 times higher than the Indian male population (18.9%) (22,26) Higher BMI could be because truck drivers who access our program services may have long driving hours, irregular eating habits, unhealthy lifestyle and irregular sleeping hours, leaving little or no time for exercise or healthy eating. The observed level of health morbidities, non-communicable diseases, and musculoskeletal conditions among Indian truck drivers are in agreement with existing Indian evidence (10–12) Besides, the physiological and occupational demands combined with long driving hours may explain the high prevalence of health morbidities (30).

In general, the prevalence of diabetes and high blood pressure among Indian truck drivers is higher compared to an adult Indian male from East, West, and South India(26,31,32))The prevalence of high blood pressure (Systolic 140-159 mm Hg or more and/or Diastolic 90-99 mm Hg or more) among truck drivers (47%) is nearly 1.5 times higher than the Indian male population (30.7%) (33). Similarly the prevalence of diabetes (more than 200 mg/dl) was 1.3 times higher in truck drivers (16%) than the Indian male population (12%) as documented by the National Diabetes and Diabetic Retinopathy Survey 2019 (34). However, within the regions, truck drivers from the West have slightly lower diabetes prevalence aligning with the findings of different survey reports documenting lower prevalence of diabetes among adults from the West region (32,35). Regional variability of Indian diets may be a probable explanation for the high prevalence of diabetes in the southern region. Existing study has pointed that people in East and South regions are more likely to consume high-fat meal like meat, sweets, and snacks and hence carry a higher risk of diabetes and NCDs than those from the North and West India (36). Therefore, we can assume truck drivers from these regions might have similar eating patterns and bear the same base risk as in the general population in addition to other risk factors. There is a possibility that increased level of random blood sugar and high systolic and diastolic blood pressure could put truck drivers at higher risk to lifestyle-related diseases in comparison to the general population.

To our knowledge, our study is the first large study in India which not only assessed the health morbidities but also provide reliable information on diabetes and raised blood pressure estimates on a broader scale among truck drivers who are increasingly prone to lifestyle-related diseases. Therefore, the current study fills a significant knowledge gap and contributes to advancing scientific knowledge for this subgroup in a wide geographical area.

Although the present study broadens the understanding of morbidity and major NCDs prevalent among truckers in India; however, there are few limitations to it. First, the conventional data collection system could not capture the important predictor variables preventing us from making conclusions about the causative links between risk factors and truck driver's health profile. Second, the presence of high blood pressure is based on single blood pressure measurement recorded at the first visit only hence making it difficult to confirm the same as hypertension clinically. Third, the study sample included those truck drivers who availed STFC-MMU services. There is a possibility that nearby truck drivers have used the services frequently than those who are long-distance truck drivers. Additionally, we might have missed the truck drivers who were suffering from diabetes and or hypertension, but due to any reasons were not able

to access the STFC-MMU services, thereby underreporting of the observed results. Finally, quantification and assessment of truck drivers taking hypoglycaemic drug or antihypertensive drugs before visiting the MMU was not done.

It is well known that truck drivers are a difficult group to engage in health and wellbeing initiatives (8,37,38). Besides, a considerable gap exists between existing programmatic interventions to address the enormous NCDs burden under community settings. Therefore program interventions such as early screening, diagnosis, prompt treatment, and referral services for key NCDs are urgently required to reduce the NCDs related premature morbidity and mortality. Efforts like MMUs have the potential to deliver such interventions at scale. Studies exploring health truck drivers behaviors and health needs should be planned for designing tailored healthcare interventions.

Conclusions

Truck drivers in India suffer from a disproportionate burden of health morbidities. The high prevalence of lifestyle diseases such as diabetes and raised blood pressure increases the risk of premature mortality in this subgroup. Tailored healthcare interventions which focuses on the current health care needs and behaviors of the truck drivers are needed urgently promoting their overall well being.

List Of Abbreviations

PSMRI: Piramal Swasthya Management and Research Institute

MMU: Mobile Medical Unit

STFCL: Shriram Transport Financial Company Limited

BMI: Body Mass Index

RBS: Random Blood Sugar

NCDs: Non-Communicable Disease

Declarations

Ethical approval and consent to participate

Piramal Swasthya's Institutional Ethics Committee approved the study (IEC Study Ref No: PSMRI/2019/06).

Consent for publication

Program staff obtained beneficiary consent to use their anonymized data for research purpose.

Availability of data and materials

We used routinely collected program data stored in centrally placed data servers. Data analyst extracted the data and anonymized it after removing all identifiable variables. The datasets analyzed during the current study are available on request from the corresponding author (vishal.dogra@piramalswasthya.org or vani1825@gmail.com).

Competing interests

The authors declare that they have no competing interests.

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None. Authors were free to design, conduct, interpret, and publish this work without the involvement of the sponsor.

Authors' contributions

SR: Conceptualized the study, cleaned the data, performed data analysis and wrote first draft article **VD:** Conceptualized and designed the study. Guided overall analysis, critically revised all article versions and was a major contributor in manuscript writing **HS:** Supervised the data transfer from the STFC-MMU program database. Provided critical inputs in study design. **SH & AS** provided inputs in the design and conduct of the study. All authors read and approved the final article version.

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Figures

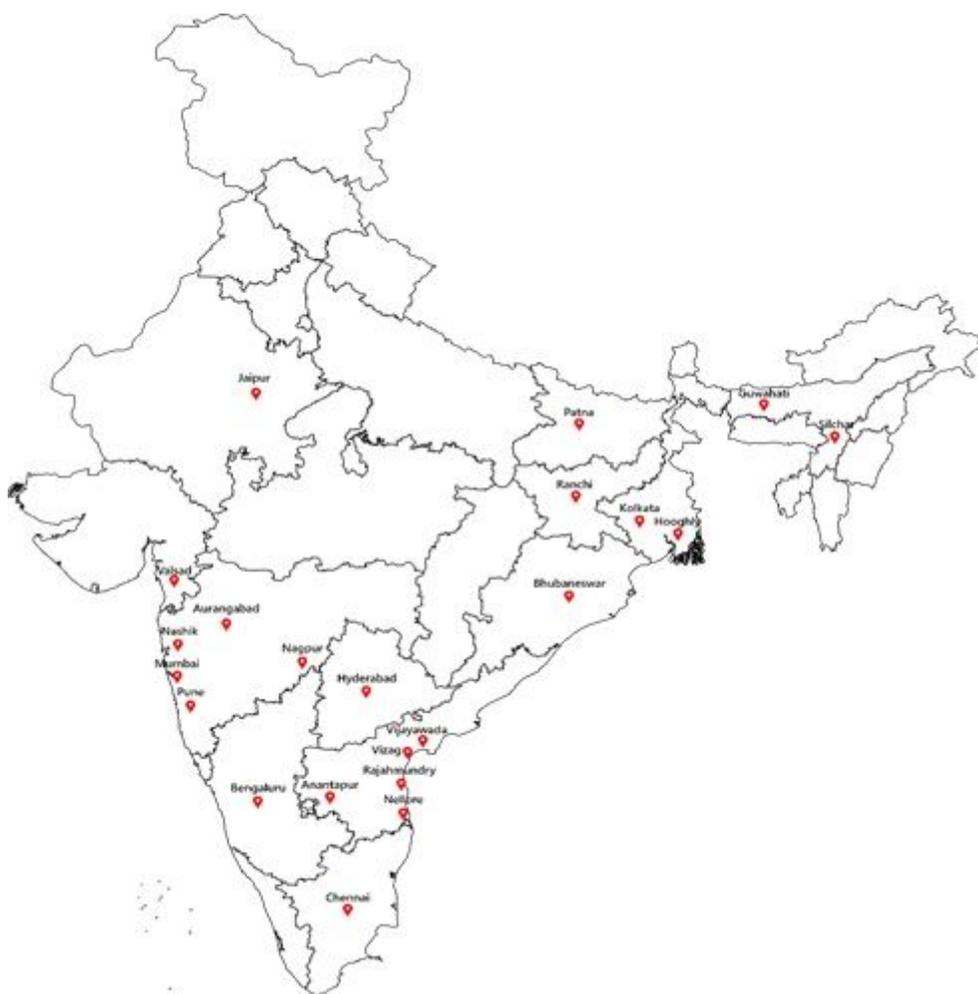


Figure 1

Distribution of “STFC-MMU” Program Sites across Twelve Indian States (2018-2019)

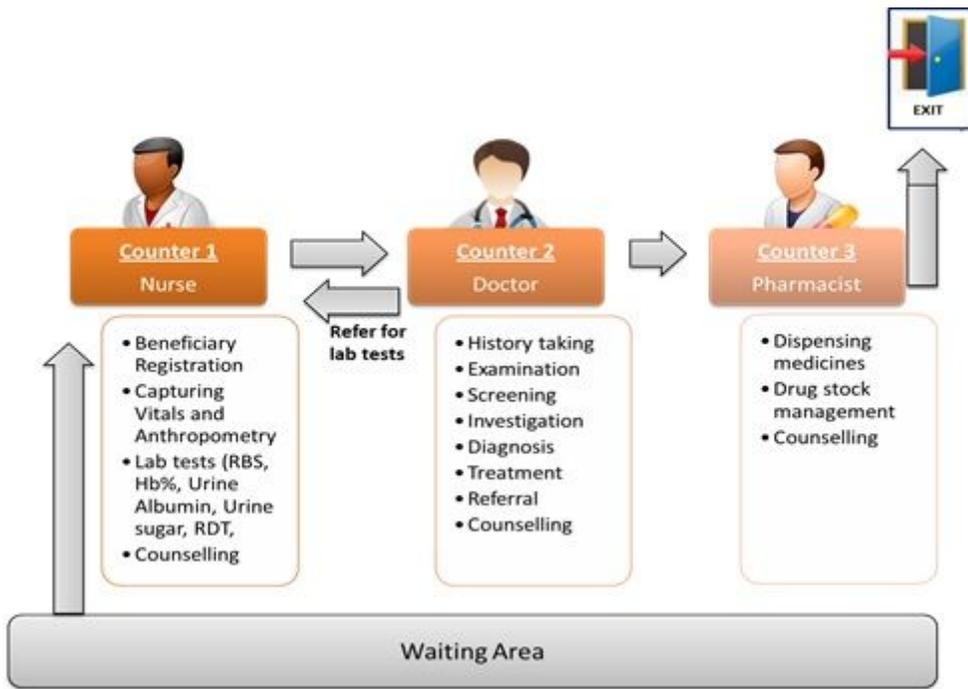


Figure 2

The "STFC-MMU" Program Services Flow

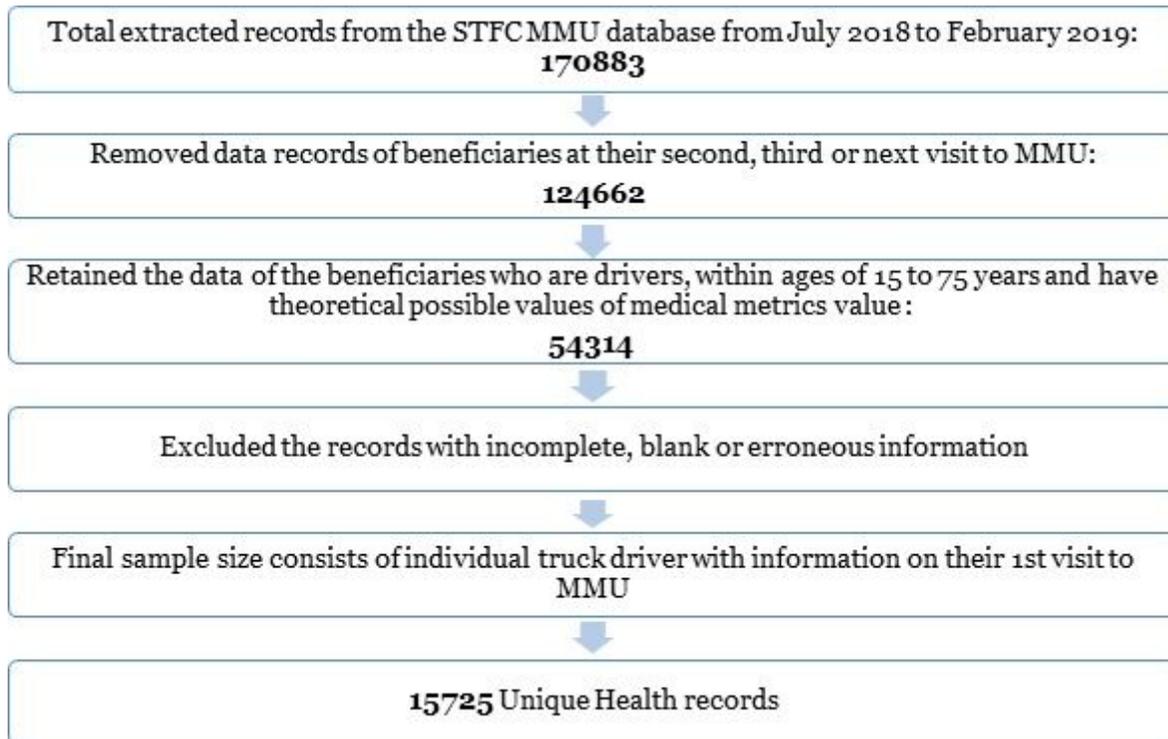


Figure 3

Analytical Sample Calculation