Mobile Clinics & Bundled Healthcare: An Exploration of Patient Perceptions of the

SughaVazhvu Approach to Chronic Care Management

by

Natalie S. Skeiky

Duke Global Health Institute
Duke University

Date: _____

Approved:

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Krishna Udayakumar, Co-Supervisor

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Joe Egger

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Manoj Mohanan, Co-Supervisor

Thesis submitted in partial fulfillment of
the requirements for the degree of
Master of Science in the Duke Global Health Institute
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ABSTRACT

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Abstract

As the burden of non-communicable diseases increases worldwide, it is imperative that health systems adopt delivery approaches that will enable them to provide accessible, high-quality, and low-cost care to patients that need consistent management of their lifelong conditions. This is especially true in low- and middle-income country settings, such as India, where the disease burden is high and the health sector resources to address it are limited. The subscription-based, managed care model that SughaVazhvu Healthcare—a non-profit social enterprise operating in rural Thanjavur, Tamil Nadu—has deployed demonstrates potential for ensuring continuity of care among chronic care patients in resource-strained areas. However, its effectiveness and sustainability will depend on its ability to positively impact patient health status and patient satisfaction with the care management they are receiving. Therefore, this study is not only a program appraisal to aid operational quality improvement of the SughaVazhvu Healthcare model, but also an attempt to identify the factors that affect patient satisfaction among individuals with chronic conditions actively availing services.

Acknowledgements

I would like to acknowledge four groups. First, this study was the result of a desire to conduct research that could have a practical and immediate impact on chronic care patients by leveraging the research capacity of Duke Global Health Institute, the social capital of Innovations in Healthcare, and the "real world" work of SughaVazhvu Healthcare. It would not have been possible without the support and participation of these three institutional partnerships.

Second, I am grateful for the guidance given to me by my thesis committee: Krishna Udayakumar, Joe Egger, and Manoj Mohanan. These three men were willing to take time from their demanding schedules in order to mull over ideas, make suggestions, read drafts, and challenge my thought process so that I could learn more along the way.

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Finally, thank you to all of my colleagues, family, and friends! One can never underestimate the value of a strong support network!

Dedication

To my beloved parents, without whom I would not truly understand what it means to be selfless

and steadfast in life. I would also like to recognize one Sara Abdullah—ever the motivator,

source of wisdom, and genuine friend you can count on when you feel like the journey toward

thesis production has exerted way too much *force* over the *area* of your life.

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1. Introduction

1.1 The Rise of NCDs

With respect to health, the advent of the 21st century has been marked by a phenomenon referred to as the *dual burden of disease*. Essentially, the burden of disease, which primarily lies with communicable diseases, is being compounded by an increase in the incidence and prevalence of non-communicable, or chronic, diseases (NCDs). According to the World Health Organization, irrespective of socioeconomic status, the five leading risk factors for premature mortality across the globe—high blood pressure, tobacco use, high blood glucose, physical inactivity, and overweight and obesity—have contributed to the increased risk of heart disease, cancer, diabetes, and other chronic conditions.[1] NCDs constitute the leading cause of death worldwide, accounting for 38 million of the 56 million total deaths in 2012 alone.[2,3] They disproportionately affect low- and middle-income countries (LMICs) which bear approximately three quarters of all NCD-attributable deaths.[3,4] In India, NCDs are responsible for over 60% of all deaths.[5] Lifestyle shifts and changing dietary choice patterns as well as environmental and metabolic risk factors can be correlated with the increasing burden of NCDs.[6,7] The multifaceted nature of NCDs has garnered worldwide attention and increased demand for improved methods of prevention and treatment.[8]

1.2 A Need to Supplement the Existing Healthcare System in India

Given the country's dual burden of disease and large population, India's healthcare system is not currently able to ensure the efficient and effective delivery of affordable, standardized, and quality healthcare services. Although there have been improvements in the sector, especially with respect to primary health care and a national commitment to global

frameworks for reducing NCD burden, service provision remains inadequate. Total health expenditure was 4.0 percent of the Indian GDP in 2013, below the LMIC average of 5.8 percent.[9] Latest World Bank data indicate that with only 0.7 physicians and 1.7 nursing and midwifery personnel per 1,000 population, India falls short of the minimum WHO recommended guidelines of 1 and 2 per 1,000 population, respectively.[10,11] The Indian public health sector is struggling to meet the healthcare demands of its vast and diverse population.

1.3 Indian Healthcare Access Challenges: Geographical & Financial

The public provision of primary health care in India relies on a vast network of sub-centers, primary healthcare centers (PHCs), community health centers (CHCs), and district hospitals.[12] The number, staffing, geographical distribution, and medical resources of these health posts are neither sufficient nor equitable.[13,14] The Government of India disproportionately allocates healthcare resources to favor urban centers leaving rural areas—where 70% of the Indian population resides—with fewer and more far-flung available care options.[15] The geographical challenges posed by greater physical distances to traverse are further exacerbated by the fact that unlike their urban counterparts, rural patients who successfully reach points of care are not always met with reliable screening methods, condition-specific medications, or skilled and licensed practitioners.[13,15,16] This suggests that the quality of chronic care available in India does not always match its physical accessibility and cost.

The Indian government has established a national health mission to achieve universal access to healthcare; however, patients who live in remote areas have difficulty accessing public healthcare services and cannot always afford private sector services.[17] The Indian healthcare system—which depends on public as well as increasingly pervasive and unregulated private providers—is primarily cash-based. The lack of government regulation of price and entry has facilitated innovations and enabled some healthcare organizations to provide quality care at low

cost.[18] However, such options are mainly accessible to individuals from high socioeconomic strata and foreigners; most Indians must cope with few and low quality care options, if they seek care at all. In 2013, 85.9% of private health expenditure in India was out-of-pocket (OOP).[19] Medication and outpatient care expenses accounted for the bulk of these OOP payments.[20]

Health insurance schemes have not significantly penetrated the market and those that are available tend not to cover outpatient care, primary care, or specialized tertiary care.[21] The few available health insurance schemes are not targeting the expenditure that burdens the average Indian seeking health care.[20] This means that, with or without insurance, Indians are not protected from the type of catastrophic health expenditure that either pushes them into poverty or entraps the already poor within cycles of poverty.[13,22] Healthcare interventions that are best able to attend to medical needs while mitigating the burdensome health expenditure patterns have the best chances of improving health outcomes without compromising household economic survival.

1.4 A Supplement to the Existing Healthcare System in India—The SughaVazhvu Model for Chronic Care Management

Since physical distance and high-cost pose significant barriers to accessing chronic care services, a method of healthcare delivery that can overcome these obstacles has the potential to help reduce the NCD burden in India by providing accessible preventive and curative treatment to a population with low disease awareness, high disease prevalence, and socioeconomic disparities.[14] SughaVazvhu Healthcare, which operates in the southern Indian state of Tamil Nadu, believes that mobile health clinics are a feasible way of providing quality, affordable, and reliable chronic care management.

Yet, its competitive edge relies on the fact that it uses a pre-paid, subscription-based managed care model to provide continuity of care to patients with chronic conditions. The

subscription-based aspect allows patients to take on a proactive role in their own healthcare decision-making process. They must evaluate their perception of their health status and act (by enrolling and availing services) if they believe medical intervention is important or required for its management. The managed care model aspect allows SughaVazhvu to take responsibility for the management of chronic conditions faced by patients in its catchment area. This multi-pronged, multi-stakeholder approach to primary care has enabled SughaVazhvu to establish itself as a trusted presence within rural Thanjavur. However, the SughaVazhvu Healthcare model is still in the pilot phase and evidence generation is necessary to measure impact. For this reason, the proposed study will contribute to current literature by: 1) evaluating patient satisfaction with the SughaVazhvu managed care model for *chronic* care service delivery and 2) exploring the factors that affect whether as well as the rationale behind why patients seek or fail to seek care at SughaVazhvu mobile health clinics in the rural setting of Thanjavur, Tamil Nadu.

1.5 Why Patient Satisfaction?

As the healthcare industry evolves and prioritizes the delivery of care that is both affordable and of high quality, it has become useful and necessary to periodically assess its performance. Health systems across the globe—responding to innovative players, evolving technology, and different disease distributions—have yet to find standardized methodological means of monitoring and evaluating their healthcare delivery.[23] Sometimes the tracking of biological markers can reflect improvement, or lack thereof, in disease status.[24-27] However, whether this is attributable to the healthcare delivery processes or a conflagration of several factors is difficult to decode. Data on the frequency of medical supply stock outs and the number of medication refills can highlight whether or not healthcare centers consistently have adequate inventory and if patients are able to fill and take their prescriptions routinely.[28-32]

Adherence to appointments is another factor that can reflect prioritization of personal health, physical access, and cost challenges.[33] However, this qualifying explanatory information must be actively sought and this is not always possible in a LMIC healthcare system where revenue streams are limited.

When it comes to more subjective elements like the patient experience, instruments such as questionnaires and surveys that measure patient satisfaction may be more helpful in quantifying the overall care experience.[34-36] Yet, there are drawbacks related to the limitations inherent in both defining patient satisfaction and utilizing Likert scale question types to measure it.[35,37] Still, patient satisfaction is gaining more attention as healthcare systems realize that they are indeed a specialized hospitality system that should be responsive to patient medical and even personal needs. SughaVazhvu Healthcare is no exception. The organization appreciates that patient satisfaction is now a widely used healthcare quality metric.[38] Furthermore, SughaVazhvu Healthcare understands the potential influence the metric can have on internal learning and ultimately how the organization continues to shape its model for chronic care management. This outlook is bolstered by the fact that patient satisfaction has been shown to be correlated with patient outcomes; that is, satisfied patients tend to take a more active role in their healthcare management and demonstrate greater adherence to their care plans.[37-39] Therefore, exploring patient satisfaction with the SughaVazhvu Healthcare model is a first step toward eventually identifying what makes a patient in rural Thanjavur, India more likely to actively manage his/her chronic condition(s).

1.6 Research Purpose & Justification

This study utilized an original 32-item questionnaire to achieve two overarching aims. First, it aimed to assess patient satisfaction with the SughaVazhvu Healthcare model for chronic

care management. To elaborate, the survey questions catered to patients who had both availed services from the mobile health clinics and enrolled in the chronic care packages offered by SughaVazhvu Healthcare. Second, it aimed to aid operational quality improvement. That is, it was also our goal to use the survey to identify what factors are meaningful to the patients in order to inform how SughaVazhvu Healthcare utilizes patient opinions to monitor and modify its healthcare delivery model. We hope that this context-specific exploration of patient satisfaction will help patients in rural Thanjavur better manage their chronic conditions in a way that appropriately addresses the iron triangle of healthcare: access, cost, and quality.

2. Methods

2.1 Study Design

This project is a cross-sectional study that utilized quantitative surveys to examine patient satisfaction with the SughaVazhvu Healthcare chronic care model. These themes were explored through verbally administered, over-the-phone questionnaires that lasted approximately 15-20 minutes.

2.2 Setting

The proposed project coordinated with SughaVazhvu Healthcare in Thanjavur, Tamil Nadu. SughaVazhvu Healthcare is an organization that combines evidenced-based care protocols and technological innovation to provide standardized and quality primary health care to rural populations in the southern Indian state of Tamil Nadu. It focuses primarily on the diagnosis and management of patients with diabetes, hypertension, and/or hyperlipidemia. Its competitive edge relies on the fact that it uses a pre-paid, subscription-based managed care model to provide continuity of care to patients with chronic conditions. This approach to primary care has enabled SughaVazhvu to establish itself as a trusted presence within rural Thanjavur. The organization caters to multiple catchment areas within Thanjavur district; each catchment has an estimated population of 8,000 to 10,000 individuals. In fact, since its opening, it has logged over 50,000 patient visits. Its advanced health management information system (HMIS) maintains an electronic record of patient enrollment, visits, and medical status. The HMIS was mined to identify the patient population for this study.

2.3 Participants

2.3.1 Project Team

The project team included a principal investigator (Natalie Skeiky), field supervisor (Aparna Manoharan), survey conductor, and data entry technician. The field supervisor—Head of Research and Advocacy at SughaVazhvu Healthcare—was responsible for all local onsite aspects of the study including everything from recruiting any additional employees needed to execute the project to overseeing data collection. Any new human resources required were funded through the Duke-allocated budget for the proposed project. The principle criteria for being a part of the project team were fluency in Tamil and English, a relatively clear telephone voice, honesty, patience, familiarity with the cultural context, and comfort interacting with patients both inside and outside of a medical setting.

2.3.2 Target Population

The main study population consisted of patients with diabetes, hypertension, and/or hyperlipidemia who were enrolled in the SughaVazhvu Healthcare chronic care, subscription-based payment model during the study period. Since the size of this dynamic population (between 100-150 individuals) was quite small, a census was conducted. As such, sample size and power calculations were not necessary; the study sample *was* the study population. The project team was responsible for recruiting patient participants for the study and relied on purposive convenience sampling. Specifically, an organizational list of currently enrolled chronic care patients was prepared by Aparna Manoharan and used as a sampling frame to identify and

screen these clinic patients for eligibility according to pre-specified inclusion and exclusion criteria (Table 1).

Table 1: Inclusion and Exclusion Criteria for Patient Participant Eligibility in Study

INCLUSION CRITERIA	EXCLUSION CRITERIA
Adults ≥ 18 years	Children < 18 years
Diagnosed with at least 1 of 3 chronic diseases: diabetes, hypertension, hyperlipidemia	*Not* diagnosed with at least 1 of 3 chronic diseases: diabetes, hypertension, hyperlipidemia
Currently enrolled in a SughaVazhvu chronic care package; enrollment occurred at least 2 months prior to study start date	*Not* currently enrolled in a SughaVazhvu chronic care package *or* currently enrolled but not meeting minimum enrollment period
Able to participate in a telephone survey	
Able to go through/attempt the entire survey	

2.4 Procedures

2.4.1 Informed Consent

Informed consent was obtained from the eligible and willing participants over the phone. After calling an eligible patient and confirming his/her identity, the survey conductor read the verbal informed consent form embedded within the survey. She then clarified any doubts and asked the patient if he/she was willing to participate in the survey. If the patient affirmed, she continued administering the survey; if the patient declined, she thanked him/her for his/her time and ended the call.

2.4.2 Data Collection

The project team was responsible for data collection. The SughaVazhvu field supervisor identified chronic care patients that fit the inclusion/exclusion criteria and made a list of their names and telephone numbers for survey administration purposes. Only the field supervisor and survey conductor had access to this key. The key functioned as a checklist; the survey conductor utilized it to keep track of which eligible and willing patients she had surveyed.

Patient names and telephone numbers were not associated with the survey instrument at all. Instead, the field supervisor generated anonymized unique IDs to tag the surveys and facilitate data collection and analysis.

As the primary investigator, I was on site initially to help with project set up, which included coordinating with the local staff to contextualize the tool. The tool was translated and back-translated and training was imparted to the data collector. After my departure I maintained regular contact with the local project team.

Data collection relied on quantitative survey administration via telephone by the local survey conductor. The telephone conversations were not recorded. I did not participate in the telephone surveys. Aparna Manoharan trained the survey conductor to obtain the most thorough surveys. She conducted the surveys in Tamil and recorded the survey responses in English to allow for data entry to be performed as soon as data collection had taken place. This was important for ensuring the highest degree of data accuracy because the survey conductor would have had better recall in the event that clarification of survey responses needed to be made.

2.4.3 Data Management
A. Quality Assurance

Quality assurance, or the act of ensuring the quality of data *before* its collection, is important for minimizing systematic or random errors.[40] Together, my field supervisor and I decided that it would be best practice to have one survey administrator that we could train in a very specific way. This was meant to be a quality assurance measure because it would mitigate inter-surveyor variability, etc. Although there was a risk of surveyor fatigue, we addressed this by suggesting the administration of 1-3 surveys per workday. We also tried to design a questionnaire that would fit the context of the study objectives and sample population. For

example, we elicited the input of local SughaVazhvu staff for the wording of questions given their familiarity with both English and Tamil and experience with patient interaction in rural Thanjavur, Tamil Nadu. However, we did not formally pre-test the survey.

B. Quality Control

Quality control, or the act of ensuring the quality of data *during* its collection, is important for minimizing bias and reliability problems.[40] In the initial stages of data collection—for the first 50 surveys—the field supervisor performed data entry after every 3-5 surveys were completed by the survey conductor. By doing it little by little, data entry was less taxing and frequent enough for her to evaluate whether or not the surveys were being conducted in a consistent manner. The field supervisor was able to note inconsistencies, reiterate best practices to the survey conductor, and ask her to review—for completeness and possible errors—each survey after she conducted it so that she could call the patient back immediately if clarifications were necessary.

During this period I was able to check the data as I received it on a bi-weekly basis. Since Duke University has a license to Box (Box, Redwood City, California)—a cloud-based storage that includes security protection for sensitive data—the field supervisor was able to share the anonymized survey data with me via a Microsoft Excel spreadsheet in a secure folder on my Duke Box account. I was able to make sure that there was overall uniformity, appropriate responses for relevant questions, and no glaring missing data problems that could indicate issues with the survey itself or survey administration. If I noted anything wrong or any emerging patterns, I could immediately bring them to the field supervisor's attention.

After the first 50 surveys Aparna Manoharan hired a data entry technician. The field supervisor still entered all of the survey data into a spreadsheet in Microsoft Excel. However, the data entry technician also entered all of the survey data into a distinct spreadsheet in

Microsoft Excel. The two spreadsheets were compared and any discrepancies were addressed.

Specifically, Aparna Manoharan reverted to the original survey results and entered that data in

personally. Thus the survey data was double-entered and validated. The hard copies of the

completed survey as well as the key were stored in a secure location only accessible to the field

supervisor. They were shredded and disposed of 6 months after data collection ended.

2.4.4 Participant Compensation

Individuals were not given any pecuniary or non-pecuniary compensation for their

participation.

2.4.5 Risks and Benefits

There was no risk of confidentiality breach as all survey questionnaires were

anonymous. Patient participants did not benefit from participating in the survey. However,

they may directly benefit from any service delivery improvements made by SughaVazhvu

Healthcare as a result of the findings of this research project.

2.4.6 Ethical Approval

A local IRB could not be identified. Although the study was primarily operational,

because it did have a secondary research purpose, approval for all study procedures was

received by the ethical review board at Duke University.

2.5 Measures

2.5.1 Survey Instrument

The creation of an original instrument was necessary because there are no validated survey instruments that are appropriate for this study given its aims, setting, and target population.

The instrument used for data collection was a 32-item questionnaire. The instrument was structured in 5 parts to obtain: (1) basic socio-demographic information, (2) patient perception of condition-specific care, (3) patient sentiment toward the SughaVazhvu Healthcare chronic care package, (4) patient sentiment toward interactions with SughaVazhvu Healthcare personnel, and (5) patient perception of the SughaVazhvu Healthcare mobile clinic services and facilities.

Part 1 was adapted from the fourth Indian National Family Health Survey (NFHS-4) and the 2002 WHO World Health Survey—Short Questionnaire Rotation A.[41] It collected information on age, sex, and marital status as well as the education level and occupation of both patients and their head of household. Part 2 was adapted from the Diabetes Treatment Satisfaction Questionnaire (DTSQ).[42] It consists of two sets of questions. The first set utilizes a 3-point Likert scale to understand how patients feel about the SughaVazhvu Healthcare management of their specific chronic condition(s).[1] The second set utilizes a 4-point Likert scale to capture patients' understanding of the importance of regular condition-specific monitoring.[2] Part 3 was adapted from the DTSQ and also included questions around the recommendation and renewal of packages that SughaVazhvu Healthcare was interested in asking. Parts 4 and 5 were adapted from a 20-item scale used by Slim Haddad, *et al*. in a validation study aimed at measuring the perception of primary healthcare service quality within the context of developing countries.[43] However, Part 5 also contained original questions intended to help SughaVazhvu Healthcare

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[1] **3-point Likert scale:** "It has worsened (-1)", "No change (00)", "It has improved (1)". This is the only question on the survey that has a neutral response option.

[2] **4-point Likert scale:** "It is not at all important (-2)", "It is of little importance (-1)", "It is moderately important (1)", "It is very important (2)".

improve the logistical operation of its mobile clinic. With the exception of Part 2, all Likert scale questions in this instrument relied on a 4-point Likert scale that ranged from very negative (-2) to very positive (2). This set up was intended to encourage patients to make a decision rather than default to neutrality. However, if the patient was still unable to make a choice, then that particular item was coded as "No response or do not know (0)" and was used in the study analysis in that manner. It should be noted that when the data were modified such that "No response or do not know (0)" was re-coded as "Missing", the results did not change significantly or at all.

The survey instrument went through several iterations. First it was evaluated for *content* to make sure that it not only included patient satisfaction measures supported by literature, but also addressed factors that SughaVazhvu Healthcare deemed important. Next, selected questions were reworded to cater to the SughaVazhvu *context*. For example, the original Haddad *et al*. question "The distance from your home to the 'hospital' is…" became "The distance from your home to the mobile clinic is…." Then the survey was assessed for phrasing to better ensure that the intent of the question would be clearly communicated to the patient participant in the simplest way possible. During this phase, the access question mentioned above was changed to "How would you rate the *distance* from your home to the SughaVazhvu mobile clinic?" Finally, the survey was examined for structure such that related questions were appropriately grouped. After this iterative process the instrument was translated and back-translated by two distinct individuals.

2.6 Data Analysis

For this study, the survey data were imported from Microsoft Excel to Stata version 13 (StataCorp LP, College Station, Texas) for cleaning and analysis. Data analysis relied on non-

parametric tests that are commonly used for Likert-scale and Likert-type data as well as in the case of samples that are small in size or do not meet the requirements of a normal distribution.

First, to avoid double-counting patients, 7 *unique* chronic condition statuses were created based on all potential combinations of the 3 above-mentioned chronic conditions that SughaVazhvu Healthcare manages: Diabetes mellitus (DM), Hypertension (HT), Hyperlipidemia (HL), DM&HT, DM&HL, HT&HL, and DM&HT&HL. Of these, three were identified as the *top 3 chronic condition statuses/categories* because they accounted for 82 of the 87 patient respondents: DM, HT, and DM&HT. These 3 categories were used in data analysis. The other 5 respondents were scattered among the 4 remaining chronic condition categories resulting in very sparse cell counts.

Descriptive statistics of patient socio-demographic factors were generated for the entire respondent sample and again according to the top 3 chronic condition statuses. To test the statistical significance of differences between the socio-demographic variables of patients who were categorized as having one of the three major chronic condition statuses, non-parametric Fisher's Exact test estimates were reported. Willingness to renew was assessed in the overall population and by sex and age categories via the presentation of frequencies and proportions.

Next, Likert questions on the survey instrument were categorized and aggregated to create 4 nested scales: (1) an overall patient satisfaction scale (α= 0.75), (2) a health care satisfaction subscale (α= 0.72), (3) a health personnel satisfaction subscale (α= 0.61), and (4) a health services satisfaction subscale (α= 0.37).[3] Cronbach's alpha was determined for each subscale as a measure of internal consistency. Subscale scores were calculated by summing the scores of the constituent subscale questions. The mean and standard deviation of participants' subscale scores were reported. Segmented bar charts depicting the percentage of participants

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[3] **Scale 1 Composition:** Q13, Q16-Q18, Q20-Q29, and Q31. **Scale 2 Composition:** Q13, Q17, Q20, and Q21. **Scale 3 Composition:** Q22-Q25. **Scale 4 Composition:** Q26-Q29 and Q31.

endorsing each rank option for each subscale question were presented for every scale. Standardized average sub-scores (range: -2 to +2) for each of the three subscales were created to allow for between-subscale comparisons. Robust measures of central tendency were also reported for each standardized average sub-score.

Non-parametric Mann Whitney *U* Tests were run to determine whether or not difference in median values of the overall patient satisfaction scores differed from zero in a *statistically* significant way by the top 3 chronic condition categories. Histograms of the overall patient satisfaction sum-scores stratified by the top 3 chronic condition categories were also produced. Although for the heretofore evaluation of subscales the data were treated as Likert-scale data, for the analysis of individual Likert questions, the data were treated as Likert-type data. For example, to test the association between willingness to renew (Q21) and indicators of quality (Q26), cost (Q27), and access (Q28), non-parametric Kendall's Tau B test estimates were reported.

3. Results

3.1 Descriptive Statistics

3.1.1 Socio-Demographic Characteristics of Patient Population Overall and by Major Chronic Condition Status (Table 2)

At the start of the study, 185 patients were enrolled in a SughaVazhvu Healthcare chronic care package (Figure 1). The sampling frame, however, consisted of the 120 patients that met eligibility criteria (Table 1). Only 87 eligible patients consented to and completed the survey. This yielded a non-response rate of 27.5%. Among the 33 non-respondents, reasons for lack of participation were: inactive subscription, denied consent, inability to respond or complete (often due to old age), and unavailability via phone.

Figure 1: Participant Sampling Strategy

The ratio of male to female participants was approximately 2-to-1 with 68.97% of the population aged 45-64 years. The mean age was 54.7 with a standard deviation of 10.9. The majority of participants either had a secondary school education (grades 6-10) or were never exposed to formal schooling. If they worked, their main occupation was farming their own land (35.6%), although it is interesting to note that 27.6% of participants considered themselves employed as "homemakers".

The three most prevalent chronic condition statuses among patient participants were a diagnosis of diabetes (DM: 63.2%), hypertension (HT: 17.2%), and diabetes and hypertension (DM&HT: 13.8%). Although *DM males outnumbered* DM females over 3-to-1, *HT females outnumbered* HT males 2-to-1, and the double diagnosis of DM & HT was equivalent across gender. The differences in sex by chronic condition status were found to be statistically significant (Fisher's exact = 0.004). Irrespective of chronic condition status, the majority of patients were aged 45-64 years, received a secondary school education (6-10) at most, and primarily cultivated their own land or tended to their homes. This mirrors the overall respondent sample.

Table 2: Patient Socio-Demographic Characteristics Overall and by Top 3 Major Chronic Condition Statuses

		All	DM	HT	DM&HT	P- Value[+]
Age (years)	Median (IQR)	54 (48, 62)	55 (50, 63)	51 (48, 64)	55.5 (48.5, 62)	
	N (%)	87(100.0%)	55 (63.2%)	15 (17.2%)	12 (13.8%)	
Age (years) Categories N (%)	18-44	12 (13.8%)	7 (12.7%)	1 (6.7%)	1 (8.3%)	
	45-64	60 (69.0%)	38 (69.1%)	11 (73.3%)	9 (75.00%)	1.000
	>=65	15 (17.2%)	10 (18.2%)	3 (20.0%)	2 (16.7%)	
Sex N (%)	Female	29 (33.3%)	13 (23.6%)	10 (66.7%)	6 (50.0%)	
	Male	58 (66.7%)	42 (76.4%)	5 (33.3%)	6 (50.0%)	0.004
Patient Education N (%)[++]	No Formal Schooling	15 (17.2%)	10 (18.2%)	3 (20.0%)	2 (16.7%)	
	Primary School (1-5)	19 (21.8%)	9 (16.4%)	7 (46.7%)	2 (16.7%)	
	Secondary School (6-10)	35 (40.2%)	23 (41.8%)	4 (26.7%)	6 (50.0%)	0.437
	High School (or equiv.) Completed	10 (11.5)	8 (14.5%)	0 (0.0%)	1 (8.3%)	
	Post-High School	8 (9.2%)	5 (9.1%)	1 (6.7%)	1 (8.3%)	
Patient Occupation N (%)	Cultivation on Own Land	31 (35.6%)	24 (43.6%)	3 (20.0%)	2 (16.7%)	
	Self-Employed Non-Farm Work	14 (16.1%)	8 (14.5%)	3 (20.0%)	2 (16.7%)	
	Homemaker	24 (27.6%)	13 (23.6%)	7 (46.7%)	4 (33.3%)	0.202
	Unemployed	8 (9.2%)	6 (10.9%)	0 (0.0%)	1 (8.3%)	
	Other	10 (11.5%)	4 (7.3%)	2 (13.3%)	3 (25.0%)	

There were 7 possible chronic condition statuses created to mitigate double-counting: (1) DM, (2) HT, (3) HL, (4) DM&HT, (5) DM&HL, (6) HT&HL, and (7) DM&HT&HL. The top 3 major chronic condition statuses (table columns 4-6) only accounted for 82 of the 87 total survey respondents. Of the 5 excluded patients, 4 were diagnosed with both diabetes (DM) and hyperlipidemia (HL) and 1 was diagnosed with all three conditions: DM, HT, and HL. [++]When rounded to the first decimal place, the percentage of *patient education* responses among "All" patients does not add up to 100%. The same is true for *patient education* responses among "HT" patients. [+]The p-values were derived from Fisher's Exact tests, which were used to test for statistically significant differences in the distribution of sex and then age categories across the top 3 major chronic condition statuses (α= 0.05).

3.1.2 Overall Patient Satisfaction Scale

The overall patient satisfaction scale appeared to have adequate internal consistency, α = 0.75. This 15-item scale could range in value from -30 indicating a very negative patient attitude/perception to +30 indicating a very positive patient attitude/perception. The mean score for this scale was 20.01 with a standard deviation of 4.52. Patient scores ranged from 9 to 28 with 51.17% of the sample exhibiting an overall patient satisfaction score between 19 and 23 (Figure 2).

Figure 2: Overall Patient Satisfaction

This score pattern remained similar when the patient sample was stratified by sex (Figure 3). Although upon first glance, it may appear that males generally have higher satisfaction scores than females, the distribution of scores is quite similar across sex after adjusting for the fact that males outnumber females almost 2 to 1. The mean score and standard deviation for males and females was 20.32 (4.87) and 19.41 (3.75), respectively. In

fact, whereas the lowest score among males was a 9, it was 12 among females. Both shared

maximum scores of 28.

Figure 3: Overall Patient Satisfaction by Sex

When stratified by age category, patients 65 years of age and older had the lowest

scores ranging from 10 to 21 with a mean and standard deviation of 17.50 (3.46) (Figure 4).

Patients between 18- and 44-years-old were the most consistently satisfied. Their scores ranged

from 20 to 24 with a mean and standard deviation of 21.50 (1.45). The scores of patients aged

between 45 and 64 years mirrored the entire sample with a mean and standard deviation of

20.30 (4.94). Patients seem to have a generally favorable experience with the SughaVazhvu

mobile clinic model for chronic care management.

Figure 4: Overall Patient Satisfaction by Age Categories

3.1.3 Willingness to Renew

Among patients that participated in the survey, willingness to renew their chronic care subscription with SughaVazhvu Healthcare was 93.1%. No patient was "Very Unwilling", only 1 person was "Unwilling", and 5 had not yet made up their minds. Viewing "Willing" as certainty and "Very Willing" as certainty with enthusiasm, when examined by sex, females generally expressed a greater degree of willingness to renew than males (Table 3). In fact, the 1 unwilling person as well as 4 of the 5 "No Response or DNK" patients were male. However, when asked to expound upon their hesitation to renew, these individuals acknowledged an appreciation of the accessibility and low cost of the services but wanted to wait until the end of their subscription to evaluate the condition of their blood glucose level—whether or not it was controlled. The unwilling male patient said he did not feel his blood glucose level was under control. He was 59-years-old. When examined by age categories, willingness to renew

remained high, though the degree of certainty/enthusiasm decreased as the age category

increased (Table 3).

Table 3: Patient Willingness to Renew SughaVazhvu Subscription Overall as well as by Sex and Age Categories

Willingness to Renew						
		Very Willing	Willing	Unwilling	Very Unwilling	No Response or DNK	P-Value[+]
All Participants N (%)		62 (71.26%)	19 (21.84%)	1 (1.15%)	0	5 (5.75%)	
Sex N (%)	Female	23 (79.31%)	5 (17.24%)	0	0	1 (3.45%)	0.426
	Male	39 (67.24%)	14 (24.14%)	1 (1.72%)	0	4 (6.90%)	
Age- *Categorical* N (%)	18-44 years	10 (83.33%)	2 (16.67%)	0	0		0.406
	45-64 years	44 (73.33%)	12 (20.00%)	1 (1.67%)	0	3 (5.00%)	
	≥65 years	8 (53.33%)	5 (33.33%)	0	0	2 (13.33%)	

[+]The p-values were derived from Fisher's Exact tests, which were used to test for statistically significant differences in the distribution of sex and then age categories across patients who were either "Very Willing" or "Willing" to renew their chronic care subscriptions ($\alpha = 0.05$).

3.1.4 Health Care Subscale

The 4-item Health Care Subscale could range in value from -8 indicating a very negative

patient attitude/perception to +8 indicating a very positive patient attitude/perception. The

mean sub-score for this subscale was 5.00 with a standard deviation of 2.12. Therefore, patients

seemed to have positive sentiments toward the health care elements of their experience with

SughaVazhvu overall. Of the 4 constituent subscale questions, 2—Q13 and Q17—were mainly

positive (+1 or light green shade) while 2—Q20 and Q21—were mainly *very positive* (+2 or dark

green shade) (Figure 5). Questions 20 and 21 had the highest percentages of patients who were

unsure and marked "No Response or DNK" (6%). Question 20 in particular stands out because it

had the highest degree of negative responses (11%) both within this subscale and among all

subscales.

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Health Care Subscale Breakdown by Question

Figure 5: Proportion of patient participants responding favorably or unfavorably to health care related questions.

Q13: "How satisfied are you with your current treatment?" **Q17:** "How do you feel about the way your chronic condition(s) is/are managed by your SughaVazhvu chronic care package?" **Q20:** "Would you recommend the SughaVazhvu chronic care package to someone else with your kind of chronic condition(s)?" **Q21:** "Would you be willing to renew your current SughaVazhvu chronic care package when it expires?"

3.1.5 Health Personnel Subscale

The 4-item Health Personnel Subscale could range in value from -8 indicating a very negative patient attitude/perception to +8 indicating a very positive patient attitude/perception. The mean sub-score for this subscale was 5.18 with a standard deviation of 1.54. Therefore, patients seemed to have positive sentiments toward the SughaVazhvu health personnel with whom they interacted when seeking care for their chronic conditions. Of the 4 constituent subscale questions, 2—Q22 and Q23—were mainly positive (+1 or light green shade), 1—Q24—was overwhelmingly very positive (+2 or dark green shade), and 1—Q25—was almost evenly split between the two degrees of positivity (Figure 6). In fact, 99% of Q24 respondents judged that SughaVazhvu healthcare providers behaved *respectfully* toward them with only 1% judging the behavior as *somewhat respectful*. The percentage of patients within

this subscale who were unsure and marked "No Response or DNK" were comparable to the

Health Care Subscale: 8% for Q22 and 7% for Q25. Question 23 in particular stands out because

it had the highest degree of "No Response DNK" selections (18%) both within this subscale and

between all subscales. It also had the highest proportion of negative responses (6%) within the

Health Personnel Subscale.

Figure 6: Proportion of patient participants responding favorably or unfavorably to health personnel related questions.

Q22: "How much do you believe that the SughaVazhvu Healthcare providers in the mobile clinic can help you manage your condition(s)?" **Q23:** "In your opinion, how well do the healthcare providers in the SughaVazhvu mobile clinic *examine* you?" **Q24:** "In your opinion, how do the healthcare providers in the SughaVazhvu mobile clinic *behave* towards you?" **Q25:** "What do you think of the *amount of time* that the healthcare providers in the SughaVazhvu mobile clinic devote to treating you?"

3.1.6 Health Services Subscale

The 5-item Health Services Subscale could range in value from -10 indicating a very

negative patient attitude/perception to +10 indicating a very positive patient

attitude/perception. The mean sub-score for this subscale was 7.38 with a standard deviation of

1.47. Therefore, patients seemed to have positive sentiments toward the health services

provided by the SughaVazhvu mobile clinic for chronic care management. Of the 5 constituent

subscale questions, 2—Q26 and Q27—were mainly *positive* (+1 or light green shade) while 3—

Q28, Q29, Q31—were mainly *very positive* (+2 or dark green shade) (Figure 7). Question 28 in

particular stands out because it elicited only two responses, both of which were positive: 95% of

respondents reported that the distance from their homes to the SughaVazhvu mobile clinic was

very reasonable and 5% judged it to be *reasonable*. Questions 26 and 27 had the highest

percentages of patients who were unsure and marked "No Response or DNK" (7% and 8%,

respectively). Question 27 also had the highest proportion of negative responses (7%) within
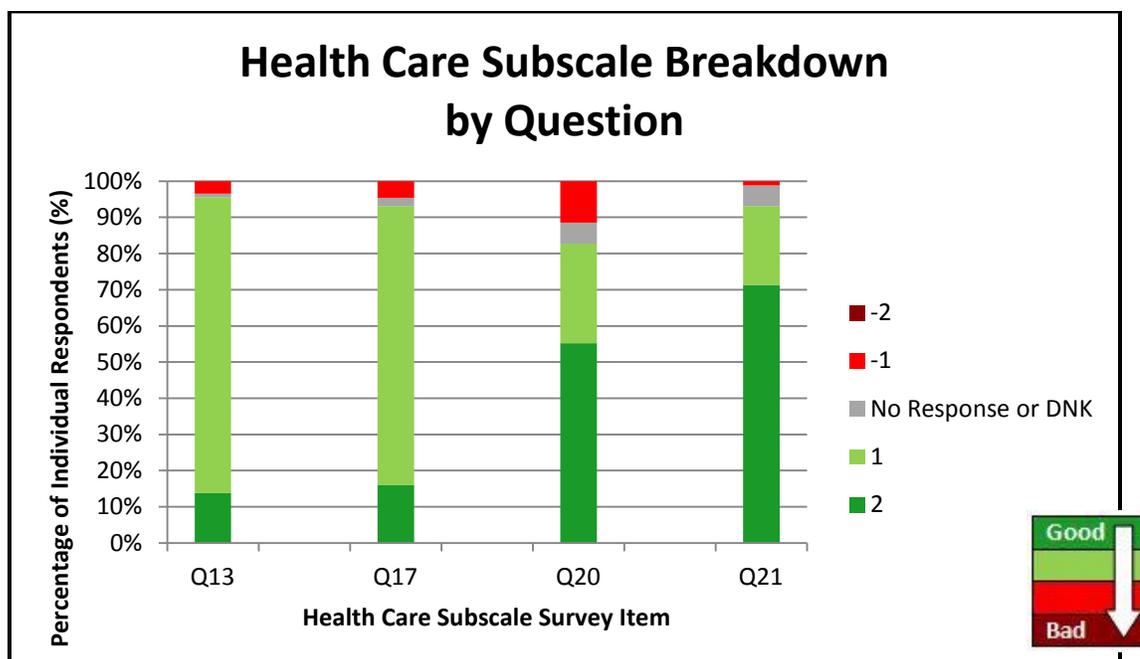
this subscale

Figure 7: Proportion of patient participants responding favorably or unfavorably to health services related questions.

Q26: "How would you rate the medicines supplied by the SughaVazhvu mobile clinic?" **Q27:** "Do you think the *amount of money* you have spent on the SughaVazhvu chronic care package in the past 12 months is high?" **Q28:** "How would you rate the *distance* from your home to the SughaVazhvu mobile clinic?" **Q29:** "How would you rate the operating hours of the SughaVazhvu mobile clinic (i.e. time of day it visits)?" **Q31:** "How would you rate the *operating schedule* of the SughaVazhvu mobile clinic (i.e. the # of days per week it visits?" Unlike all other subscale questions where n=87, for Q31 n=86.

3.1.7 Comparison of the Standardized Versions of the 3 Main Subscales

The sub-scores for each subscale were standardized to range from -2 to +2. The Health Care Subscale and Health Personnel Subscale had similar positive ratings with mean sub-scores and standard deviations of 1.25 (0.53) and 1.30 (0.38), respectively. This indicates that overall, patients had a positive perception of both their general chronic care and interactions with SughaVazhvu mobile clinic healthcare staff. The Health Services Subscale reflected the most patient satisfaction with a mean sub-score and standard deviation of 1.48 (0.29). This is best demonstrated by the positive shift in the interquartile range when compared to the other two subscales (Table 4).

Table 4: Summary Statistics for the Standardized Sub-scores of the 3 Main Subscales

	Mean (SD)	Median (IQR)
Health Care Subscale	1.25 (0.53)	1.50 (0.00, 2.00)
Health Personnel Subscale	1.30 (0.38)	1.50 (0.50, 1.75)
Health Services Subscale	1.48 (0.29)	1.60 (0.80, 2.00)

In this table (n=87), IQR is reported as the *range* of the first and third quartiles (Q1, Q3) rather than the *actual single IQR value* (IQR = Q3 – Q1) in order to better convey the data's symmetry or asymmetry around the median.

3.2 UNIVARIATE ANALYSIS

3.2.1 Overall Patient Satisfaction by the Top 3 Most Prevalent Chronic Condition Statuses

A Mann-Whitney *U* Test, sometimes referred to as a Wilcoxon Rank Sum Test, was used to determine whether the outcome variable (overall patient satisfaction score) differed between *two* exposure groups (of the variable chronic condition status).[44] Since the test is limited to comparing only *two* exposure groups, it was performed three times: (1) DM versus HT, (2) DM versus DM&HT, and (3) HT versus DM&HT. These three pair-wise comparisons indicated that the difference in median values of the overall patient satisfaction scores did not differ from zero

in a *statistically* significant way by the 3 chronic condition categories being assessed (Table 5). There is *in*sufficient evidence against the null hypothesis that the median score of DM patients is the same as the median score of HT patients (p= 1.000). Similarly, there is *in*sufficient evidence against the null hypothesis that the median score of HT patients is the same as the median score of DM&HT patients (p= 0.065). A comparison of the medians and IQR values reported as a range, corroborates the Mann-Whitney *U* findings for the DM (21 [18, 23]) and HT (20 [18, 25]) comparison.

Although overall patient satisfaction scores were statistically significant between DM and DM&HT patients at the α=0.05 level, this did not hold true after a Bonferroni correction. Therefore, the Bonferroni-adjusted interpretation is that there is *insufficient* evidence to reject the null hypothesis that the median score of DM patients is the same as the median score of DM&HT patients. However, a comparison of the medians and IQR values reported as a range, demonstrated a *reduction* in satisfaction among patients with DM&HT (19 [13, 19.5]) when compared to patients with DM (21 [18, 23]) and patients with HT (20 [18, 25]). Additionally, Figure 8 further supports that there may be a *substantively* significant difference in overall patient satisfaction scores between DM and DM&HT patients as well as between HT and DM&HT patients. Therefore, the Bonferroni significance threshold used for the score comparison between DM and DM&HT patients may be too conservative.

Table 5: Test of the Difference of Overall Patient Satisfaction Scores across the Top 3 Chronic Condition Statuses

	P-Value (Mann-Whitney *U* Test)
DM versus HT	1.000
DM versus DM&HT	0.017*
HT versus DM&HT	0.065

DM: Patient has diabetes mellitus (n=55). HT: Patient has hypertension (n=15). DM&HT: Patient has both diabetes mellitus and hypertension (n=12). *Significant at the p<0.05 level. **Significant at the p<0.017 level (Bonferroni correction for three pair-wise comparisons—p<0.05/3 → p<0.017).

Figure 8: Overall Patient Satisfaction by Three Most Prevalent Chronic Condition Types

3.2.2 Associations: Willingness to Renew and Quality/Cost/Access

Three pair-wise comparisons demonstrate that of the quality, cost, and access indicators evaluated, only quality is moderately associated with willingness to renew (Table 6). There is a statistically significant *lack of independence* between the quality indicator (medication) and willingness to renew rankings (τ_b= 0.463, p<0.001). Patients who rank the medications provided by SughaVazhvu higher also have a higher willingness to renew. The cost and access indicators show slightly negative associations with willingness to renew although there is not enough statistical evidence to reject the null hypothesis of independence. Still, the fact that cost, distance, and willingness to renew were rated positively by 85.1%, 100%, and 93.1% of the patients, respectively, suggests some substantive positive associations between these ranked variables.

Table 6: Associations between Willingness to Renew and Quality, Cost & Access Indicators

	Kendall's τ_b	P-value
Quality (medication)	0.463	0.001
Cost (SV-related expenditure)	-0.071	0.479
Access (distance)	-0.026	0.818

n=87 (all respondents). The beta tau was chosen over the alpha tau because the prior adjusts for ties, which were present when the non-parametric test was run.

4. Discussion

Patient satisfaction is a multifaceted concept with implications on both the delivery of medical care and the improvement of health status. Although it is only one aspect of health care, patient satisfaction has been shown to be correlated with actual patient outcomes.[37,38] This knowledge was a central motivation of this study because SughaVazhvu Healthcare believed that better understanding patient satisfaction with its model was integral to aiding operational quality improvement. Therefore, this study aimed to identify and examine factors that affect patient satisfaction in the hopes of providing SughaVazhvu Healthcare with information that could positively influence how it approaches chronic care management in rural Thanjavur.

4.1 Patient Satisfaction

The central finding of this study is that overall—whether analyzed per question, by subscale, or as a single scale—patients exhibit satisfaction with the SughaVazhvu Healthcare approach to chronic care management.

4.1.1 Per Question Highlights

Three survey questions in particular stood out for capturing, not just *positive*, but *very positive* patient opinions: Q16, Q24, and Q28. Question 16, which measured patient awareness of the importance of regular medication intake, found that 89% of respondents thought this was *very important* for managing their chronic conditions. This finding, coupled with the overall satisfaction expressed by patient participants, aligns with a study which demonstrated that medication knowledge was associated with patient satisfaction among chronic care patients.[45] This could suggest that patients with a greater awareness of how their medication contributes

to their disease management may tend to exhibit more satisfaction with their care. This can usually be attributed to their more active role in managing their health. Question 24, which measured patient opinion about the behavior of SughaVazhvu Healthcare employees toward them, found that 94% of respondents noted *respectful* behavior. This provides further evidence for the finding that positive patient-provider interactions and trust are essential for enrollment. When reviewing community-based health insurance schemes from a health system perspective, Mladovsky and Mossialos noted that 'trust decreases the likelihood of adverse selection and moral hazard and increases willingness to pay….'[46] Question 28, which measured patient satisfaction with the distance from their home to point of care, found that 99% of respondents viewed the distance as *very reasonable*. In fact, the patients often mentioned the "doorstep delivery" aspect of the subscription-based chronic care package as a favored feature of their care management. This points to the importance of ease of access. Taken together, these three questions indicate that SughaVazhvu Healthcare is helping to address patient knowledge, comfort, and access challenges within the catchment area it is servicing.

4.1.2 By Subscale Highlights

Patients expressed satisfaction with the three major dimensions of the SughaVazhvu Healthcare managed care model assessed in this study: health care, health personnel, and health services. The standardized sub-scores for each subscale, which ranged from -2 to +2, were all on the positive end of the spectrum. This indicates that overall, patients had a positive opinion of their general chronic care experience, interactions with SughaVazhvu Healthcare mobile clinic staff, and the technical aspects of SughaVazhvu Healthcare's chronic care delivery. The Health Care Subscale results suggest that patients believe they derive benefits from enrolling in a SughaVazhvu Healthcare subscription-based chronic care package. This is an important motivator for consistently renewing subscriptions.[47] The Health Personnel Subscale

results point to an implicit comfort and trust that patients have with SughaVazhvu Healthcare staff, which the insurance literature has demonstrated to be an important quality of care indicator that impacts patient policy renewal decisions.[46-49] The Health Services Subscale results suggest that from a technical operational standpoint, SughaVazhvu Healthcare is satisfactorily meeting the patient medication, cost, and schedule needs. These technical quality of care factors are important because when not met, they have been shown to lead to non-renewal of insurance policy among patients.[47] Therefore, SughaVazhvu Healthcare should see these sub-scores as positive affirmation of their approach to chronic disease management. At the same time, the NGO should periodically re-evaluate these three dimensions in order to guide the evolution of its managed care model.

4.1.3 Overall Patient Satisfaction Highlights

The results of the overall patient satisfaction scale echoes those of the three subscales: all scores are positive, reflecting general satisfaction. When evaluated *by the 3 major chronic condition categories being assessed*, scores on the overall patient satisfaction scale did not differ in a *statistically* significant way. However, there was a noted reduction in satisfaction among patients with DM&HT when compared to patients with DM and patients with HT. This suggests that health status may show a slight negative association with overall patient satisfaction scores such that the more chronic conditions one has, the lower one's satisfaction.

4.2 Subscription Renewal

Modeled somewhat after the health insurance industry's use of willingness to pay (WTP), this study uses willingness to renew as a measure of patient satisfaction. Among patients that participated in the survey, willingness to renew their chronic care subscription with

SughaVazhvu Healthcare was overwhelmingly high (93.1%). No patient was "Very Unwilling", only 1 person was "Unwilling", and 5 had not yet made up their minds.

Viewing "Willing" as certainty and "Very Willing" as certainty with enthusiasm, when examined by sex, females generally expressed a greater degree of willingness to renew than males. Literature suggests that women, who traditionally occupy the caregiver role, are more likely to spend their limited income on the health of their loved ones.[50] Unfortunately, their ability to act on this is often restricted by social and legal structures that place men at the head of the household and sacrifice the autonomy of women. The power dynamics which favor men help explain why one WTP study conducted among Indian rural poor found that male respondents reported slightly higher willingness to pay levels.[51] Interestingly, in this study, the 1 unwilling person as well as 4 of the 5 "No Response or DNK" patients were male. However, when asked to expound upon their hesitation to renew, these individuals acknowledged an appreciation of the accessibility and low cost of the services, but wanted to wait until the end of their subscription to evaluate the condition of their blood glucose level—whether or not it was controlled. The sole unwilling patient was a 59-year-old male. He said he did not feel his blood glucose level was under control. This again points to the importance of quality of care.

When examined by age categories, willingness to renew remained high, though the degree of certainty/enthusiasm decreased as the age category increased. This contradicts literature around the Patient Satisfaction Index (PSI) which states that older patients tend to receive higher scores when compared to young and middle-aged patients.[52] It is possible that the greater non-communicable disease burden of older patients is contributing to the downward trend observed in this study.

4.3 Implications for Policy & Practice

Moving forward, SughaVazhvu Healthcare should make use of both the positive and negative patient feedback gathered from this study.

4.3.1 Signals for Areas of Positive Reinforcement

Positive reinforcement should take place at the organizational *and* staff levels. Overall, the organization's approach to chronic care management seems to be working well. Not only has SughaVazhvu Healthcare garnered buy-in within its catchment area, but it is also establishing itself as a reliable healthcare provider in the community. It has social capital— which Woolcock defined as 'the information, trust and norms of reciprocity inhering in one's social network'—it can use to further penetrate its sphere of influence.[46]

One of the most salient characteristics that patients lauded was the respectful, quality, and attentive treatment they received from SughaVazhvu Healthcare personnel. This provides the organization with the opportunity to acknowledge its employees. Specifically, staff should be told how positively patients view their interactions in terms of behavior and time spent. This sort of "pat on the back" can encourage staff to take pride in their work ethic which should, in turn, continue to have positive effects on patient satisfaction.

4.3.2 Signals for Areas of Improvement

Despite the overwhelming satisfaction exhibited by patient participants, it is important to point out aspects of the SughaVazhvu Healthcare managed care model that tended to receive more negative responses. Three questions in particular are noteworthy: Q18, Q20, and Q27.

A. Patient Knowledge

Question 18 received the most negative responses of any survey item: 22% of respondents were dissatisfied with their knowledge of their chronic conditions. This somewhat contradicts the 98% of patients who expressed awareness about the importance of regular medication intake. The discrepancy in these results could suggest that SughaVazhvu Healthcare has succeeded in raising awareness and gaining patient buy-in but has not yet *educated* its customers. Perhaps patients are going through the motions—fulfilling their health care checklist—but have not necessarily reached a point where they can really understand their condition and its required management in order to truly take ownership of their care. Therefore, in the future, SughaVazhvu Healthcare may want to emphasize patient education. Frick *et al.* even encourage the periodic assessment of patient disease-specific knowledge to better ensure the effectiveness of patient-provider communication since healthcare professionals have been found to overestimate patient understanding.[53]

B. Patient Recommenders

Question 20, which asked patients whether they would recommend the SughaVazhvu Healthcare chronic care package, found that 11% would not. Qualitative probing by the surveyor demonstrated that the negative responses were due to lack of clarity. The *intention of recommending* that the question meant to elicit was lost in translation. That is, most negative respondents cited logistical reasons such as old age or not having the authority/social presence to make recommendations. One 50-year-old female patient however did not feel comfortable disclosing her disease status. If this question is important to SughaVazhvu Healthcare (i.e. for determining whether willingness to recommend is associated with willingness to renew and/or

actual renewal patterns), then the organization may consider dichotomizing and rephrasing it for future use. For example, the current question could become two questions—one that measures *willingness* and another that measures *ability*. This could help SughaVazhvu Healthcare identify whether patients would recommend its services if they could (hypothetical situation) as well as if they actually can recommend them (actionable situation).

C. Cost

With respect to question 27, about 7% of respondents believed that the cost of the SughaVazhvu Healthcare chronic care package was *somewhat high*. Some explained that it was expensive compared to the Government of India's free Primary Health Centers (PHC). Others said it was costly if only medications were obtained but diagnostic services were not availed. It may be worthwhile for SughaVazhvu Healthcare to gather qualitative data that could guide the streamlining of package services or the creation of a more bare bones basic package (i.e. diabetes basic package: diabetes medication and 1 diagnostic service).

4.4 Further Research

As the SughaVazhvu Healthcare approach to chronic care becomes more robust over the next few years, this study will serve as formative research for future studies that can assess the degree to which the model has penetrated its catchment areas within rural Thanjavur. First, SughaVazhvu Healthcare can use the results of this study to inform the creation of a short, internal organizational patient satisfaction questionnaire based on Q16, Q18, Q20, Q24, Q27, and Q28. This could be administered periodically for operational improvement purposes. This could also help the organization determine if and how satisfaction among its patients changes over time as well as identify the predictors of changes. Second, future studies may seek to cover a larger segment of the enrolled patient population or emphasize more qualitative study

methodologies such as in-depth interviews or focus groups. Third, further research could

examine particular themes. For example, how does patient satisfaction relate to patient

medical status? Is SughaVazhvu Healthcare only serving certain types of people (i.e. specific

castes, religious affiliations, or education levels)? Do certain segments of the patient population

exhibit certain enrollment patterns (i.e. those of high socioeconomic status are consistently

enrolled but those of low socioeconomic status tend to start and stop)? Do principal

determinants of patient satisfaction differ by disease condition or gender, etc. (i.e. patients with

diabetes emphasize self-knowledge of their condition while females stress the importance of

healthcare providers who behave *respectfully*)? For now, the focus has been on discovering and

beginning to understand what the major factors are that seem to influence the satisfaction of

patients availing services from SughaVazhvu Healthcare.

4.5 Limitations

There are several methodological limitations associated with this study, many of them

relating to the nature of survey data. First, as cross-sectional exploratory research, the study

design does not allow for inferences in re causality; only associations can be made at most.

Second, given that the survey utilized is not a validated instrument, the internal, construct, and

external validity are called into question. Neither a pre-test nor pilot study was conducted to

assess the survey instrument's internal validity or reliability. In terms of construct validity,

question 20—willingness to recommend—exemplifies this uncertainty about whether the

survey questions are actually measuring what they aim to measure. External validity is also

uncertain since the instrument has yet to be tested across and between various populations.

It is worthy to note that a census was conducted of all SughaVazhvu Healthcare chronic

care package subscribers at the start of this study. The study sample is the study population.

This is a strength because the study results are representative of subscribers to SughaVazhvu Healthcare, yet this also yields limitations three and four. Third, it is not certain whether the study results are further generalizable to other patient populations. Fourth, despite being a census, the 27.5% non-response rate limits generalizability, especially if there are systematic differences between those patients who willingly consented to complete the survey (n=87) and those who refused or could not (n=33).

Fifth, since the survey was written and analyzed in English but conducted in Tamil, it is possible that information may have been lost despite attentive translation/back-translation practices. Sixth, although the use of one survey conductor limits inter-surveyor variability, it could introduce bias. Since the surveys took place over-the-phone rather than in-person, respondents may have felt more comfortable being frank. However, survey length—and therefore content—was restricted and the ability to really engage patients and obtain rich data was compromised (i.e. respondent fatigue, limited recall of response options, etc.). The telephone aspect also introduced the problem of dropped calls and the need to sometimes contact individuals multiple times for survey completion. Finally, despite the ability of Likert-scale questions to detect intensity/degree of patient sentiment, employing quantitative techniques to explore satisfaction may not fully capture the nuances of responses in the way that qualitative methodology can.

5. Conclusion

The increasing worldwide burden of NCDs is contributing to the need for health systems to (re-)evaluate how best to consistently deliver high quality, low cost care that is accessible to patients with lifelong conditions. It is also highlighting the importance of patient satisfaction and knowledge of treatment for long-term compliance. SughaVazhvu Healthcare's managed care model, which relies on both subscription-based plans and mobile health clinics, is one potentially sustainable approach to NCD management. Yet, the success of the SughaVazhvu Healthcare model will depend not only on patient outcomes, but also on patient satisfaction with said outcomes. That is, chronic conditions have reiterated the importance of the patients' role in managing their own health. This belief is a central motivation of this study, which has attempted to identify and examine factors that are meaningful to patients—medication quality, patient-provider interactions, and physical accessibility—in order to inform how SughaVazhvu Healthcare utilizes patient opinions to monitor and modify its healthcare delivery model. This information should assist SughaVazhvu Healthcare in increasing renewal and subscription rates as well as hopefully inform other chronic care models.

Appendix—Patient Satisfaction Survey Instrument

SughaVazhvu Mobile Clinics and Chronic Disease Management
PATIENT SATISFACTION SURVEY

GENERAL SURVEY INSTRUCTIONS TO SURVEY ADMINISTRATOR

ATTENTION SURVEYOR: Text printed within a box such as this one is intended as directions to help guide *you*. Please follow the instructions in these boxes. Please indicate respondent answers by circling the appropriate survey response for multiple-choice questions AND by writing in the empty boxes provided for free-response questions. Please read the *underlined and italicized text instructions* **aloud** to the patients.

SURVEY ADMINISTRATOR INFORMATION

Please complete the following 4 fields at the start (and end) of **every** survey. They are very important for quality control.

Surveyor Name: _____
Date (DD/Month/YYYY): ____/_____/ _____
Survey Start Time: _____ (HH:MM—*24-hour clock*)
Survey End Time: _____ (HH:MM—*24-hour clock*)

PATIENT INFORMATION
Anonymized ID: _____

PATIENT VERIFICATION (Q1-Q3)

Use the following series of 3 questions to confirm that you are speaking to the intended patient. *Italicized words are instructions for how to proceed from one question stem to the next, depending on the patient's response.*

1. Am I speaking to ___(**say** *patient name*)___?
    a. If NO → *go to Q2.*
    b. If YES → *read the **Verbal Informed Consent** on the next page and then ask Q3.*

2. May I speak to ___(**say** *patient name*)___?
    a. If NO → *ask: May I call back at a later time?*
        i. If NO (unwilling to participate) → *thank the patient for his/her time and hang up.*
        ii. If YES   →*ask: When would be a good time to*

            call? (Mark any preferred time here _____, then hang up and call again later.)
    b. If YES → *read the **Verbal Informed Consent** on the next page and then ask Q3.*

Verbal Informed Consent

Hello, my name is _____ and I am working with SughaVazhvu Healthcare. The purpose of this call is to understand how *mobile health clinics* are affecting healthcare delivery here in Thanjavur. Specifically, I will be talking to you about SughaVazhvu, where you have been receiving healthcare.

During this call I wish to ask you some questions. The questions will help us understand your experiences with the SughaVazhvu mobile clinic services and program for high blood sugar, high blood pressure, and high cholesterol. Your feedback will help SughaVazhvu improve its services.

This telephone interview will last about 20-25 minutes. It is *your choice* whether you wish to participate or not. Your decision *in no way* will affect or change the quality of services you receive from SughaVazhvu. You can skip any question that you do not want to answer. You may stop answering questions at any time that you wish.

Your responses are anonymous—no one from SughaVazhvu's field team or anywhere else will know what you said or be able to trace your responses to you. However, anonymous responses will be shared with researchers from Duke University, who will help us understand how patients feel about the services we are providing.

If you have any questions, you can ask them now or later. Do you have any questions? Is there anything else you would like to know about this study? If you wish to ask questions later, you may contact Aparna Manoharan at this number: +91 43 62 231 373 between 10:30am and 5:30pm, Monday through Friday.

3. Are you willing to participate in this survey?
   a. No—too busy →   *thank the patient for his/her time and hang up*.
   b. No—unwilling →   *thank the patient for his/her time and hang up.*
   c. Yes   →   *go to Q4.*

SUBSCRIPTION CONFIRMATION (Q4-Q5)

Use the following series of 2 questions to confirm the enrollment and disease status of the patient. Only read the question stem, listen for the patient's answer, and circle the corresponding response option. If a patient known to be currently enrolled in a SughaVazhvu package for at least 2 months *denies or fails to acknowledge* that fact, please probe further. If after probing the patient still says no, mark that response and end the survey.

(INSTRUCTIONS TO PATIENT): Okay, we will now begin the survey.

4. Are you currently enrolled in a SughaVazhvu chronic care package?
   No (0)
   Yes (1)

5. Which chronic diseases are you currently receiving treatment for from SughaVazhvu: diabetes, hypertension, **and/or** hyperlipidemia?
   __Diabetes   __Hypertension   __Hyperlipidemia

DEMOGRAPHIC INFORMATION (Q6-Q12**)**

Although the next 7 questions are multiple-choice, they should be conducted as if they are free-response. That is, you should pose each question as written, listen for the patient's answer, and (circle) the corresponding response option. If a patient's answer does not match the given response options, ask the question again and list the possible choices from which the patient can then choose.

(INSTRUCTIONS TO PATIENT): The following 7 questions are designed to help us get a sense of your background.

6. What is your gender?
   __Male   __Female   __Transgender   __Other:_____

7. How old are you?   _____ years

8. What is your current marital status?
   __Never Married   __Currently Married   __Separated   __Divorced
   __Widowed

9. What is the highest level of education that you have completed?
   __No formal schooling
   __Primary school (1-5)
   __Secondary school (6-10)
   __High school (or equivalent) completed
   __College/Pre-University/University completed
   __Post graduate degree completed

10. What is your occupation?
    __Daily wage earner on other people's land   __Cultivation on own land
    __Self-employed non-farm work   __Government worker
    __Non-government worker   __Student
    __Homemaker   __Retired
    __Unemployed (able to work)   __Unemployed (unable to work)

11. What is the highest level of education that the head of your household has completed?
    __No formal schooling
    __Primary school (1-5)
    __Secondary school (6-10)
    __High school (or equivalent) completed
    __College/Pre-University/University completed
    __Post graduate degree completed

12. What is the occupation of the head of your household?
    __Daily wage earner on other people's land   __Cultivation on own land
    __Self-employed non-farm work   __Government worker
    __Non-government worker   __Retired
    __Unemployed (able to work)   __Unemployed (unable to work)

GENERAL CHRONIC CARE—PART 1 (Q13**)**

> This is a transitional question. Read the entire question stem and the first 4 response options to the patient.

(INSTRUCTIONS TO PATIENT): Now I am going to ask you about your experience with SughaVazhvu and the chronic care package you are currently enrolled in.

13. How satisfied are you with your current treatment?
    - I am not satisfied at all (-2)
    - I not very satisfied (-1)
    - I am somewhat satisfied (1)
    - I am very satisfied (2)
    - No response or do not know (0)

CONDITION-SPECIFIC CARE (Q14-Q15)

For questions 14 and 15, you should only ask the sub-questions related to the condition(s) that the patient has (reference Q5 if necessary). In other words, identify the appropriate column and read/ask **down** the column. Sub-questions A refer to diabetes. Sub-questions B refer to hypertension. Sub-questions C refer to hyperlipidemia. If the patient has more than one condition, then you will have to use more than one column.

For question 14, read the entire question stem and the first 3 response options to the patient. For question 15, read the entire question stem and the first 4 response options to the patient.

	DIABETES	HYPERTENSION	HYPERLIPIDEMIA
INSTRUCTIONS TO PATIENT	*The following 2 questions are concerned with the treatment of your diabetes (including insulin, tablets, and/or diet) and your experience. Please focus on the time since you have been enrolled in the SughaVazhvu subscription-based plan.*	*The following 2 questions are concerned with the treatment of your hypertension (including blood pressure monitoring, tablets, and/or diet) and your experience. Please focus on the time since you have been enrolled in the SughaVazhvu subscription-based plan.*	*The following 2 questions are concerned with the treatment of your hyperlipidemia (including blood cholesterol monitoring, tablets, and/or diet) and your experience. Please focus on the time since you have been enrolled in the SughaVazhvu subscription-based plan.*
QUESTION #	**14A**	**14B**	**14C**
	Since you started the SughaVazhvu chronic care package, how do you feel about the management of your **blood sugar**? • It has worsened (-1) • No change (00) • It has improved (1) • No response or do not know (0)	Since you started the SughaVazhvu chronic care package, how do you feel about the management of your **blood pressure**? • It has worsened (-1) • No change (00) • It has improved (1) • No response or do not know (0)	Since you started the SughaVazhvu chronic care package, how do you feel about the management of your **blood cholesterol level**? • It has worsened (-1) • No change (00) • It has improved (1) • No response or do not know (0)
QUESTION #	**15A**	**15B**	**15C**
	How important do you think it is to get your **blood sugar level** checked regularly? • It is not at all important (-2) • It is of little importance (-1) • It is moderately important (1) • It is very Important (2) • No response or do not know (0)	How important do you think it is to get your **blood pressure** checked regularly? • It is not at all important (-2) • It is of little importance (-1) • It is moderately important (1) • It is very Important (2) • No response or do not know (0)	How important do you think it is to get your **blood cholesterol level** checked regularly? • It is not at all important (-2) • It is of little importance (-1) • It is moderately important (1) • It is very Important (2) • No response or do not know (0)

GENERAL CHRONIC CARE—PART 2 (Q16-Q21**)**

> For questions 16-18 and 20-21, read the entire question stem and the first 4 response options to the patient. For questions 19 and 21A, <u>do NOT</u> read what is **(bolded and in parentheses)** to the patient.

(INSTRUCTIONS TO PATIENT): Now I am going to ask you more about your experience with SughaVazhvu and the chronic care package you are currently enrolled in.

Health Care

16. In order to manage your chronic condition(s), how important do you think it is to take medication regularly?
    - It is not at all important (-2)
    - It is of little importance (-1)
    - It is moderately important (1)
    - It is very important (2)
    - No response or do not know (0)

17. How do you feel about the way your chronic condition(s) is/are managed by your SughaVazhvu chronic care package?
    - My condition(s) is/are very poorly managed (-2)
    - My condition(s) is/are barely managed (-1)
    - My condition(s) is/are somewhat managed (1)
    - My condition(s) is/are very well managed (2)
    - No response or do not know (0)

18. How satisfied are you with your knowledge of your chronic condition(s)?
    - I am not satisfied at all (-2)
    - I not very satisfied (-1)
    - I am somewhat satisfied (1)
    - I am very satisfied (2)
    - No response or do not know (0)

19. **(Multi-pronged and semi-open-ended question):** I want to ask you about what your treatment through the SughaVazhvu chronic care package includes.

    a. Are you getting lifestyle advice?

    b. Are you getting nutritional advice?

    c. Are you being informed ahead of time about coming in for treatment?

20. Would you recommend the SughaVazhvu chronic care package to someone else with your kind of chronic condition(s)?
    - No, I would definitely not recommend it (-2)
    - No, I would not recommend it (-1)
    - Yes, I would probably recommend it (1)
    - Yes, I would definitely recommend it (2)
    - No response or do not know (0)

21. Would you be willing to renew your current SughaVazhvu chronic care package when it expires?
    - No, I would definitely not be willing to renew it (-2)
    - No, I would not be willing to renew it (-1)
    - Yes, I would probably be willing to renew it (1)
    - Yes, I would definitely be willing to renew it (2)
    - No response or do not know (0)

21A. **(Free-response follow-up question):** Why?

MOBILE CLINIC MODEL (Q22-Q32**)**

For the following questions, read the entire question stem and the first 4 response options to the patient.

(INSTRUCTIONS TO PATIENT): We would like to know your opinion on the SughaVazhvu mobile clinic. We would like to know what you think about the mobile clinic and healthcare providers that work in it.

Health Personnel

22. How much do you believe that the SughaVazhvu healthcare providers in the mobile clinic can help you manage your condition(s)?
    - They cannot help me at all (-2)
    - I do not really believe they can help me (-1)
    - I somewhat believe they can help me (1)
    - I believe they can help me (2)
    - No response or do not know (0)

23. In your opinion, how well do the healthcare providers in the SughaVazhvu mobile clinic *examine* you?
    - They do a very poor job of examining me (-2)
    - They do a relatively poor job of examining me (-1)
    - They do a relatively good job of examining me (1)
    - They do a very good job of examining me (2)
    - No response or do not know (0)

24. In your opinion, how do the healthcare providers in the SughaVazhvu mobile clinic *behave* towards you?
    - They behave disrespectfully (-2)
    - They behave somewhat disrespectfully (-1)
    - They behave somewhat respectfully (1)
    - They behave respectfully (2)
    - No response or do not know (0)

25. What do you think of the *amount of time* that the healthcare providers in the SughaVazhvu mobile clinic devote to treating you?
    - They never spend enough time with me (-2)
    - They often do not spend enough time with me (-1)
    - The usually spend enough time with me (1)
    - The always spend enough time with me (2)
    - No response or do not know (0)

Health Services

26. How would you rate the medicines supplied by the SughaVazhvu mobile clinic?
    - The medicines are not at all good (-2)
    - The medicines are hardly good (-1)
    - The medicines are good (1)
    - The medicines are very good (2)
    - No response or do not know (0)

27. Do you think the *amount of money* you have spent on the SughaVazhvu chronic care package in the past 12 months is high?
    - Yes, it is very high (-2)
    - Yes, it is somewhat high (-1)
    - No, it is not very high (1)
    - No, it is very low (2)
    - No response or do not know (0)

28. How would you rate the *distance* from your home to the SughaVazhvu mobile clinic?
    - The distance is very unreasonable (-2)
    - The distance is unreasonable (-1)
    - The distance is reasonable (1)
    - The distance is very reasonable (2)
    - No response or do not know (0)

29. How would you rate the operating hours of the SughaVazhvu mobile clinic (i.e. time of day it visits)?
    - The hours are very unreasonable (-2)
    - The hours are unreasonable (-1)
    - The hours are reasonable (1)
    - The hours are very reasonable (2)
    - No response or do not know (0)

30. What is the best time of day for the SughaVazhvu mobile clinic to come?
    - Early morning—7am-10am   (1)
    - Late morning/Early afternoon—11am-1pm   (2)
    - Prime afternoon—2pm-4pm   (3)
    - Late afternoon/Early evening—post-4pm (4)
    - No response or do not know   (0)

31. How would you rate the *operating schedule* of the SughaVazhvu mobile clinic (i.e. the # of days per week it visits)?
    - It is definitely not enough days per week (-2)
    - It is probably not enough days per week (-1)
    - It usually seems like enough days per week (1)
    - It is definitely enough days per week (2)
    - No response or do not know (0)

For question 32, only read the question to the patient. Multiple responses are allowed. Indicate his/her selection(s) with a circle.

32. What is the best day of the week for the SughaVazhvu mobile clinic to come?
    - Monday (1)
    - Tuesday (2)
    - Wednesday (3)
    - Thursday (4)
    - Friday (5)
    - Saturday (6)
    - Sunday (7)
    - No response or do not know (0)

(INSTRUCTIONS TO PATIENT): We have reached the end of the survey. Do you have any questions for me? Okay, thank you for your time. Goodbye.

Please go to the first page of this survey and indicate the time at which this survey was completed.

References

1.   Organization WH. *Global health risks: mortality and burden of disease attributable to selected major risks.* World Health Organization; 2009.

2.   Organization WH. *Global Status Report on Noncommunicable Diseases 2014.* Geneva, Switzerland2014.

3.   Organization WH. Noncommunicable Diseases Fact Sheet. In: Organization WH, ed. Geneva, Switzerland: World Health Organization; 2015.

4.   Di Cesare M, Khang Y-H, Asaria P, et al. Inequalities in non-communicable diseases and effective responses. *The Lancet.* 2013;381(9866):585-597.

5.   Organization WH. *India NCD Country Profile.* Geneva, Switzerland: World Health Organization;2014.

6.   Gujral UP, Pradeepa R, Weber MB, Narayan K, Mohan V. Type 2 diabetes in South Asians: similarities and differences with white Caucasian and other populations. *Annals of the New York Academy of Sciences.* 2013;1281(1):51-63.

7.   Raban M, Dandona R, Dandona L. Availability of data for monitoring noncommunicable disease risk factors in India. *Bulletin of the World Health Organization.* 2012;90(1):20-29.

8.   Beaglehole R, Bonita R, Horton R, et al. Priority actions for the non-communicable disease crisis. *The Lancet.* 2011;377(9775):1438-1447.

9.   Bank TW. Health expenditure, total (% of GDP). The World Bank; 2013:World Development Indicators.

10.   Organization WH. Density of physicians (total number per 1000 population, latest available year).

11.   Organization WH. Density of nursing and midwifery personnel (total number per 1000 population, latest year available).

12.   Bajpai N, Goyal S. Primary health care in India: Coverage and quality issues. 2004.

13.   Balarajan Y, Selvaraj S, Subramanian S. Health care and equity in India. *The Lancet.* 2011;377(9764):505-515.

14.   Baruah M, Pathak A, Kalra S, et al. *A revisit to prevailing care and challenges of managing diabetes in India: Focus on regional disparities.* Vol 182014.

15.   Kaveeshwar SA, Cornwall J. The current state of diabetes mellitus in India. *The Australasian medical journal.* 2014;7(1):45.

16.   Singh S, Badaya S. Health care in rural India: A lack between need and feed. *South Asian journal of cancer.* 2014;3(2):143.

17.   Reddy KS, Patel V, Jha P, et al. Towards achievement of universal health care in India by 2020: a call to action. *The Lancet.* 2011;377(9767):760-768.

18.   Berman PA. Rethinking health care systems: Private health care provision in India. *World Development.* 1998;26(8):1463-1479.

19.   Bank TW. Out-of-pocket health expenditure (% of private expenditure on health). The World Bank; 2013:World Development Indicators.

20.   Shahrawat R, Rao KD. Insured yet vulnerable: out-of-pocket payments and India's poor. *Health policy and planning.* 2011:czr029.

21.   Marten R, McIntyre D, Travassos C, et al. An assessment of progress towards universal health coverage in Brazil, Russia, India, China, and South Africa (BRICS). *The Lancet.* 2014;384(9960):2164-2171.

22.   Engelgau MM, Karan A, Mahal A. The economic impact of non-communicable diseases on households in India. *Globalization and health.* 2012;8(1):1.

23.   Sen S, Fawson P, Cherrington G, et al. Patient satisfaction measurement in the disease management industry. *Disease Management.* 2005;8(5):288-300.

24.   Schwedes U, Siebolds M, Mertes G. Meal-related structured self-monitoring of blood glucose effect on diabetes control in non-insulin-treated type 2 diabetic patients. *Diabetes Care.* 2002;25(11):1928-1932.

25.   Deiss D, Bolinder J, Riveline J-P, et al. Improved glycemic control in poorly controlled patients with type 1 diabetes using real-time continuous glucose monitoring. *Diabetes care.* 2006;29(12):2730-2732.

26.   Pearson TA, Mensah GA, Alexander RW, et al. Markers of inflammation and cardiovascular disease application to clinical and public health practice: a statement for healthcare professionals from the centers for disease control and prevention and the American Heart Association. *circulation.* 2003;107(3):499-511.

27.   Schocken DD, Benjamin EJ, Fonarow GC, et al. Prevention of heart failure A scientific statement from the American Heart Association councils on epidemiology and prevention, clinical cardiology, cardiovascular nursing, and high blood pressure research; Quality of care and outcomes research interdisciplinary working group; and functional genomics and translational biology interdisciplinary working group. *Circulation.* 2008;117(19):2544-2565.

28.   Surwit RS, Allen III LM, Cummings SE. Systems, methods and computer program products for monitoring, diagnosing and treating medical conditions of remotely located patients. Google Patents; 2000.

29.   Williamson MJ. Dispensing, storage, control and inventory system with medication and treatment chart record. Google Patents; 1998.

30.   Engleson JJ, Chamberlain C. System and method for collecting data and managing patient care. Google Patents; 1998.

31.   van der Wal MH, Jaarsma T. Adherence in heart failure in the elderly: problem and possible solutions. *International journal of cardiology.* 2008;125(2):203-208.

32.   van der Wal MH, Jaarsma T, Moser DK, Veeger NJ, van Gilst WH, van Veldhuisen DJ. Compliance in heart failure patients: the importance of knowledge and beliefs. *European Heart Journal.* 2006;27(4):434-440.

33.   Schectman JM, Schorling JB, Voss JD. Appointment adherence and disparities in outcomes among patients with diabetes. *Journal of general internal medicine.* 2008;23(10):1685-1687.

34.   Boyer L, Francois P, Doutre E, Weil G, Labarere J. Perception and use of the results of patient satisfaction surveys by care providers in a French teaching hospital. *International Journal for Quality in Health Care.* 2006;18(5):359.

35.   Williams B. Patient satisfaction: a valid concept? *Social science & medicine.* 1994;38(4):509-516.

36. Sitzia J, Wood N. Patient satisfaction: a review of issues and concepts. *Social science & medicine.* 1997;45(12):1829-1843.

37. Pascoe GC. Patient satisfaction in primary health care: a literature review and analysis. *Evaluation and program planning.* 1983;6(3-4):185-210.

38. Fenton JJ, Jerant AF, Bertakis KD, Franks P. The cost of satisfaction: a national study of patient satisfaction, health care utilization, expenditures, and mortality. *Archives of internal medicine.* 2012;172(5):405-411.

39. Hoffman K. Evaluation of Patient Satisfaction in Men Receiving External Beam Radiation Therapy for a Diagnosis of Prostate Cancer. 2015.

40. Szklo M, Nieto J. *Epidemiology.* Jones & Bartlett Publishers; 2014.

41. Organization WH. World Health Survey 2002 Short Questionnaire Rotation A.

42. Bradley C. The diabetes treatment satisfaction questionnaire: DTSQ. *Handbook of Psychology and Diabetes: a guide to psychological measurement in diabetes research and practice.* 1994:111-132.

43. Haddad S, Fournier P, Potvin L. Measuring lay people's perceptions of the quality of primary health care services in developing countries. Validation of a 20-item scale. *International Journal for Quality in Health Care.* 1998;10(2):93-104.

44. Kirkwood B, Sterne J. Essential medical statistics. 2003. *Malden: Blackwell.*347-349.

45. Burge S, White D, Bajorek E, et al. Correlates of medication knowledge and adherence: findings from the residency research network of South Texas. *Family medicine.* Nov-Dec 2005;37(10):712-718.

46. Mladovsky P, Mossialos E. A Conceptual Framework for Community-Based Health Insurance in Low-Income Countries: Social Capital and Economic Development. *World Development.* 4// 2008;36(4):590-607.

47. Boateng D, Awunyor-Vitor D. Health insurance in Ghana: evaluation of policy holders' perceptions and factors influencing policy renewal in the Volta region. *International Journal for Equity in Health.* 2013;12(1):1-10.

48.   Schneider P. Trust in micro-health insurance: an exploratory study in Rwanda. *Soc Sci Med.* 2005;61.

49.   Schneider P. Why should the poor insure? Theories of decision-making in the context of health insurance. *Health Policy Plan.* 2004;19.

50.   Hottordze AR. *Decision to enroll or not in Health insurance scheme; views from North Tongu district (NTD).* Graduate School of Development Studies: Msc Thesis. Institute of social sciences; 2006.

51.   Dror DM, Radermacher R, Koren R. Willingness to pay for health insurance among rural and poor persons: Field evidence from seven micro health insurance units in India. *Health policy.* 2007;82(1):12-27.

52.   Rahmqvist M. Patient satisfaction in relation to age, health status and other background factors: a model for comparisons of care units. *International Journal for Quality in Health Care.* 2001;13(5):385-390.

53.   Frick U, Gutzwiller FS, Maggiorini M, Christen S. A questionnaire on treatment satisfaction and disease specific knowledge among patients with acute coronary syndrome. II: Insights for patient education and quality improvement. *Patient education and counseling.* 2012;86(3):366-371.