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## **WILLINGNESS TO PAY FOR IMPROVED HEALTH CARE WASTE MANAGEMENT IN ADDIS ABABA: APPLICATION OF CONTINGENT VALUATION METHOD**

A THESIS SUBMITTED TO CENTER FOR THE SCHOOL OF GRADUATE STUDIES OF  
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DEVELOPMENT

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I hereby confirm that the thesis proposal titled "patient's willingness to pay for improved health care waste management in Addis Ababa: application of contingent valuation method" prepared by ZenebeTefera, satisfies the University's regulations and meets the established criteria for originality and quality. This submission is in partial fulfillment of the requirements for the degree of Masters of Art (Environment and Sustainable Development).

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## *Abstract*

*Health care waste (HCW) has drawn attention from all over the world due to the risk it poses to the public health. Of the waste produced by health care activities, 85% is classified as general waste, and the remaining trashes hazardous due to its potential for being radioactive, poisonous, or contagious. The general objective of the study was to estimate willingness to pay (WTP) for improved health care waste management practice among selected public health facilities in Addis Ababa. To meet the study objective, a cross sectional, descriptive study design through mixed approach was used. 300 respondents which were selected through accidental sampling technique were participated in the study. Contingent valuation model was utilized to estimate the environmental valuation. Moreover, for the analysis of the study results, Logit model of analysis was used. The analytical application SPSS version 26 was used to analyze both descriptive and inferential statistics. The findings of the study revealed that among the total number of respondents, 240(80%) were found to be willing to pay for the proposed improved health care waste management service. And gender, marital status, educational status, family size, monthly income of the respondents, level of satisfaction and awareness about the effects of current health care waste on health were found to have significant association with respondents WTP for the improved health care waste management service. Even though there are efforts to tackle the effects of health care waste in the public health facilities under study, there is a lot to be done .the study recommends .....*

**Key words:** Willingness to pay, health care waste, health care waste management, contingent valuation method, logit model

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## *Abbreviations and acronyms*

**CEM**- Choice Experiment Method

**CLAD**- Censored Least Absolute Deviation

**CVM**- Contingent Valuation Method

**EM**- Expectation Maximization

**HCF**- Health Care Facility

**HCW** – Health Care Waste

**HCWM**- Health Care Waste Management

**HWMS**- Health Waste Management System

**ML**- Maximum Likelihood

**NLLS**- Non Linear Least Square

**NLWLS**- Non Linear Weighted Least Squares Method

**PC** -Payment Card

**TB**- Tuberculosis

**WHO**- World Health Organization

**WLSM**- Weighted Least Squares Method

**WTA**-Willingness to Accept

**WTP**- Willingness to Pay

# CHAPTER ONE: INTRODUCTION

## 1-1 Background of the study

The highest amount a consumer is willing to pay for a good or service is known as willingness to pay, or WTP for short. Usually, it is expressed as a monetary amount, although occasionally, a price range is used instead. In most situations, potential buyers won't accept a higher price, even though they are probably willing to spend less than this barrier. The idea of willingness to pay tells us that no matter how much someone is prepared to pay for a product, no matter where it comes from, they just won't pay more than that for it. Customers' willingness to pay can differ greatly from one another. This variance is often caused by differences in the customer population, typically classified as either extrinsic or intrinsic. **Extrinsic differences** are observable. They are factors you can generally determine about a person without needing to ask them directly. A customer's age, gender, income education and where they live can all be extrinsic differences that impact their willingness to pay. **Intrinsic differences** on the other hand are a person's characteristics you wouldn't know about without asking them directly. They are hard to observe and often called "unobserved differences". Intrinsic differences such as an individual's level of passion for a particular subject, desire to fit in with others, and risk tolerance can all influence their readiness to pay (Stobierski, 2020).

Health care waste (HCW) has drawn attention from all over the world due to the risk it poses to public health. HCW falls under the general and hazardous waste categories. The sources of general waste are household duties, administrative work, and food preparation. On the other hand, laboratory waste, diseased bodily fluids, and sharp wastes are among the hazardous wastes created during the administration of healthcare (Yazie, 2019). According to the World Health Organization (WHO), of the waste produced by health care activities, 85 percent is classified as general waste and the remaining trash is hazardous due to its potential for being radioactive, poisonous, or contagious (Kumi and Legesse, 2014).

Health institutions face significant challenges in managing trash since improper treatment of garbage might put patients at danger (Manuel et al., 2017). According to Yazie et al. (2019), inadequate management of medical waste is an issue, especially in the majority of developing nations, and it can spread more than 30 harmful blood-borne viruses. Furthermore, a number of researches revealed that HCWM is still in its infancy, with Ethiopia being a country where it is

often ignored. To improve HWMS, pertinent policies relating to the knowledge, perception, and willingness to pay (WTP) of populations must be established and put into action. On the other hand, residents' preferred payment mechanism, which remains unclear, needs to be surveyed so that new rules may be seamlessly put into reality (Song et al., 2016).

The majority of patients who seek medical attention are willing to pay for enhanced medical services, including adequate HCW management, according to studies on willingness to pay for improved medical services (Pavel et al., 2015). According to welfare economic theory, a person's greatest willingness to pay for medical care should be commensurate with the advantages that same person receives. The difference between the interventions' cost and the benefit from the danger it prevented (such as the likelihood of dying) represents the gain in wellbeing. Paying for services directly out of pocket, often known as user fees, is the most common way that people in low-income nations choose to pay for their medical treatment. 60% of all medical expenses are paid for out of pocket, compared to 20% in high-income nations. It makes up over 80% of the population in Ethiopia (Kumlachew et al, 2015).

Hence, the aim of this study was to estimate patient's willingness to pay for improved Health care waste management in selected public health care facilities in Addis Ababa.

## **1.2 Statement of the problem**

Potentially dangerous germs that might infect hospital patients, medical personnel, and the general public are present in health care waste. Drug-resistant germs that escape from medical institutions and enter the environment could be another source of danger. To prevent harmful health consequences linked to poor practices, such as exposure to harmful substances and infectious agents, health care waste management demands more focus and dedication.

The World Health Organization (2018) identifies hospitals and other healthcare facilities as some of the main producers of waste in healthcare. The study's findings show that whereas low-income countries produce an average of 0.2 kg of hazardous waste per hospital bed per day, high-income countries produce up to 0.5 kg on average. But in low-income nations, medical waste is frequently not segregated into hazardous and non-hazardous materials, which increases the actual amount of hazardous waste significantly.

According to estimates from the World Health Organization (WHO), 16 billion injections are given annually throughout the globe. However, the danger of sharp injuries to patients and healthcare personnel increases if safety steps are not taken and needles and syringes are not disposed of correctly. Sharp injuries raise the risk of contracting syphilis, brucellosis, diphtheria, malaria, hepatitis B and C viruses (HBV/HBC), tuberculosis (TB), and other infections (karpinska et al, 2023).

One possible factor contributing to the risks associated with improperly managed medical waste is the presence of microorganisms resistant to chemical disinfectants and antibiotics. For instance, it has been shown that plasmids from laboratory strains found in medical waste can spread to native bacteria through the waste disposal system. Furthermore, it has been demonstrated that antibiotic-resistant *Escherichia coli* can thrive in an activated sludge plant, however under typical waste water disposal and treatment circumstances, there does not appear to be a substantial transfer of this bacterium (Pandanabhan and Baric, 2018).

Lack of knowledge about the health risks associated with medical waste, inadequate training in appropriate waste management, the absence of systems for managing and disposing of waste, a lack of resources—both human and financial—and the topic's low priority are some of the factors that lead to poor health care waste management practices in low-income countries. Many nations either lack the necessary legislation or do not implement them (WHO, 2018).

There are studies (Chelkeba, 2021; Yehuwalashet, 2017; Dereje, 2020) on WTP for solid waste management services and WTP for medical services.(Kokebie et al., 2022). However, the studies didn't assess the health care waste management services in public health facilities and no study has been done in Addis Ababa that focuses specifically on patients' WTP for improved health care waste management practices in public hospitals. In this study, the current practices in SWMS in the selected health care facilities was given focus and to provide solution for the observed problem in delivering appropriate HCWM, willingness to pay for improved HCWMS of the patients who attend the public facilities was assessed..

Therefore the purpose of this study was to estimate patients WTP for improved health care waste management system in selected public hospitals.

### **1.3 Objectives**

### **1.3.1 General objective**

- The general objective of the study was to estimate willingness to pay of patients for improved health care waste management practice among selected public health facilities (hospital) in Addis Ababa.

### **1.3.2 Specific objectives**

1. To assess the current state of health care waste management practices in the public health care facilities in Addis Ababa.
2. To investigate willingness to pay for improved health care waste management among patients who attend the public health facilities in Addis Ababa.
3. To find out determinants of willingness to pay for health care waste management practices.

## **1.4 Research questions**

1. What is the current state of waste management practices in health care facilities
2. What kind of health care waste management system do the hospitals apply?
3. How do patients perceive the current status of the health care waste management systems of the hospitals?
4. How is the willingness to pay for improved health care waste management of patients?
5. What are the main socio economic and demographic factors that influence WTP of patients?
6. What are the determinants of willingness to pay for health care waste management?
- 7.

## **1.5 Significance of the study**

Health care waste generation increases in amount and composition as the population grows and number of patients who seek medical care increases. To deal with the negative consequences of rising health care waste, such as public health, environmental, and aesthetic issues, proper waste management is required in health facilities. As a result, the goal of this study is to examine patients' demand-side preferences in order to enhance present health care waste management using contingent valuation(CV) method. Hence to analyze the findings, the research applied logit model. Because this is the first study on willingness to pay for health care waste management in

the public health facilities in Ethiopia, the findings of this study can be used to inform appropriate policy formulations to close the gap between demand and supply for better health care waste management services. It also serves as a spring board for additional study on the subject. . The study's conclusions will contribute to bettering medical facilities procedures for disposing of medical waste. In addition the results offer insightful information on future policy decisions regarding. Willingness to pay for better methods of disposing of medical waste.

### 1.6 Scope of the study

The study focused on selected governmental hospitals found in Addis Ababa only. The study utilized contingent valuation model to investigate WTP of patients for an improved health care waste management service. To meet the objectives of the study, a cross sectional descriptive study design was use in mixed approach. Contextually the study focused on willingness to pay for improved health care waste disposal practices of the health facilities. In the study the unit of analysis used were adult patients of age 18 and above, who attend public hospitals in Addis Ababa. Therefore, other health facilities such as private hospitals and clinics and other healthcare delivery practices of the health care facilities were not included in the

### **1-7 Limitations of the study**

The study have encountered the following limitations: unavailability of relevant literatures was one of the major constraints encountered during the course of conducting the study. The other limitation of the study was that the study was focused only on the public health facilities. Whereas, the private health facilities were not included in the study. If the private health facilities were included, the results of the study would have been more significant. The other limitation stems from the fact that the study utilized CVM as mentioned in Haab et al ( 2002) contingent valuation method has its own limitations such as it relies on hypothetical scenarios and questions, which may not reflect the actual behavior of decisions of the respondents in real situations, or may induce strategic or biased responses.

In order to tackle these limitations, the study has implemented different strategies like using as large a number of respondents, applying mixed methodology i.e. both quantitative and

qualitative methods that supplement each other to strengthen the reliability of findings of the study. Finally despite the limitations, the study has tried to investigate the problem thoroughly.

### **1.8 Organization of the paper**

This thesis divided into five chapters. Background of the study, Statement of the problem, Research questions, Research objectives, Scope/Delimitation, Limitations and operational definition are all included in the first chapter. The second chapter looks at relevant literature or previous studies by a variety of authors and academics. The third chapter is the study's methodology, which includes description of the study area, Research design and Approach, Sample and Sampling Technique, Sources and Methods of Data Collection, Methods of Data Analysis, model specification, study variables and Ethical Consideration. The fourth chapter includes result analysis and discussions. The last and the fifth chapter consist of conclusion and recommendations.

### **1-9 operational definitions of key term**

**Waste:** According to Penido et al. (2009), waste is defined as transportable stuff that is incorrectly assumed to be of no further value. Once disposed, it might not cause any annoyance, trouble, or danger. Furthermore, waste can be defined as any object or material that is generated and disposed of or intended to be disposed of by the person in charge of it (Hajkowicz, et al., 2006). garbage can include yard garbage, old paint containers, abandoned cars, sewage sludge, waste from manufacturing processes, packaging materials, and household rubbish. On the other hand, certain definitions of waste are dependent on the context in which they occur.

**Solid waste:** is any non-hazardous industrial, commercial, or residential waste, such as construction waste, hospital and institutional waste, street sweepings, and organic home trash. Liquid waste, on the other hand, includes human and animal excrement and is outside the purview of this study. The Federal Democratic Republic of Ethiopia (FDRE, 2007) defined "solid waste" as everything that is disposed of as undesired and is neither liquid nor gas. The FDRE proclamation, addresses solid waste management. Yard sweeping, meal residues, ash and chat remnants, and saw dusts are examples of waste from residential, business, and educational institutions (Degaga, 2021).

**Health care waste:** can be waste generated from health facilities linked with medical procedures (Esayas et al, 2018) and it is defined as waste generated within health care establishments, laboratories and research centers related to medical procedures. It includes waste produced during health care performed in homes such as dialysis, self-administration of insulin, and recuperative care (WHO, 2014)

**Health care waste management:** refers to all operations related to the creation, classification, movement, handling, and ultimate disposal of trash of any kind produced in healthcare institutions, each of which requires particular care at different stages. Inputs (money, facilities, and equipment), activities, and outputs (safe workplaces, hygienic surroundings, and healthy employees) for the responsible management and disposal of medical waste will all be guaranteed by doing this. Handling hospital waste is a dangerous activity that need for extensive training. Depending on the duties, exposure, and type of each worker, it necessitates specialized training. In most poor nations, improper handling of hazardous medical waste is an issue (Manyele and Lyasenga, 2010). And WHO defines health care waste management (HWM) as a procedure to protect health workers, patients, and public from dealing with health care waste (WHO, 2014) health care waste management is the process of collecting, transporting, treating and disposing of health care waste in a safe and environmentally friendly manner. HCWM is important for protecting public health and the environment. Improper health care waste management can lead to the release of harmful substances into the environment, which can contaminate water sources, soil and air. This can lead to a variety of health problems, including a respiratory infections, gastrointestinal diseases and cancer. HCWM is a particular challenge in developing countries, where resources are often limited and infrastructure is poor.(Bahatia& Sharma,2017)

**Willingness to pay (WTP):** Willingness to pay is a methodological instrument that is used to calculate the estimated cost of programs, certain medical treatments, and other types of care. Acceptance by the public determines its willingness to pay, and the elements that influence it will determine each person's relative degree of contribution. By understanding the contributing variables, they claimed, this would more firmly validate and justify the computation. More specifically, WTP refers to the maximum price a person is ready to pay for products or services (Azhar et al., 2018) assess a social group's ability to afford a thing. As to Aizuddin and Al Junid (2018), the maximum amount of money that a person is willing to spend on an enhancement of an item, like an environmental amenity, instead of sacrificing it. This is the amount of money

that would make a person choose between paying for and receiving the improvement and bypassing the upgrade and saving the money to spend on other things (Freeman et al., 2014).

Wastes and byproducts may be produced by healthcare facilities (HCFs) during the delivery of healthcare. The trash produced by HCFs is currently referred to by a number of names, including clinical waste, medical waste, biomedical waste, healthcare waste, and waste from health facilities. However, healthcare waste (HCW) is most frequently used by the studies published so far in this study, the word HCW will be used to indicate the overall waste created from the HCFs. There are two sorts of waste that are classified as healthcare: hazardous and general. garbage originating from food preparation, housekeeping, and administrative tasks makes up the majority of garbage. On the other hand, hazardous waste is produced all during the healthcare delivery process. It comprises pathological, bodily fluid, laboratory, and sharp wastes. The rules state that the HCFs must carry out six successive steps in healthcare waste management (HCWM). Segregation, collection, storage, transportation, treatment, and ultimate disposal are all steps in this effective management process (Yazie et al, 2019).

The term willingness to accept (WTA) refers to the smallest sum of money that someone is prepared to take in exchange for giving up a unit of goods or services. It is intended to request a person's minimal willingness to accept (WTA) payment in the event that the quality of their resources declines (Yehualashet,

**Valuation:** is the process of putting a monetary value on unmarketed goods and services. If a product or service contributes to human wellbeing, it has economic value. But whether or not a non-marketed good or service satisfies a person's preferences determines whether or not it contributes positively to that person's wellbeing. In the absence of markets or market pricing, alternative techniques for estimating the worth of these resources are needed. Because of this, economists have created a variety of empirical techniques to determine the monetary value of environmental products and services that have hard-to-observe markets. Therefore, in order to measure, we must understand what value is and how much people are willing to pay for goods that don't have a perfect market or even a market at all (Pearce & Ozdemiroglu, 2002).

**Environmental valuation:** Historically, certain environmental goods and services were valued at zero or at a very low level because it was impossible to place an economic value on them or because people believed they were free things. Because of this, it is imperative that

environmental values be taken into account while making economic decisions, since doing otherwise may have unfavorable effects on both the current and future generations. With the goal of "pricing" the variety of environmental goods services provided by the biosphere, a sizable body of environmental economics literature has developed since the late 1960s, embracing a variety of monetary valuation theories and strategies. The valuation of environmental products and services was done using market adjusted, surrogate, and simulated market approaches because many of them are non-market commodities. The primary strategy for creating environmental value is the commercialization of the services provided by the natural environment. According to Paraman et al. (2003), households and enterprises utilize the services, which are regarded as parameters in utility and production functions, respectively.

Types of health care waste include cultures, sharps, liquid waste, human waste, laboratory waste, and soft waste (gauze, bandages and gowns). These include **Infectious waste**: waste contaminated with blood fluids (e.g. from discarded diagnostic samples), cultures and stocks of infectious agents from laboratory work (e.g. waste from autopsies and infected animals from laboratories), or waste from patients with infections (e.g. swabs, bandages and disposable medical services). **Pathological waste**: human tissues, organs or fluids, body parts and contaminated animal carcasses. **Sharps waste**: syringes, needles, disposable scalpels and blades etc. **Chemical waste**: solvents, sterilants and heavy metals contained in medical devices (eg mercury in broken thermometers) and batteries. **Pharmaceutical waste**: expired, unused and contaminated drugs and vaccines.

**Cytotoxic waste**: waste containing substance with genotoxic properties (i.e., highly hazardous substances that are mutagenic, teratogenic or carcinogenic), such as toxic drugs used in cancer treatment and their metabolites. **Radioactive waste**: such as products contaminated by radionuclide including radioactive diagnostic material or radio therapeutic materials and;

**Non-hazardous or general waste**: waste that does not pose any particular biological, chemical, radioactive or physical hazard.

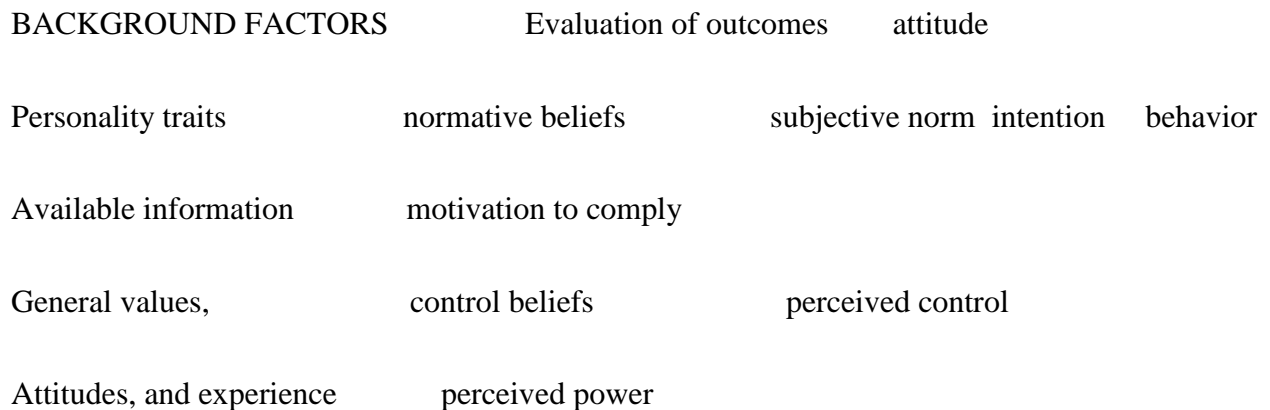
**Major sources of health care waste**: The following are believed to be the major sources of health care waste: hospitals and other health facilities laboratories and research centers animal research and testing laboratories, blood banks and collection services Nursing homes for the elderly (WHO, 2018).

# CHAPTER TWO: REVIEW OF RELATED LITERATURES

## 2.1. Theoretical framework

### 2.1.1 Theory of planned behavior

The theory of planned behavior (also known as the theory of reasoned action) distinguishes between three types of beliefs that affect an individual's intention to perform a specific behavior: 1) behavioral beliefs, which translate into attitudes toward the behavior; 2) normative beliefs, which relate to perceived attitude of peers and respected figures towards the behavior; and 3) control beliefs or perceived ability to perform the behavior. This theory is frequently used for both patient-facing and provider-facing interventions (Etheridge et al, 2023)



The theory of planned behavior (TPB) started as theory of reasoned action in 1980 to predict an individual's intention to engage in behavior at a specific time and place. The theory was intended to explain all behaviors over which people have the ability to exert self control. The key component to this model is behavioral intent; behavioral intentions are influenced by the attitude about the likelihood that the behavior will have the expected outcome and the subjective evaluation of the risks and benefits of that outcome. The TPB has been used successfully to predict and explain a wide range of health behaviors and intentions including smoking, drinking, health services utilization, breastfeeding, and substance use, among others. TPB states that behavioral achievement depends on both motivation (intention), and ability (behavioral control). It distinguishes between three types of beliefs- behavioral, normative, and control. ( )

## **2.1.2 Theory of public goods**

a public good as defined by economic theory, is a good that once produced, can be consumed by an additional consumer at no additional cost. A second characteristic is sometimes added, specifying that consumers cannot be excluded from consuming the public good once it is produced. Goods with these characteristics will be under produced in the private sector, or may not be produced at all, following the conventional wisdom, so economic efficiency requires that the government forces people to contribute to the production of public goods, and then allow all citizens to consume them. simple observation of the real world suggests two problems with the application of public goods theory as justification for government production. First, many public goods are successfully produced in the private sector, so government production is not necessary, second, many of the goods government actually does produce do not correspond to the economists definition of public goods, so the theory does a poor job of explaining the governments actual role in the economy.(Shang & Rachel, 2009)

Public goods theory has been a cornerstone of the economic theory of the public sector since the 1950s. inspired by Paul Samuelson, published in 1954 and 1955, the economics profession has accepted a rigorous definition of the term “public goods” and has used the concept of public good to outline a role for government production in the economy. Public goods theory purports to show why goods with the rigorously defined characteristics of publicness cannot be produced efficiently by the private sector of then economy creating a market failure which implies a role for government in the production of those goods for which the market fails.(Jonathan,2013)

## **2.1.3 The norm activation model**

The norm activation model(NAM) developed by Schwartz (1977), identifies the drivers influencing human intention towards altruistic and pro environmental behavior. Pro environmental behavior is often depicted as a type of pro social behavior in the sense that it leaves positive effects on others and includes behaviors that reduce a persons destructive effects upon natural systems that are shared across multiple human and non human communities. With

in the NAM model, behaviors/intentions are functions of personal norms(PN) which in turn, are regulated by awareness of consequences (AC) and ascription of responsibility(Savari et al, 2023)

Initially, the norm activation model (NAM) has typically been applied to explain various types of prosocial intentions and behaviors such as blood or bone marrow donation, volunteering and helping in emergency situations. These studies did not test the full NAM in most cases, only a limited set of NAM variables were included. Later, the NAM has been applied to study why people engage in pro-environmental actions. Pro-environmental behavior is considered to be pro social behavior, because pro-environmental behavior also entails that people benefit others, where as often, no direct individual benefits are received by engaging in these behaviors. The studies typically did not include all the variables included in the original NAM either. In particular, ability was typically did not included in the studies. And mostly either AR or OE was included. The NAM appeared to be successful in explaining various types of pro environmental intentions and behaviors, among which energy conservation, willingness to pay for environmental protection, willingness to reduce car use ,using the car for short distance and closing the faucet while brushing teeth , recycling, political behavior, environmental citizenship, policy acceptability and general pro environmental behavior were included(Steg & Groot,2010)

### **2.2.2. Factors affecting health care waste management**

The issue of waste management is multifaceted and affects many facets of the economy and society. It is closely related to many other global issues, including sustainable production and consumption, health, and climate change. The socioeconomic and technical levels of a society influence the sources of solid waste. In every instance, the following sources are universally accepted: Domestic solid wastes, Commercial wastes, Institutional wastes, Industrial wastes, Street sweepings, and Construction and demolition wastes. Even while poor nations produce less solid waste than industrialized nations do, the methods used for collecting, storing, transporting, processing, and disposing of it are incredibly inefficient and harm the environment as a result. The main causes of these issues are the low levels of financial and human participation in society. Developing nations face significant challenges in implementing appropriate solid waste management practices. . Environmental sensitivity is the ability to observe environments with compassion according to the individual's affective characteristics (Chang & Wu, 2015)

### 2.2.3. Health care waste management: reasons for failure

The most frequent issues relating to health care waste, according to WHO (2018), are lack of knowledge about the health risks associated with it, inadequate training in appropriate waste management, the absence of a system for managing and disposing of waste, a lack of financial and human resources, and the topic's low priority. Many nations either lack the necessary regulations or do not uphold them.

### 2.2.4. Willingness to pay

The highest amount a consumer is willing to pay for a good or service is known as willingness to pay, or WTP for short. Usually, it is expressed as a monetary amount, although occasionally, a price range is used instead. In most situations, potential buyers won't accept a higher price, even though they are probably willing to spend less than this barrier. The idea of willingness to pay tells us that no matter how much someone is prepared to pay for a product, no matter where it comes from, they just won't pay more than that for it. Customers' willingness to pay can differ greatly from one another. This variance is often caused by differences in the customer population, typically classified as either extrinsic or intrinsic. **Extrinsic differences** are observable. They are factors you can generally determine about a person without needing to ask them directly. A customer's age, gender, income education and where they live can all be extrinsic differences that impact their willingness to pay. **Intrinsic differences** on the other hand are a person's characteristics you wouldn't know about without asking them directly. They are hard to observe and often called "unobserved differences". Intrinsic differences such as an individual's level of passion for a particular subject, desire to fit in with others, and risk tolerance can all influence their readiness to pay (Stobierski, 2020).

#### 2.2.4.1. Determinants of willingness to pay

Comprehensive knowledge about factors determining WTP is crucial when planning the study design , data collection and analysis of a contingent valuation study, either as mere statistical predictors or as causal factors of WTP,mediators, effect modifiers, or potential confounders in a specific research questions on the determinants of WTP.(Caroline et al, 2022)

The use of the commodity or service in issue and income are the two main factors that determine WTP in a basic economic model. People's decisions and answers to valuation questions regarding the cost of better environmental quality are influenced by their disposable income. Therefore, the amount of money respondents are willing to spend on obtaining environmental products, improving the quality of the environment, or preventing environmental deterioration

should be correlated with their income. As a result, income is frequently asked about in studies of expressed preferences and is thought to positively impact WTP. Another factor that is strongly tied to the economic concept of value is whether or not people really use the public goods in question. It is expected that a landscape will have instrumental value if someone visits it, for example. People utilize the good because it improves their quality of life. In this instance, the individual's well-being and the good are directly correlated through activity. The idea of "use values" conveys this connection. The only connection between an individual's well-being and the benefit in question if they choose not to use it is their "knowledge" of it. The "nonuse values" (such as existence value) are used to express this relationship. It is presumed that consumers are prepared to pay because this latter link is stated to be weaker than a link based on direct use. (Bahatia & Sharma, 2017 )

In general factors that affect WTP can be categorized into extrinsic and intrinsic factors. The **extrinsic** factors are observable. They are factors you can generally determine about a person without needing to ask them directly. A customer's age, gender, income, education and where they live can all be extrinsic factors that impact their willingness to pay. **Intrinsic** factors, on the other hand, are a person's characteristics you wouldn't know about without asking them directly. They are hard to observe and often called "unobservable factors" an individual's risk tolerance, desire to fit in with others, and level of passion about a given subject are all examples of intrinsic factors that can impact their willingness to pay. In addition to extrinsic and intrinsic factors, numerous differences can cause individual WTP, these include, geography, service level, expectation, computing products, and environmental or social impact (Stobierski, 2020)

## 2.2.5. Econometric models

### 2.2.5.1. Contingent valuation method

A approach for determining the economic values of different kinds of ecosystem and environmental services is called the contingent valuation method (CVM). Although it may also be used to estimate use values, this is one of the most widely used techniques for evaluating non-use values. People's willingness to pay for a particular environmental service is taken into account in CVM (Haab, 2013). Furthermore, in many situations, people's desire to receive payment for quitting an environmental duty is also taken into account. Because they are not

sellable, the utilities provided to the public by nonmarket resources occasionally may not have market values, even if they are usually sufficient to be assessed using price-based models.

CVM is capable of handling these problems. The procedure starts with defining the problem under consideration for review. This is followed by an initial survey that involves speaking with respondents. The real survey is then completed, which is a lengthy and sometimes complicated procedure. Ultimately, it is put into practice, and then the outcomes are analyzed (Himanshu&Varun, 2021). In order to evaluate nonmarket commodities in the domains of culture, health care, transportation safety, economics, and the environment, the contingent valuation technique (CVM) has been applied extensively. It takes the form of a questionnaire survey that is run in a hypothetical market where respondents are asked directly how much they would be willing to pay (WTP) to protect or use a particular environmental good or service, or how much they would be willing to accept (WTA) in the event that an ecological environment is damaged or destroyed. Next, the economic value of environmental products and services is estimated by the WTP or WTA. No application studies on the classification, collection, and management of rural residential trash have been found, despite studies on the use of CVM to examine the categorization and disposal of domestic garbage.

The three steps of CVM are usually design of the questionnaire, dissemination, and data analysis. The design and dissemination of questionnaires are critical to the effectiveness of CVM, as the initial bidding value and sample size have an impact on the evaluation outcomes. The most popular forms of questionnaires are dichotomous choice and payment card (PC) formats. A PC can reduce the variation in WTP brought on by regional disparities in economic level, save time, and prevent respondent annoyance due to complex difficulties (Tao &Nyankson, 2023).

The expressed preference approach that was used the most frequently was the contingent valuation method (CVM). When the good or service is similar to one that is marketed, CVM functions well. Participants' values are dependent upon the conditions of the setting generated by the researcher and elicited from individual respondents using carefully designed and performed sample surveys (Mitchell and Carson, 1989; Arrow et al., 1993; Hanemann, 1994; Venkatachalam, 2004).

The researcher then constructs a variety of hypothetical scenarios and asks survey participants to indicate which ones they prefer. This mimics a scenario where the respondent's actions are watched in a market. The poll then asks respondents to indicate their maximum and lowest willingness to pay (WTP) and accept (WTA) for the specified change in the quantity or quality of the environmental item, service, or resource. To determine the environmental value, the sample mean bids are projected to the entire population (Mitchell and Carson, 1989).

The capacity to take into account a resource's nonuse values and account for environmental changes that have not yet happened is what makes CVM and other stated preference approaches so popular (ex-ante valuation). The knowledge produced as part of the process can be used to analyze hypothetical policy scenarios or environmental problems outside of the present or historical institutional arrangements or levels of provision, and can also enrich public conversation.

Despite its frequent use, there are a number of objections leveled at CVM (Kahneman and Knetsch, 1992; Birol et al., 2006). The validity and reliability of the numbers produced, particularly for the nonuse values when the method does not require actual payments, are among them. Other concerns include the possibility of introducing errors (i.e., incentives to misrepresent values, implied value cues, and scenario misrepresentation); being susceptible to a variety of biases, including information bias, interviewing bias, starting-point bias, non-response bias, strategic bias (free riding), yea-saying, scope and embedding effects, payment vehicle bias, and

The property rights to the good determine whether WTP or WTA compensation is the appropriate metric to use (Carson, 2000). Although conceptually the difference between the two measures should be modest, empirical studies reveal all other factors accounted for WTA estimates are frequently greater than WTP (Kahneman et al., 1990; Hanemann, 1991). This can be explained by the fact that humans, like many other behavioral economists, are loss averse and see the potential loss of an item or service they already own as more detrimental than an equal potential gain of the same commodities and services (Kahneman and Tversky, 1979).

Other stated preference techniques include the choice experiment methods (CEMs), conjoint analysis, and choice analysis. Conjoint analysis involves respondents rating or ranking each of

the treatment combinations consisting of different levels of different attributes and predetermined price levels.

(Hanley et al., 2001), while choice analysis involves respondents making precise choices between alternatives with various degrees of the same traits or with distinct attributes (Hensher et al., 2005).

The main distinction between CEM and CVM is that the former asks respondents to make trade-offs between options, whereas the latter bases respondents' WTP on a suggested change to the environment. According to Birol et al. (2006), a choice experiment makes use of carefully crafted tasks or alternatives to highlight variables that affect decision-making. Based on the characteristics of an environmental resource, one or more profiles are generated for it. The quality of bathing water, for instance, might be used to characterize coastal waterways. This property could have monetary values applied to it and be divided into high, medium, and low levels. The respondent is then offered with choices or a myriad of scenarios to establish tradeoffs and WTP (Birol et al., 2006). Factors that favor choice experiment as a method for valuation include marginal values of goods and services are easier to measure, respondents are more familiar with choices than the CVM payment approach, it is more informative as it offers individuals multiple choices, and it reduces response problems and some biases associated with CVM such as strategic bias, yea-saying, and embedded effects (Louviere et al., 2000; Bateman et al., 2003). CEM has advantages similar to CVM as it can be used for any environmental resource and to estimate nonuse values with the additional benefit of being able to estimate specific qualities of a resource rather than just the resource as a whole (Belt & Farley, 2011).

## . 2.3. Empirical literature review

### 2.3.1. Health care waste management practices and awareness and knowledge about HCWM

Several studies have been conducted in different areas of the world to assess HCWM practices. In Greece, the huge healthcare unit of Rio University Hospital in Western Greece was the subject of an investigation by Zamparas et al. (2019) regarding the available techniques, procedures, and ways of handling infectious waste. To increase sensitivity and promote green shopping, the authors recommended that staff awareness be raised even further. Al- Khatib et al. (2020)

investigated medical waste management at three hospitals located in the Jenin area of Palestine. The findings revealed that healthcare waste was disposed of in landfills and that none of the institutions had implemented healthcare waste segregation. The authors recommended that legislation pertaining to healthcare waste be put into place and enforced.

Healthcare waste management in a few public and private hospitals in the South-East of Nigeria was studied by Oli et al. (2016). The study had 660 respondents in all, and the findings indicated that most hospital staff members were aware of the healthcare waste disposal program. The findings, however, did not demonstrate a connection between public and private hospitals' needle and syringe disposal policies. The waste segregation at both institutions, according to the authors, was inadequate and low. Kudoma (2013) studied healthcare waste management in Gaborone City Council healthcare establishments in Botswana, and 105 respondents were randomly selected among healthcare workers and ancillary staff. The study revealed a lack of clinical waste documentation and monitoring by the clinics and health facilities. Incineration to treat the healthcare waste was correctly done. The author suggested that improvements in healthcare waste management practices were needed.

Khanehzaei and Ishak (2014) conducted a research of healthcare waste management in Asian nations, focusing on the waste composition and management methods of clinics in Selangor, Malaysia. The findings showed that the current state of the waste planning system and management was poorly defined, and trash produced by private clinics was not sufficiently documented. Healthcare waste management at private clinics in Surabaya, Indonesia was investigated by Wilujeng et al. (2019). The amount of trash produced in 17 representative clinics demonstrated the need for better government support and oversight of clinics. Sharma and Gupta (2017) investigated healthcare waste management in the Indian state of Himachal Pradesh. The findings demonstrated that when compared to public hospitals, private hospitals produced greater healthcare waste. Public hospitals produced more trash, though, especially in the case of specific healthcare waste categories like the blue category. A human resources perspective on healthcare waste management was used to assess some managerial and policy consequences. The amount of beds, staff, and doctors were taken into account by the writers as independent factors. Manowan (2009) conducted research in Thailand on hospital awareness levels and healthcare waste management in the Bangkok metropolitan area. The findings demonstrated that while the majority had put in place a strategy for managing healthcare waste, the majority of programs fell

short. The key variables influencing the healthcare waste management ratings were the kinds of hospitals and personnel knowledge levels.

Lagis and Matthew (2023) conducting a research in Putrajaya district of Malaysia to determine residents WTP for HCWM have revealed that patients who had a history of treatments in hospitals had more knowledge about HCWM( Lagis& Matthew,2023).

### **2.3.3. Willingness to pay for waste management**

The establishment of relevant policy with the association of population's knowledge, perception, and willingness to pay (WTP) are necessary to improve HCWMS. On the other hand, residents preferred payment mechanism which remains unknown needs to be surveyed so that new policies can be smoothly put into practice (Song et al, 2016). Willingness to pay is based on population acceptance, and the influencing factors will give a calculation of an individual's contribution level (Azhar et al, 2018).

Many researchers have begun to focus on WTP due to environmental concerns and for healthcare services improvements. A number of studies have been conducted to assess the WTP for improved HCWM in developing countries. These studies have found that there is a generally high level of WTP for improved HCWM. For example, a study in Vietnam revealed that 88% of households were willing to pay for improved HCWM, with a mean WTP of 10,000 Vietnamese dong per month per household (Nguyen et al, 2015). Similarly a study in India found that 92% of households were willing to pay for improved HCWM, with a mean WTP of 20 Indian Rupees per month per household (Des et al, 2017).

The WTP for updated government outpatient registration fees for healthcare services among Malaysians was investigated by Aizuddin and Al Junid (2018). According to their analysis of 774 families across four states, 63.6% of the respondents were willing to pay more than the current RM1.00 price. It was discovered that the primary factor influencing the variation in WTP for user fees was income level. Owusu-Amankwah (2018) investigated the WTP for particular healthcare facility amenities such services, physician consultation, and operation hours in the US. Whether or not they had health insurance, respondents to a total of 786 surveys conducted across 10 counties were willing to pay an average of US\$69.90 year for the facility services that served patients. Respondents without insurance were prepared to spend \$81.15 USD for the same service. Surveys conducted across ten counties found that, regardless of health insurance status,

respondents were generally willing to pay US\$69.90 annually for the facility services that treated patients. Respondents without insurance were prepared to spend \$81.15 USD for the same service.

Numerous investigations have been carried out to examine the demand side, or the willingness of households to pay for better SWM systems. Using binary probit regression, Roy et al. (2013) investigated the WTP for sustainable solid waste management in India. The study found that the WTP for solid waste management plan was positively correlated with monthly average household expenditure, household size, average education, environmental consciousness, and the number of working women in the family. The WTP has little bearing on informal garbage disposal arrangements. The study's final finding was that there is a chance of success if a solid waste management plan is implemented.

Anjum (2013) found that age, household income, education, and environmental awareness have a substantial impact on a person's willingness to pay for solid waste management in Pakistan. This was determined using logistic regression and multiple regression analysis. Similar to this, Khattak and Amin (2013) sought to identify Pakistan's public WTP for the treatment of solid waste that poses a risk to the environment. The study used a binomial logit model to find that family disease history, income, size of the household, and education are the main factors influencing a household's decision about WTP. According to Mustafa et al. (2014), WTP was found to be influenced by household size, geography, awareness, income, and education.

Alhassan and Mohammed (2013) used the contingent valuation approach to examine household demand for improved solid waste disposal services in Ghana. According to the study, the most significant and influencing factors that affect WTP are the environmental safety concern of the respondent, level of satisfaction of current waste disposal services, education, household size, length of stay in the current residence, walking time to public dumpster, and sex of respondent. In a similar vein, Addai and Danso-Abbeam (2014) found a substantial correlation between the willingness to pay for improved solid waste management and the age, gender, size, and degree of education of the household head. According to Amfo-Otu et al. (2012), the respondents' willingness to pay for waste collection in Ghana's semi-rural towns is not significantly influenced by their sex, level of education, income, expenditure level, frequency of payment, frequency of collection, or satisfaction with the current waste management system. However,

variables including mode of collection, occupation and age are proven to have a substantial effect on willingness to pay. In Ethiopia, Muhidin et al (2016) conducting a research entitled “determinants of households willingness to pay for improved solid waste management in Ethiopia: the case study of Jimma town” found out that males are more willing to pay for solid waste management than females, married individuals were more willing to pay than unmarried and divorced, separated and widowed, and more educated people were more willing to pay than those in lower educational level.

Ojo et al. (2015) used a multiple regression model to examine an enhanced household solid waste management system in Nigeria. The results of the study showed that household spending, environmental awareness, age, and income all had a positive and statistically significant link with how willing households were to pay for local waste disposal. Nonetheless, there is a statistically significant negative correlation between household size and willingness to pay. According to Mary and Adelayo (2014), households in the same nation that are prepared to pay for solid waste management. Other characteristics (education, marital status, household size, household expenditure and weight of solid waste) are not substantially connected with the willingness to pay for improved solid waste management. Ultimately, the study came to the conclusion that charging for solid waste collection services would not be very successful. In Ethiopia, factors such as the cost of the service, the respondents' age, education level, and household size all influence their willingness to pay. Adebo and Ajewole (2012) found that willingness-to-pay for garbage disposal is significantly affected by gender, nature of primary occupation, marital status, level of education and average monthly income. Ojok et al. (2015) used a logit linear regression model to evaluate households' willingness to pay (WTP) for better municipal solid waste management in Uganda. The study found that the following factors influence WTP: gender, age, size of the household, income, education, marital status, and immigration status of the household respondents. However, researches in this area have shown a negative correlation between the age of the family head and Niringiye and Omortor (2010). Dagneu et al. (2013) state that among other things, citizens' WTP for better solid waste management is highly correlated with their income and level of environmental quality awareness. As per Tewodros and Samson (2009), WTP is highly affected by household income and present availability to waste disposal containers. However, the demand for better waste collection services is not significantly impacted by demographic characteristics like gender, age,

household size, or education. Similarly, Birtukan (2013) demonstrates that factors such as income, household work, length of stay (years), family size, number of children, and education level all impact a household's WTP. The likelihood of accepting the WTP is inversely correlated with the size of the family. WTP is positively impacted by the remaining variables (Muhdin et al., 2016). Numerous research were conducted to determine the key factors influencing willingness to pay for improved solid waste management, as well as to incorporate the participation of society in terms of personnel and cost recovery. Averages of 63% of households indicate that they are willing to pay more for better garbage management. This result supports the environmental economic theory, which holds that as income rises, so does the desire for better environmental quality. The study's findings suggest that persons who are more knowledgeable about ISWM, have larger families, make more money, and are better educated are more likely to be willing to pay for better services. In his study, he used the contingent valuation method to ascertain households' willingness to pay for better solid waste management in Mekelle, Ethiopia. The outcome showed that the present city sanitation fee is significantly less than the residents' WTP. Municipal officials utilize the mean WTP estimate as a guide when determining a more suitable fee to fund improvements in city SWM.

Furthermore, in an effort to enhance waste management, a few other researchers attempted to estimate household WTP. Generally speaking, every empirical study that has been analyzed has demonstrated that socioeconomic, demographic, and solid waste-related factors that are specific to a given place may have an impact on consumers' willingness to pay for upgraded technologies. However, a single variable may have a positive and considerable impact on willingness to pay in one situation and place, while it may have the opposite effect or be negligible in another. Furthermore, the average willingness to pay varies by time period and location (Getachew&Fufa, 2018).

## **2.4. Conceptual framework**

A number of critical criteria will influence patients willingness to pay for which is represented as a categorical dummy variable with only two values. So, the study's conceptual framework centered on how to elicit patients WTP in order to improve health care waste management in the study areas. What are the primary socioeconomic elements that influence a patient's willingness to pay for improved health care waste management services. The student researcher established

the following conceptual framework for the purpose of analysis based on the associated literatures.

**Monthly income of the patients (MI):** this variable refers to the total monthly income (total monthly expenditure used as proxy) of the patients in Ethiopian birr (ETB). Many studies revealed that income is positively and significantly associated to people WTP for improved SWM ( Endalew&Tassie, 2018; Selamawit, 2019; Tamiru,2019)

**Awareness (AWPT):** Awareness of patients about health impact of poorly managed health care waste on the environment has significant effect on the respondents WTP for improved HCWM services. Theoretically, people with higher awareness about the impact of improper solid waste disposal on the environment tend to provide positive and have higher WTP values. As in studies in the literature people's awareness about the impacts of poorly managed solid waste is expected to affect positively their WTP for improved SWM (Tamiru, 2019). Environmental sensitivity is the ability to observe environments with compassion according to the individual's affective characteristics (Chang & Wu, 2015)

**Sex of the respondent (SR):** this variable refers to the sex or gender of the respondent. It assumes in many societies that, women have more preference for improved waste management and are responsible for the management of household sanitation, child care and food preparation. Hence, the study expects positive relationship between female patients and WTP for improved HCWM services and thus, female patients will be more willing to pay for improved HCWM as findings of other studies indicate (Endalew&Tassie, 2018)

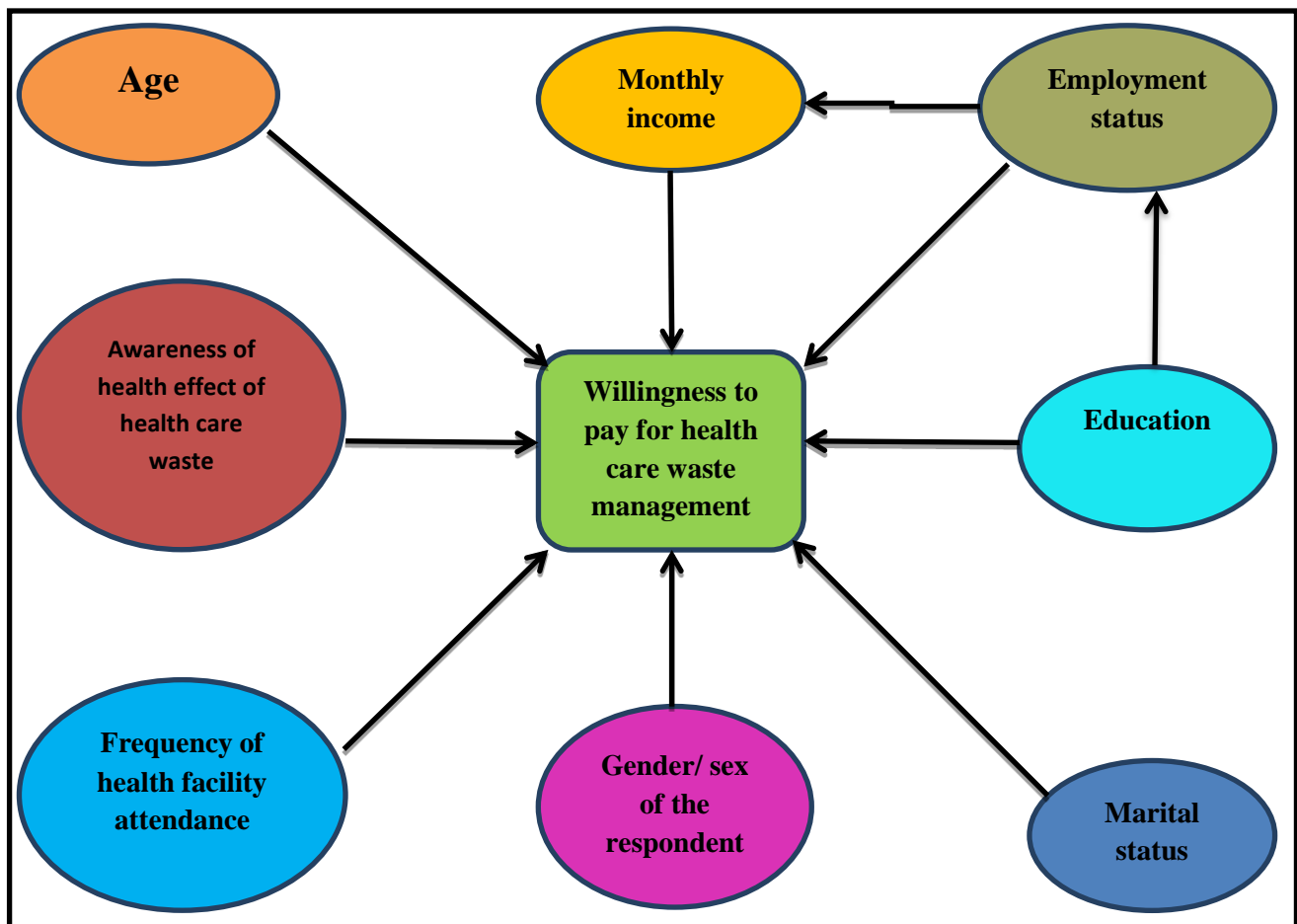
**Age of respondents (AR):** This variable refers to the age of the respondents in number of years. Studies conducted on WTP for improved waste management revealed that age of respondents affects WTP significantly. Therefore this study expects the age of respondents affect positively the patients WTP for improved HCWM as other studies in the literature found out (Alshan et al, 2017; Selamawit et al, 2019)

**Time spent in the health facilities(TS):** this variable refers to the number of years the patients attending the health facilities(how often the patients attend the health facilities) patients who visit the health facilities more frequently will be more willing to pay for improved HCWM services.(Tamiru, 2019)

**Education of the respondents(ER):** this variable refers to the level of education the patient attained on formal; education. Educated people better understand the impact of improper health care waste management on the environment and are more willing to pay for improved health care waste management service. Hence, the level of education of the respondents is expected to affect positively patients WTP for HCWM (Alhassan et al, 2017)

**Marital status (MS):** this variable refers to the marital status of the patient categorized as married and not married. Marred people are more willing to pay for improved SWM compared to those people who are unmarried, divorced or widowed (Alhassan et al, 2017).

**Employment status (ES):** employment status refers to formal employment of the respondents in governmental as well as private institutions of the respondents. As indicated in other studies (selamawit et al, 2019), employment status of people is significantly associated with WTP for improved solid waste management..



Conceptual framework prepared by the researcher (2024)

## **2.5 Research hypothesis**

**Hypothesis 1** monthly income of patients has a positive significant relationship with WTP for improved health care waste management service. As monthly income increases, willingness to pay will increase.

**Hypothesis 2** awareness about effect of health care waste management service has positive effect on patients willingness to pay for improved health care managements. As awareness about the effect of health care waste management and health effect of health care waste increase, willingness to pay would increase.

**Hypothesis 3** sex/ gender of the patients is significantly related with their willingness to pay for improved health care waste management service

**Hypothesis 4** age of the respondents has significant relation with their willingness to pay for improved health care waste management service. As age increases, willingness to pay would also increases.

**Hypothesis 5** frequency of health facility has significant relationship with willingness top pay for health care waste management. The more the patients visit the health facilities, the more would be their willingness to pay for the improved health care waste management service.

**Hypothesis 6** education has significant relation with willingness to pass to pay.

**Hypothesis 7** marital status has significant relation with willingness to pay. Married patients have more willingness to pay than non married patients.

**Hypothesis 8** employment is significantly associated with willingness to pay. Employed respondents have higher willingness to pay than those who are unemployed.

## CHAPTER THREE: METHODOLOGY

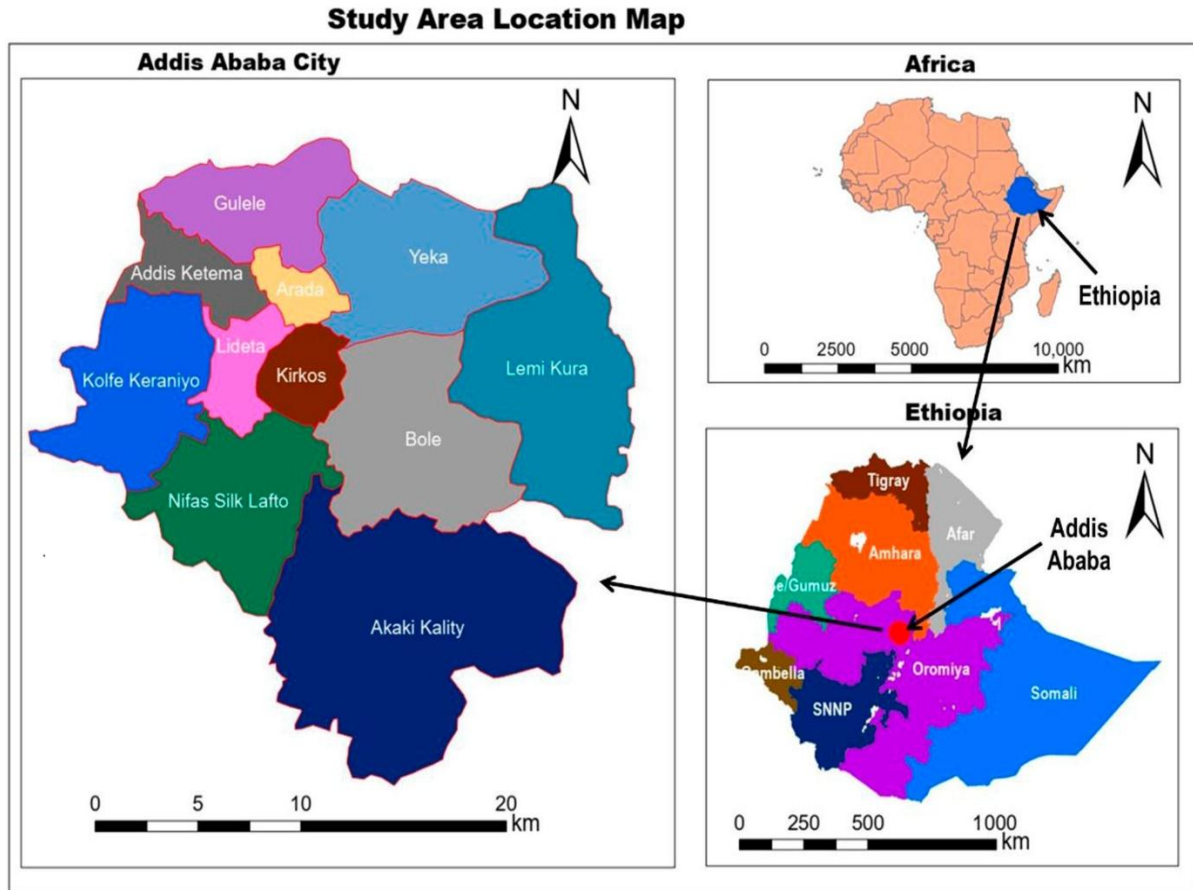
### 3.1. Description of the study area

Addis Ababa is the capital and largest city of Ethiopia. In the 2007 census, the city's population was estimated to be 2,739,551 inhabitants. Addis Ababa is a highly developed and important cultural, artistic, financial and administrative center of Ethiopia. The founding history of Addis Ababa dates back in late 19th-century by Menelik II, Negus of Shewa, in 1886 after finding Mount Entoto unpleasant two years prior. At the time, the city was a resort town; its large mineral spring abundance attracted nobilities of the empire and led them to establish permanent settlement. It also attracted many members of the working classes — including artisans and merchants — and foreign visitors. Menelik II then formed his imperial palace in 1887. Addis Ababa became the empire's capital in 1889, and subsequently international embassies were opened. Addis Ababa urban development began at the beginning of the 20th century, and without any preplanning.(Derese and Negassa, 2018)

Addis Ababa saw a wide-scale economic boom in 1926 and 1927, and an increase in the number of buildings owned by the middle class, including stone houses filled with imported European furniture. The middle class also imported newly manufactured automobiles and expanded banking institutions. During the Italian occupation, urbanization and modernization steadily increased through a master plan; it was hoped Addis Ababa would be a more "colonial" city and continued on after the occupation. Subsequent master plans were designed by French and British consultants from the 1940s onwards, focusing on monuments, civic structures, satellite cities and the inner-city. Similarly, the later Italo-Ethiopian master plan (also projected in 1986) concerned only urban structure and accommodation services, but was later adapted by the 2003 master plan. (Esayas et al, 2018)

Addis Ababa is a federally-chartered city in accordance with the Addis Ababa City Government Charter Proclamation No. 87/1997 in the Constitution Called "the political capital of Africa" due to its historical, diplomatic, and political significance for the continent, Addis Ababa serves as the headquarters of major international organizations, such as the African Union and the United Nations Economic commission for Africa()The city lies a few kilometers west of the East African Rift, which splits Ethiopia into two, between the Nubian Plate and the Somali Plate.<sup>[18]</sup>

The city is surrounded by the Special Zone of Oromia, and is populated by people from different regions of Ethiopia. As of 2014, the capital of Ethiopia, Addis Ababa, had more than 52 hospitals, 12 of them state run, and more than 40 private.



**Figure 1: Location Map of Addis Ababa**

Source: Lamesginet’al., (2023)

### 3.2 Study design

A cross-sectional, explanatory sequential study design was carried out in both quantitative and qualitative approaches (mixed approach). The explanatory sequential approach is a sequential approach and used when the researcher is interested in following up the quantitative results with qualitative data. Thus the qualitative data is used in the subsequent interpretation and clarification of the results from the quantitative data analysis.(Edmonds & Kennedy, 2014). Mixed method is a study approach which utilizes both quantitative and qualitative data collection

methodologies. This kind of method is used when both quantitative and qualitative data together provide a better understanding of the research problem than using either of the approaches (Abreham, 2023).

### **3.3. Sources of data**

Both primary and secondary sources of data were used in this study:

#### **3.3.1. Sources of primary data**

Primary data is the type of data that is generated by the researcher himself/ herself, surveys, interviews experiments especially designed for understanding and solving the research problem at hand. In this study, primary data was collected from respondents using structured questionnaires that were prepared for quantitative data collection and qualitative data was collected through open ended interview questions.

#### **3.3.2. Sources of secondary data**

Secondary data means data collected by someone else. surveys, observations, experiments, questionnaires, personal interviews etc government publications, websites, books journal articles, internal records etc. Hence in this study, secondary data was collected from different documented and published materials, office pamphlets, office charts, etc.

### **3.2. Instruments of data collection**

Interviewer administered structured interview questionnaire was used to collect quantitative data. And an open ended interview was used to collect qualitative information from purposively selected respondents.

### **3.3. Data collection procedures**

An official permission letter and ethical clearance was acquired from Addis Ababa University before the data collection began. The letter was submitted to the selected health facilities and after getting acceptance from the health facilities, 4 data collectors were recruited to perform face to face interview using structured interview tool. The interview questionnaires were translated into Amharic before the actual data collection began. Data was collected from January 2 to February 30. The qualitative data was acquired through open ended interview from purposively selected respondents. These people include administrative personals, cleaners and environmental health professionals (sanitarians).

## **3.4. Population and sampling**

### **3.4.1. Target population**

Target population is the group of individuals that the intervention intends to conduct the research in and draw conclusion from (LuiseBarsbee, 2018). Therefore, the target population of this study was all patients who visit public hospitals in Addis Ababa (infinite population)

### **3.4.2. Sampling**

Sampling technique is the process of studying the population by gathering information and analyzing that data. It is the basis of the data where the sample space is enormous.(Shona, 2023). in this research, the health facilities in which the study is conducted were selected using purposive sampling method. For the study, two public hospitals were selected .Purposive accidental sampling technique was used to select respondents for the questionnaire. In accidental sampling the researcher simply reaches out and picks up the cases that fall to hand, continuing the process till such time as the sample acquires a desired size. For this study a sample size of 300 respondents was selected. The researcher picks anyone who is willing to be interviewed or to provide the kind of information he is seeking. The respondents for the qualitative data were selected through purposive sampling method. Purposive sampling method is a technique used in qualitative research to select a specific group of individuals or units for analysis. Participants are chosen on purpose, not randomly. The samples are selected based on certain characteristics or attributes that the researcher is interested in studying (Heath, 2023).

#### **3.4.2.1. Sample size determination**

The sample size was determined as follows: the optimum size of sample was determined from previous studies and using purposive accidental sampling method, every other patient was interviewed at the gate of the outpatient department (OPD) after she/he come out of the exam room ( Doctors room). This continued until the optimum number of sample size reached. In this study the optimum sample size was 300 respondents. For the study, two public hospitals were selected using purposive sampling technique.

#### **3.4.2.2. Design of Survey Questionnaire**

The survey included four sections and be designed in accordance with the NOAA Panel's recommendations (Arrow et al., 1993; Mitchell & Carson, 1989). The first component of the survey included questions about respondents' demographic and socioeconomic statuses. In the

second section, patient's awareness of the state of health care waste management in the health facilities was included. Respondents' willingness to pay was questioned in Section 3 of the survey, and the determinant factors to WTP were questioned in Section 3. The enhanced HCWM scenarios included information on the services that would be offered, their dependability, the waste management issues that the medical facilities are currently facing, the fictitious better state, and the payment method that each patient would use to cover the cost of the improvement.

The information covered the respondents' socioeconomic and demographic traits, such as age and gender, marital status, family size, income, and educational attainment; environmental characteristics, such as degree of environmental awareness; and design variables, such as initial fee size and maximum WTP for better HCWM and environmental improvement.

A single-bounded dichotomous option structure was used for the contingent valuation, and the WTP portion thereafter had open-ended questions. Four data collectors with college degrees or above—two from each health facility— received training to make sure they comprehend every question and know how to approach and interview respondents in the most effective way to obtain accurate information. Twenty patients participated in a trial survey to ascertain the initial charge value and resolve any issues. With regard to the amount of ETB for the initial bid, estimation was done based on the cost of affordable improved technology available and taking into consideration other costs such as maintenance services and salaries for operating personnel.

### **3.5. Methods of data analysis**

in order to assess the measure of dispersion and central tendency of the obtained data, descriptive analysis was utilized in the study. Using logit regression models, the drivers of a patient's willingness to pay for enhanced health care waste management were investigated. Furthermore, the study employed (Lopez-Feldman, 2012)'s 'doubleb' command to estimate the average WTP from the double-bounded format. SPSS version 26 was used for all of the analyses. The study employed simple descriptive statistics such as percentages, ratios, means, etc. to explain health care waste management practice in the health facilities and inferential statistics such as t-test and chi-square test to test statistical significance of continuous and dummy variables, respectively among the willing and non-willing households using SPSS.

### 3.6. Model specification

#### 3.6.2. Contingent valuation method (CVM)

The contingent valuation method (CVM) was applied in this study. It is the most commonly used method of valuing environmental qualities. In CVM, individuals are simply asked to state their WTP for the non-marketed resource through WTP surveys. Hence to characterize patient's willingness to pay for improved health care management in the study area, the probability model in which the chances of WTP are linked to individual demographic and socio economic characteristics will be used. In the study, logit equation was applied to determine dummy dependent variable in this case WTP. amiliar with choices than the CVM payment approach, it is more informative as it offers individuals multiple choices, and it reduces response problems and some biases associated with CVM such as strategic bias, yea-saying, and embedded effects (Louviere et al., 2000; Bateman et al., 2003). CEM has advantages similar to CVM as it can be used for any environmental resource and to estimate nonuse values with the additional benefit of being able to estimate specific qualities of a resource rather than just the resource as a whole(Belt & Farley, 2011).

#### 2.2.5.2. Logit Model

In the logit regression model, none of the presumptions made during the linear regression analysis—such as the dependent variable's linear distribution, the independent variables' withdrawal from a normal distribution, the error term's normal distribution, the absence of a relationship between the values of the error term, etc.—are tested in the logit regression model. As a result, it offers researchers a great deal of flexibility and is increasingly favored. A general linear regression model can be written as expressed in Equation 1, where  $y_i$  is a dependent variable and  $x_i$  is an independent variable.

$$y_i = \alpha + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_k x_{ik} + \epsilon_i \quad (1)$$

Thus, when the dependent variable  $y_i$  takes “0” and “1”, binary logit takes the name of the model. When the dependent variable is “1”, the probability is expressed by Equation 3:

$$P_i = (y=1|x_i) = \frac{e^{-(\alpha + \beta x_i)}}{1 + e^{-(\alpha + \beta x_i)}} = \frac{1}{1 + e^{-Z_i}} \quad (3)$$

In this model,  $P_i$  provides information about the argument  $x_i$  while the first individual expresses the probability of making a particular choice. Thus  $P_i$  also takes values between “0” and “1”. The equations given in Equation 4 and Equation 5 can be written here:

$$P_i=1 \text{ by } (P_i1-P_i)=\ln(11-1)=\ln(10)=+\infty \text{ (4)}$$

$$P_i=0 \text{ by } (P_i1-P_i)=\ln(01-0)=\ln(01)=-\infty \text{ (5)}$$

To determine the logit function,  $\alpha$  and  $\beta$  parameters cannot be directly predicted by OLS and Equation 6 is used to estimate the model:

$$1-P_i=1-11+e^{-(\alpha+\beta x_i)}=1-11+e^{-Z_i} \text{ (6)}$$

If equations (3) and (6) are proportional,

$$P_i1-P_i=e^{Z_i} \text{ (7)}$$

Equation 7 is obtained. It is also the odds or odds ratio (Odds Ratio, OR). Variables close to 1 among these OR values are not the factors that have a significant effect on the change of  $y$ . For OR values greater than 1, it is interpreted that the factor is an important risk factor provided that the coefficient is significant. Values close to zero indicate that the factor is an important risk factor, provided that the coefficient is significant, but that it is a negative factor that causes the  $y$  to take low values. Equation 8 can be written by taking the natural logarithm of this model according to “e” base:

$$L_i=(P_i1-P_i)=Z_i=\alpha+\beta x_i \text{ (8)}$$

$L_i$  is the difference rate logarithm and is linear with respect to both  $x_i$  and parameters. Here  $L_i$  is called the “logit model”. This model is a semi-logarithmic function. Therefore, the logit model is one of the best known models among generalized linear models.

In order to estimate the parameters in the model, when the  $L_i$  function,  $P_i=1$  and  $P_i=0$  are put in their places in  $\text{logit}L_i$ , then (1/0) and (0/1) values are obtained which are insignificant. Estimates of the parameters in the  $L_i$  function cannot be found by OLS but these parameters can be estimated by the maximum likelihood model (ML). However, the following points should be taken into consideration in research using logit model:

All appropriate independent variables should be included in the model: Failure to include some variables in the model may cause the error term to grow and the model to be inadequate.

All unsuitable independent variables should be excluded: Inclusion of causally inappropriate variables in the model can complicate the model. The effect of a change in the independent variables on the predicted value of the dependent variable cannot be immediately inferred from the coefficients in the Logit model. It is possible to compute OR values or marginal impacts in applications because of this. Additionally, the direction of the link between the argument and the likelihood that the event will occur is shown by the sign of the coefficients.

The "chi-square test" is used to test the logit model, and "Wald test statistics" are used to verify that each independent variable in the model exists. However, in circumstances where there is a classification and assignment procedure and when normal distribution assumption and continuity assumption are not required, data should be examined with logit model (Guner & Drums, 2020).

### 3.7 *Study variables*

Dependent variable the dependent variable used for the econometric model in this study was patients willingness to pay (WTP) for improved health care waste management service. Hence the dependent variable takes the value of 1 if it is positively affected and 0 if it is not or otherwise. The selection of explanatory variables for the logit model is based on theoretical considerations and previous studies, i.e., significant variables used in other studies on household's willingness to pay for improved solid waste management.

Independent variables the independent variables of this research were demographic and selection of explanatory variables for the logit model is based on theoretical considerations and previous studies, i.e., significant variables used in other studies on patient's willingness to pay for improved solid waste management

**Monthly income of the patients (MI):** this variable refers to the total monthly income (total monthly expenditure used as proxy) of the patients in Ethiopian birr (ETB). Many studies revealed that income is positively and significantly associated to people WTP for improved SWM ( Endalew & Tassie, 2018; Selamawit, 2019; Tamiru, 2019) in this study income is one of the major determinants of patients WTP an hypothesized to affect positively patients WTP for improve HCWM in the public health facilities.

**Awareness (AWPT):** Awareness of patients about health impact of poorly managed health care waste on the environment has significant effect on the respondents WTP for improved HCWM

services. Theoretically, people with higher awareness about the impact of improper solid waste disposal on the environment tend to provide positive and have higher WTP values. As in studies in the literature people's awareness about the impacts of poorly managed solid waste is expected to affect positively their WTP for improved SWM (Tamiru, 2019) it takes the values 1 if the patient is aware & 0 if the patient is not aware. Environmental sensitivity is the ability to observe environments with compassion according to the individual's affective characteristics (Chang & Wu, 2015)

**Sex of the respondent (SR):** this variable refers to the sex or gender of the respondent. It assumes in many societies that, women have more preference for improved waste management and are responsible for the management of household sanitation, child care and food preparation. Hence, the study expects positive relationship between female patients and WTP for improved HCWM services and thus, female patients will be more willing to pay for improved HCWM as findings of other studies indicate (Endalew&Tassie, 2018) it takes the value 1=female and 0= male

**Age of respondents (AR):** This variable refers to the age of the respondents in number of years. Studies conducted on WTP for improved waste management revealed that age of respondents affects WTP significantly. Therefore this study expects the age of respondents affect positively the patients WTP for improved HCWM as other studies in the literature found out (Alshan et al, 2017; Selamawit et al, 2019)

**Time spent in the health facilities(TS):** this variable refers to the number of years the patients attending the health facilities(how often the patients attend the health facilities) patients who visit the health facilities more frequently will be more willing to pay for improved HCWM services.(Tamiru, 2019)

**Education of the respondents(ER):** this variable refers to the level of education the patient attained on formal; education. Educated people better understand the impact of improper health care waste management on the environment and are more willing to pay for improved health care waste management service. Hence, the level of education of the respondents is expected to affect positively patients WTP for HCWM (Alhassan et al, 2017) in this study 1=primary, and 0= others

**Marital status (MS):** this variable refers to the marital status of the patient categorized as married and not married. Married people are more willing to pay for improved SWM compared to those people who are unmarried, divorced or widowed (Alhassan et al, 2017). As a result, this study expects the positive relationship between marital status and WTP of patients. It takes the value 1= for married and 0= otherwise.

**Employment status (ES):** employment status refers to formal employment of the respondents in governmental as well as private institutions of the respondents. As indicated in other studies (selamawit et al, 2019), employment status of people is significantly associated with WTP for improved solid waste management. Hence in the study, employed people are more willing to pay for improved HCWM. In this case, 1= employed, ND 0= unemployed.

### 3.7. Inclusion and exclusion criteria

**Inclusion:** in this study, only adult patients > 18 years old in the outpatient department (OPD) level were investigated. Moreover, the respondents were those patients who are mildly ill, and can well communicate.

**Exclusion:** pediatrics (children) patients, adult patients who are seriously ill and incapable of communicating, mentally ill, and patients who are admitted in the ward were excluded from the study. Besides, mothers who attend maternal care were excluded from the study.

### 3.8. How to determine the initial bid for WTP

Initial amount of money in ETB was determined by dividing the cost of the improved health care waste management technology by the number of patients who attend the hospitals per annum. Accordingly, the total cost of the improved health care waste management technology costs \$ 4000, hence when we change this amount of money into ETB, we multiplied it with ETB 57 ( the current amount of change). Then it becomes ETB 22800. According to the data available from SPMMC, the number of patients who visit the hospital annually is 209676 (only taking those are in the inclusion criteria), therefore, when divided the cost of the machine to the number of patients who attend the hospital annually, we get ETB 1.10 (Approximately).then taking into consideration other costs such as maintenance which is estimated to be 100,000 ETB per year, according to Ato Addis, environmental science professional at st. pauls medical millennium

college, and salary of the two machine operators, 10,000 ETB for each operator and a total of 20,000 ETB per month, the initial bid was estimated to be 25 ETB

Essential healthcare type	May 2020	June 2020	July 2020	August 2020	September 2020	October 2020	Monthly average
<b>Outpatient services</b>							
Internal Medicine	3297	6172	6497	7010	8141	7820	6489
Surgery	2551	2255	2254	3235	3725	3976	3000
Gynaecology	769	866	890	1128	1502	1477	1105
Dermatology	0	58	186	326	475	686	289
Dental & Maxillofacial	252	169	184	242	388	711	324
Ophthalmology	232	494	928	1696	2495	3572	1569
Psychiatry	602	598	615	697	594	777	647
Ear Nose & Throat (ENT)	0	234	510	629	879	1078	555
Renal Transplant	170	270	267	259	333	350	275
Palliative care	1	0	2	3	4	4	3
Oncology	538	804	832	1016	1075	987	879
Pediatrics	473	418	917	690	2168	1373	1006
<b>Emergency services</b>							
Pediatrics Emergency	173	116	172	187	254	205	164
Adult Emergency	426	400	554	571	701	694	485
Gynaecology Emergency	1063	1002	879	1004	1135	1064	1028
A&E Emergency	629	538	260	372	595	431	527
<b>Other services</b>							
Family planning	220	178	298	230	286	265	223
Cervical cancer screening	1	0	-	-	17	16	6
Voluntary Counselling & Testing	0	0	6	77	4	0	14
Post Exposure Prophylaxis	0	1	-	-	15	0	3
Dialysis	-	-	206	194	211	200	68
<b>Maternal Service</b>							
Spontaneous Vaginal Delivery	443	537	442	291	529	528	462
Instrumental delivery	45	38	33	33	47	25z	37
Caesarian section	372	347	356	356	426	399	376
Maternal death	0	0	0	1	1	0	-
Antenatal care	1860	2235	1605	1352	1119	1307	1746
Postnatal care	384	520	558	509	880	427	546
<b>Surgical Service</b>							
Emergency surgery	203	148	209	192	270	245	193
Elective surgery	142	133	181	190	206	344	168
<b>Inpatient Service</b>							
Surgical ward	-	-	130	145	230	261	128
Medical ward	-	-	76	72	81	66	49
Pediatrics ward	-	-	74	75	73	70	49
Maternity ward	-	-	491	503	607	524	354
Gynaecology ward	-	-	114	127	162	142	91
<b>*Others</b>	211	166	828	524	648	650	504
<b>Total inpatient admission</b>	211	166	1713	1446	1801	1713	682

\*Others: Dental & Maxillofacial, Ophthalmology, Psychiatry, ENT, ICU and Renal Transplant

Number of visits to essential healthcare-delivering units in SPHMMC (from May 1 to October 31, 2020)

Figure 2: total number of hospital visits

### **3.9. Pilot study**

Pilot study was conducted with some respondents who are not included in the study. This helps to avoid response duplication. Moreover it is important to test validity and clarity of the data collection instruments. Pilot studies are a fundamental stage of the research process. They can help identify design issues and evaluate a study's feasibility, resources, time, and cost before the main research is conducted. It involves selecting a few people and trying out the study on them. It is possible to save time and in some cases, money by identifying any flaws in the procedures designed by the researcher (Simkus, 2023).

### **3.10. Ethical consideration**

Support letter and ethical clearance were obtained from the university (AAU) and delivered to the research centers of the selected public hospitals. After permission is secured from the hospitals, informed consent was gained from the respondents, explanation was given about the purpose of the study and they were informed that confidentiality would be kept to the maximum. Furthermore, they were informed that they would be free to leave the study participation whenever they want. In addition respondents were informed that they have the right to get the research publication after the study is completed.

## CHAPTER 4: RESULTS AND DISCUSSIONS

### 4.1. Descriptive analysis

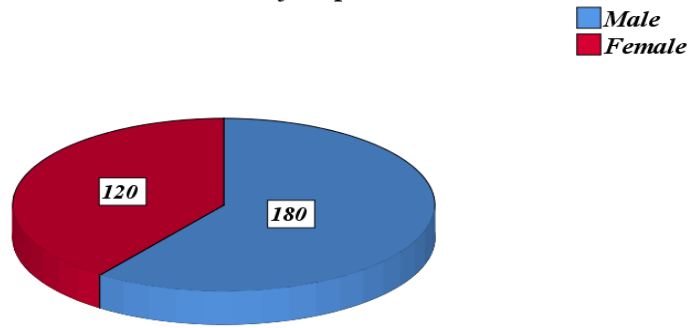
A total of 300 questionnaires were distributed to accidentally selected respondents. Due to the fact that the questionnaires were filled by data collectors, all of the 300(100%) of the questionnaires were completely filled. Hence the response rate of the study was 100%.

#### 4.1.1. Socioeconomic and demographic characteristics of the respondents

As seen from the results, a total of 300(100%) accidentally selected respondents were participated in the study who were selected from two public referral hospitals- St Paul's Medical Millennium College(SPMMC) and St Peters Specialized Hospital. Based on the annual number of patient who visit the two hospitals, the student researcher selected 200(75%) respondents from St Paul's hospital and 100(25%) from StPeter hospital to attain proportionality. because according to SPHMMC, (2020), the average number of patients who visit the hospital were 200,000 and according to the St. Peters hospital annual report, the number of patients who visit the hospital were found to be 100,000( St peters hospital, 2023)

According to the survey results, the majority 180 (60%) of the respondents were males and 120 (40%) were females. In terms of age, only adults of 18 years old and above were sampled. The results reveal that the mean and standard deviation (SD) age of the respondent was 46 and 13.2 respectively with the youngest being 23 years old and the oldest 75 years old. From this result it can be concluded that most of the respondents were in their economic active age range and can participate in productive activities that can influence their decision to willingly pay for the improved health care waste management (Lagis& Matthew, 2023).

*Sex of respondents*



**Figure 3: gender of respondents**

Source: own survey 2024

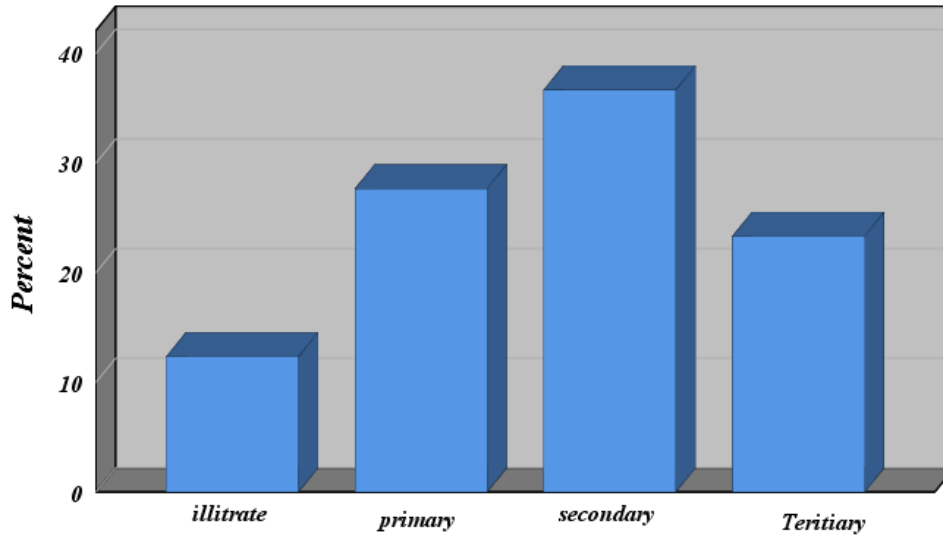
**Table 1: age of respondents**

Statistics		
Age of respondents		
N	Valid	300
	Missing	0
Mean		46.4133
Std. Deviation		13.02105
Minimum		23.00
Maximum		81.00

Source: own survey 2024

The result from respondents educational attainment revealed that 37 (12.3%), 83(27.7%), 110(36.7%), and 70(23.3%), illiterate, elementary, secondary, and tertiary levels of education respectively.

*educational status of respondents*



**Figure 4: educational status of respondents**

Source: own survey 2024

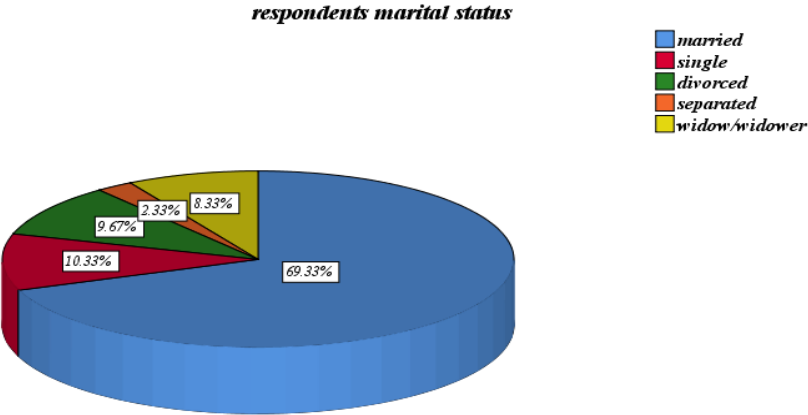
The finding on Occupational status show that most 84 (28.0%) of the respondents were peasants and those who were the least in number were health professionals accounting 11(3.7%)

**Table 2: respondent’s occupation and religion**

RESPONDENTS OCCUPATION TYPE					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Peasant	84	28.0	28.0	28.0
	Teacher	19	6.3	6.3	34.3
	merchant	68	22.7	22.7	57.0
	Driver	20	6.7	6.7	63.7
	health professional	11	3.7	3.7	67.3
	unemployed	45	15.0	15.0	82.3
	Other	53	17.7	17.7	100.0
	Total	300	100.0	100.0	

Source: own survey 2024

With regard to marital status, the finding from the study reveals that most 208 (69.3%) of the respondents were married followed by singles 31(10.3%), divorced 29(9.7%) widows 25(8.3%) and separated 7(2.3%).



**Figure 5: marital status of respondents**

Source: own survey 2024

The mean family size of the respondents was 4.41, which approximately coincides with the average family size of Ethiopia (5) *CSA, (2016)* and the majority 240 (80%) were household head, spouses 60 (20%).

Concerning the age categories in the respondent’s families, the results reveal that majority. (85.3%) of members of the families of the respondents fall in the age range of 14-64. This implies that the number of dependent family members was less, which can be clue for the positive WTP decision of the respondents 10.87% were under the age of 14 years old and the rest 3.8% were in the age group of above 64 years old.

**Table 3: respondent's family member by age group**

		<b>below 14</b>	<b>between 14 – 64</b>	<b>above 65</b>
N		300	300	300
	Missing	0	0	0
Mean		.4267	3.3467	.1500
Median		.0000	2.0000	.0000
Std. Deviation		.92057	2.33624	.40995
Minimum		.00	1.00	.00
Maximum		3.00	8.00	2.00

Source: own survey 2024

Among the respondents who live in Addis Ababa, the majority 53 (36.6%) lived in Gullele sub city, and among the total 300 (100%) number of the respondents, the majority 162 (54.0%) of the respondents were living in urban areas. Among those of the respondents who live in Addis Ababa the average duration of stay in Addis Ababa was 22.55 years.

**Table 4: respondents place of region**

<b>If you are from AddisAbaba, which sub city?</b>					
	Addis Ketema	27	9.0	18.4	18.4
	Arada	32	10.7	21.8	40.1
	Gullele	53	17.7	36.1	76.2
	Yeka	35	11.7	23.8	100.0
	Total	147	49.0	100.0	
Missing	System	153	51.0		
Total	300	100.0			

Source: own survey 2024

With regard to monthly income of the household head of the respondents, the results reveal that mean monthly income of the respondents household head was 9907 ETB, with a minimum of 1000 ETB and maximum of 40,000 ETB, which corresponds approximately to the average monthly income of Ethiopian people (Skwad, 2024).

**Table 5: Monthly income of respondents**

monthly income of household head in ETB		
N	Valid	300
	Missing	0
Mean		9907.6667
Std. Deviation		7339.74209
Minimum		1000.00
Maximum		40000.00

Source: own survey 2024

Most of the respondents 240 (80%) were heads of the household and out of these,180(75%) of the respondents had their own monthly income. Similarly, the number of respondents who said that they receive a monthly income from other members of the family was 60(25%) and the mean monthly income from other members of the family was found to be 2883 ETB.

**Table 6: Role of the respondent in their household**

respondents relation to the family					
		Frequency	Percent	Valid Percent	Cumulative Percent
	household head	240	80.0	80.0	80.0
	spouse	60	20.0	20.0	100.0
	Total	300	100.0	100.0	

Source: own survey 2024

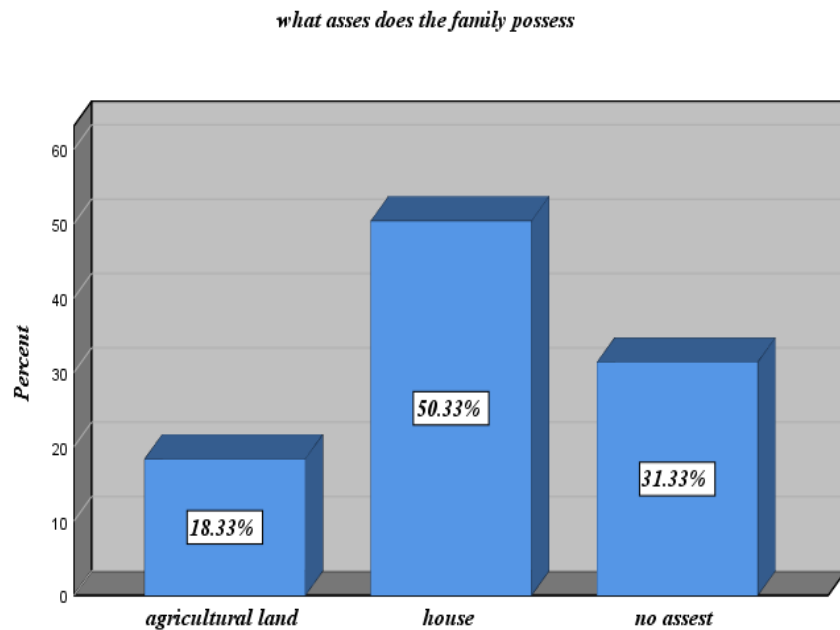
With regard to sources of income, the majority 180(60%) of the respondents source of income was employment, followed by trade 90(30%) and the least income source of the respondents was house rent30(10%).

**Table 7: Respondents sources of income**

source of income of family members					
		Frequency	Percent	Valid Percent	Cumulative Percent
	employment	180	60.0	60.0	60.0
	house rent	30	10.0	10.0	70.0
	Trade	90	30.0	30.0	100.0
	Total	300	100.0	100.0	

Source: own survey 2024

As shown in the figure below, for the question asked whether the respondents had assets, the majority 151(50.3%) of the respondents said that they had house and those who answered that they didn't have any assets were 94 (31.3%).



**Figure 6: assets of respondents**

Source: own survey 2024

Concerning monthly expenditure of the respondents, the mean monthly expenditure of the respondents for food, clothing, energy(electricity, charcoal), house rent, medical cost, school fee, transportation, water, waste disposal, social affairs (idir, equb etc), and other costs was found to be 9390 ETB, with a minimum of 1000 ETB and maximum of 35,000ETB, which approximately coincides with the average income of the respondents which was 9927ETB per month.

**Table 8: monthly expenditure the respondents**

N	Valid	300
	Missing	0
Mean		9390.1667
Std. Deviation		6600.71535
Minimum		1000.00
Maximum		35000.00

Source: own survey 2024

With regard to the type of disease the patients were being treated in the hospitals, most 86 (54.3%) of the respondents were hypertensive patients followed by cardiac/ heart patients 47 (15.7%), tuberculosis (TB) 42 (14.0%), diabetes 35 (11.7%) gastrointestinal problems 28 (9.3%), kidney problem 26 (8.7%), liver problem 15 (5.0%) other types of disease 12 (4.0%), neurological problems 6 (2.0%) and who had spinal problems were only 3 (1%).

**Table 9: types of disease under treatment**

<b>types of disease under treatment</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
	tuberculosis	42	14.0	14.0	14.0
	diabetes	35	11.7	11.7	25.7
	hypertension	86	28.7	28.7	54.3
	gastrointestinal	28	9.3	9.3	63.7
	kidney problem	26	8.7	8.7	72.3
	liver problem	15	5.0	5.0	77.3
	spinal problem	3	1.0	1.0	78.3
	neurological problem	6	2.0	2.0	80.3
	cardiac/heart problem	47	15.7	15.7	96.0
	Others	12	4.0	4.0	100.0
	Total	300	100.0	100.0	

Source: own survey 2024

The average frequency of visit of the hospitals by the respondents was found to be 3.28 times per annum. According to the findings, 184 (61.3%) of the respondents had health insurance while 116 (38.7%) had no the service. Among the total number 300(100%) of the respondents those who had disability were 9 (3.0%), and those who were in pension were 5 (1.7%).

**Table 10: Frequency of visit to hospitals by the respondents**

N	Valid	300
	Missing	0
Mean		3.2867
Std. Deviation		.77879
Minimum		2.00
Maximum		5.00

Source: own survey 2024

**Table 11: Health insurance, disability and pension stat of the respondents**

<b>Are you member of health insurance?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	184	61.3	61.3	61.3
	No	116	38.7	38.7	100.0
	Total	300	100.0	100.0	
<b>Do you have any kind of disability?</b>					
	Yes	9	3.0	3.0	3.0
	No	291	97.0	97.0	100.0
	Total	300	100.0	100.0	
<b>Are you in pension?</b>					
	Yes	5	1.7	1.7	1.7
	No	295	98.3	98.3	100.0
	Total	300	100.0	100.0	

Source: own survey 2024

**4.1.2. Current status of the health care waste management system**

In this section, questions were asked to assess whether the respondents had awareness or knowledge about the HCWM. Patient’s awareness or knowledge about HCWM depends on their comprehension and sensitivity about the hospital environment. Sensitivity is the ability to observe environments with compassion, according to an individual’s affective characteristics (Cheng and Wu, 2015) as mentioned in Lagis and Mathew (2022), sensitivity is the predisposition to take an interest in learning about the environment, feel concern for it, and take action to conserve it based on formative experiences. Therefore, the analysis of the patient’s awareness of HCWM was to know patients concern about hospitals environmental pollution. For the question asked whether respondents were satisfied with the current status of health care waste management of the hospitals, majority 192 (64.0%) of the respondents answered that they were

not satisfied. Meanwhile when the respondents were asked to rate the current status of health care waste management of the majority 153 (51.0%) of the respondents said it was bad, followed by those who rated as good 90 (30.0%), 24 (8.0%) said that it was very bad. 21 (7.0%) said they couldn't judge and 12 (4.0%) said that they didn't know.

**Table 12: Respondents satisfaction on the hospital service**

<b>Are you satisfied with the current sanitation of the hospital?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	108	36.0	36.0	36.0
	no	192	64.0	64.0	100.0
	Total	300	100.0	100.0	
<b>Are you satisfied with the current HCWM service in the hospital?</b>					
	Yes	85	28.3	28.3	28.3
	No	215	71.7	71.7	100.0
	Total	300	100.0	100.0	
<b>How do you evaluate the current situation of HCWM in the hospital?</b>					
	very bad	24	8.0	8.0	8.0
	Bad	153	51.0	51.0	59.0
	good	90	30.0	30.0	89.0
	i can't judge	21	7.0	7.0	96.0
	i don't know	12	4.0	4.0	100.0
	Total	300	100.0	100.0	

Source: own survey 2024

For the question asked whether the respondents know any adverse health effects in connection with improper health care waste management practices, majority 282 (94.0%) of the respondents answered that they know that improper health care waste management practices can bring health problems. In connection with this, majority of the respondents mentioned common cold 218 (77.3%) followed by covid58 (20.5%) and the least mentioned health problem was diarrhea 6(2.1%).

**Table 13: awareness question**

<b>Are you aware of the problem that stems from improper HCWM?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
	yes	282	94.0	94.0	94.0
	no	18	6.0	6.0	100.0
	Total	300	100.0	100.0	

Source: own survey 2024

Then the respondents were asked whether they pay for health care waste management during their hospital visits. Accordingly all 300(100%) of the respondents assured that they didn't pay for health care waste management. The other question asked was who do you think is responsible for the HCWM in the hospital for this question, the majority 227 (75.7%) of the respondents said that the responsibility of HCWM was the responsibility of both the hospital and the patients. 73 (24.3%) of the respondents said that it is the responsibility of the hospital only.

**Table 14: respondents perception towards the responsibility of management of HCW**

<b>Who do you think is responsible for the proper management of HCW in the hospital in your view?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
	the hospital	73	24.3	24.3	24.3
	Both the hospital and the patients	227	75.7	75.7	100.0
	Total	300	100.0	100.0	

Source: own survey 2024

With regard to whether the improper health care management practice affected the health of their family members, 216 ((72%) of the respondents said that the improper HCWM didn't affect the health of their family members, and 84(28.0%) answered yes for the question. Among those who said yes, 35 (41.7%) said that their family members were affected by common cold, 25 (29.8) said typhoid fever Asthma and diarrhea both 10(11.9%) and 4 (4.8%) said other types of diseases.

**Table 15: perception towards unsound HCWD**

<b>Do you think that the unsound HCWD is damaging members of your family health?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	84	28.0	28.0	28.0
	No	216	72.0	72.0	100.0
	Total	300	100.0	100.0	
<b>If yes, have your household members suffered any one of the following disease due to HCW?</b>					
	common cold	35	11.7	41.7	41.7
	Asthma	10	3.3	11.9	53.6
	typhoid fever	25	8.3	29.8	83.3
	Diarrhea	10	3.3	11.9	95.2
	Other	4	1.3	4.8	100.0
	Total	84	28.0	100.0	
	System	216	72.0		
	300	100.0			

**Source: own survey 2024**

#### 4.1.3. Willingness to pay for health care waste management of the respondent

In this section, the respondent’s willingness to pay for the improved health care waste management was assessed. Accordingly, for the question they were asked whether they were willing to pay for an improved health care’s waste management, majority 240(80%) of the respondents have shown their willingness. Among the total number of the respondents, who didn’t show willingness to pay were 60 (20%).

**Table 16: respondents’ willingness to pay to support HCWM**

<b>Would you be willing to pay in support of improved HCWM service?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	240	80.0	80.0	80.0
	No	60	20.0	20.0	100.0
	Total	300	100.0	100.0	

**Source: own survey 2024**

Among those who were willing to pay, 210 (87.5%) of them were agreed to pay 25 ETB per visit which is the initial bid for the study. Again those who were agreed to pay 25 ETB were asked

whether they were willing to pay 30 ETB, among these, 150 (62.5%) were willing to pay 30 ETB. Again, among those who were willing to pay 30 ETB 120 (50%) were agreed to pay the next bid which was 35 ETB. Finally those of the respondents who were willing to pay 35 ETB were asked to mention the maximum amount of ETB they were willing to pay per visit. The average maximum amount of money these respondents were willing to pay was 57.14.

**Table 17: Respondents willingness to pay**

<b>Would you be willing to pay 25.00 ETB per hospital visit for improved HCWM service?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
	yes	210	70.0	87.5	87.5
	no	30	10.0	12.5	100.0
	Total	240	80.0	100.0	
<b>Would you be willing to pay 30.00 ETB per hospital visit for improved HCWM service?</b>					
	Yes	150	50.0		62.5
	No	90	30.0		37.5
	Total	240	80.0		100.0
<b>Would you be willing to pay 35.00 ETB per hospital visit for improved HCWM service?</b>					
	Yes	120	40.0		50.0
	No	120	40.0		50.0
	Total	240	80.0		100.0

Source: own survey 2024

**Table 18: the maximum amount respondents are willing to pay for improved HCWM**

<b>Statistics</b>	
What is the maximum amount would you be willing to pay per hospital visit per ETB?	
Mean	57.1429
Std. Deviation	58.99013
Minimum	25.00
Maximum	200.00

Source: own survey 2024

Among the respondents who were willing to pay but were not willing to pay 25 ETB were asked if they were willing to pay 20ETB, 10. (33.3%) of the respondents agreed to pay 20ETB. For those who didn't agree to pay 20 ETB I have asked whether they could be willing to pay 15ETB

per visit, 15(75.0% ) showed their willingness to pay 15 ETB. For those who were not willing to pay 15 ETB, I have asked what the maximum amount they were willing to pay was. The average amount of money they could pay for the service was 10ETB.

**Table 19: WTP 20 ETB**

<b>Would you be willing to pay 20.00 ETB per hospital visit for improved HCWM service?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	10	3.3	33.3	33.3
	No	20	6.7	66.7	100.0
	Total	30	10.0	100.0	
<b>Would you be willing to pay 15.00 ETB per hospital visit for improved HCWM service?</b>					
		yes	15	5.0	75.0
		no	5	1.7	25.0
		Total	20	6.7	100.0

Source: own survey 2024

**Table 20: Maximum WTP of the respondents**

<b>Statistics</b>	
What is the maximum amount would you be willing to pay per hospital visit per ETB?	
Mean	10.0000
Std. Deviation	.00000
Minimum	10.00
Maximum	10.00

Source: own survey 2024

#### 4.1.1. Factors that affect WTP among the respondents

The respondents who were willing to pay for the improved health care waste management were asked to explain their reason to pay. Accordingly, the majority 72 ( 33.5% ) of the respondents explained that they had confidence on the newly proposed improved health care waste management technology would bring an improved clean and healthy hospital environment. And 59 ( 27.4% ) said that they would be willing to pay because of all the choices mentioned i.e. because of the adverse health effect of the improperly managed HCWM, due to the reason that they had confidence on the newly proposed improved HCWM, and because the newly proposed technology brings clean and healthy hospital environment.

Similarly, the respondents who were not willing to pay for the proposed improved health care waste management technology were asked to explain their reason not to pay. In this regard, majority 84 (97.7% ) of the respondents said that they were not willing to pay due to lack of money or shortage of finance 2 (2.3%) said it is the responsibility of the government (the hospital) to provide such services.

**Table 21: factors that affect WTP**

<b>For those who are willing to pay, why are you willing to pay in support of HCWM service?</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
	the proposed idea will create clean safe and healthy environment in the hospital	120	40.0	50.0	50.0
	All i.e, because the adverse effect of the health care waste would cause serious health problem, because the proposed idea would create clean safe and healthy environment in the hospital, because the proposed idea would create safe living environment.	90	30.0	37.5	87.5
	Others	30	10.0	12.5	100.0
	Total	240	80.0	100.0	
		60	20.0		
		300	100.0		
<b>For those who are not willing to pay, why are you not willing to pay in support of HCWM service?</b>					
Valid	we cannot pay due to lack of income	49	16.3		81.7
	it is the responsibility of the government to provide the service	11	3.7		18.3
	Total	60	20.0		100.0

Source: own survey 2024

#### 4-2 inferential statistics

#### 4.1.1. Analytical result of testing the awareness/ knowledge about HCWM

The student researcher used t-test Regarding awareness or knowledge was analyzed using cross tabulation to assess the correlation with six variables: sex/gender, age, marital status, educational level, household size, and household income. The findings reveal there was a significant difference between knowledge and age at a p value (  $P < 0.05$ ) in line with this, Lagis& Matthew (2023), conducting a research in Malaysia on WTP for HCWM found out that there was significant difference between age and knowledge about HCWM in other words younger people had more knowledge.

**Table 22: Awareness and dependent variables regression**

	B	S.E.	Wald	df	Sig.	Exp(B)
Sex of respondents	.421	.562	.561	1	<b>.454</b>	1.523
Age of respondents	.008	.025	.092	1	<b>.015</b>	1.008
educational status of respondents	.116	.335	.120	1	<b>.021</b>	1.123
respondents occupation type	-.095	.110	.754	1	<b>.455</b>	.909
respondents marital status	-.405	.330	1.503	1	<b>.220</b>	.667
respondents family size	.005	.161	.001	1	<b>.977</b>	1.005

According to the results shown in the above table, awareness of the respondents about the current status of the HCW was significantly associated with age, educational status, and place of origin of the respondents.

Age of the respondents was significantly associated with awareness about health care waste effect, at a p value  $< 0.05$  ( $P=0.015$ ). This result corresponds with the finding from Bamlaku et al, (2019) which revealed that age of respondents had a negative significant relationship with awareness of health care waste effects i.e, the smaller the age the more awareness the individual has about health care waste effects. According to Ligas& Matthew (2023) the possible reason for this may be younger people are closer to information about effects of health care waste than older people.

The other variable which has significant relationship with awareness about effect of health care wastes was educational status. As indicated in the above table educational status has a positive significant relationship with educational status at a p value  $< 0.005$  ( $P= 0.025$ ) As educational status increases, then awareness about health effects of health care wastes increases. Several studies, ( Legas& Matthew (2023), revealed that educational status had a positive statistical significance with education. It is obvious that the reason for this can be educated people are prone to information about environment and health effects of health care wastes.

#### **4-3 Patients Willingness to pay for health care waste management service in the selected public hospitals**

The findings reveal that about 240(80%) of the total respondents were willing to pay for the hospitals health care waste management service. The rest 60 (20%) were not willing to pay for the planned improved health care management service. In line with this, a study conducted in Vietnam revealed that 88% of households were willing to pay for improved HCWM, with a mean WTP of 10,000 Vietnamese dong per month per household (Nguyen et al, 2015). Similarly a study in India found that 92% of households were willing to pay for improved HCWM, with a mean WTP of 20 Indian Rupees per month per household (Des et al, 2017). This shows that when people are asked to pay for waste disposal, vast majority of them would be willing to pay.

The willingness to pay responses of the patients for the double bounded value elicitation format are shown in the table below, the proportion of “yes-yes” answer patterns for the initial bid is higher than the proportion of “ yes- yes” replying patterns of the initial bid negative. This illustrates that; respondents need to make the hospital environment more clear and healthy. “yes-yes” and “no-yes” responses imply that patient’s willingness to pay is between the initial bid amount and the increased and decreased bid amounts, respectively. This finding can be seen as witness of the CVM answers validity, ensuring the selection of efficient bid design (Banga et al, 2011).

**Table 23: double bounded**

	Yes- yes	Yes – no
25	210(87.5%)	30 (!2.5%)
20	10 (12.5%)	20 ( %)

**T test analysis of respondents WTP and nominal variables T-Test**

In the study the independent t test was also applied to check which categories of individuals were willing to pay for the improved health care waste management service, in this regard, more attention was given to the effects of gender, marital status, educational level, asset ownership, and satisfaction with the current status of health care waste management service on WTP of the respondents.

As shown in table below, WTP of male respondents was found to be significantly greater than that of females. This may happen due to the fact that monthly income of the males is greater than that of the females. As indicated in a study conducted on SWM and WTP by Muhdin et al (2016), in Jimma town, males are more willing to pay for SWM services than females.

With regard to marital status of the respondents, the average WTP for married respondents was significantly higher than those who were single, divorced separated and widowed. This implies that when there is stability in the family, there would be more concern to the environment and hence willingness to pay.

The independent t test result also reveals that having tertiary level of educational status (diploma, degree, masters etc.) is a factor for WTP for improved health care waste management service. This implies that the more individuals become educated, the more they would be concerned about health care waste management services. In other words, people who got more education have more information about health effect of health care waste

.with regard to asset holding of the respondents, those how have assets was more willing to pay for the improved health care waste management service.

The result from the independent t test also show that respondents who were dissatisfied from the current health care management services in the public health facilities were more willing to pay for the proposed improved health care waste management service.

**Table 24: independent t- tests**

Outcome indicator	Treatment variables	Samples		SD	Sig(2-tailed)
WTP	<b>Gender</b>				
	Male	180		.50203	<b>.000</b>
	Female	120		.36344	
	<b>Marital status</b>				
	Married	208		.42502	<b>.038</b>
	Others	92		.39125	
	<b>Education (certificate)</b>				
	Yes	70	1.4595	.50523	<b>.000</b>
	No	230	1.1571	.36656	
	<b>Asset ownership</b>				
Yes	151	1.3907 1.0000	.48954	<b>.000</b>	
No	149		.00000		
<b>HCWMS satisfaction</b>					
Yes	108	1.1823	.038709	<b>.000</b>	
No	192	1.4815	.50199		

**Cross tabulation analysis**

The cross tabulation analysis was used to assess the association of patient’s willingness to pay in binary terms I.e., yes or no, and dichotomous or normal variables

**Cross tabulation analysis**

The cross tabulation analysis is also applied to assess the relationship of patients WTP ( in binary terms i.e. yes or no) and dichotomous or nominal independent variables. As shown in the table although the total number of both females and males who were willing to pay for the improved HCWM was higher, the WTP of males (152) was observed to be higher than that of females (61).

**Table 25: cross tab analysis of gender and WTP**

		Male	female	Total
WTP ( binary)	Yes	152	88	240
	No	28	32	60
		180	120	300

Source: own survey 2024

**Table 26: Pearson Chi- square1**

	Pearson Chi- square	
Value : 39.504	DF: 1	Asymp sig (2 sided): .000

Source: own survey 2024

In relation to marital status and WTP, table shows that marital status of individuals is a factor that determines WTP for health care waste management service. In this case, being married was shown to be associated with WTP. According to the results of cross tabulation with regard to marital status, married respondents were seen having a higher (169) tendency of WTP than those who were not in marriage.

**Table 27: Cross tab analysis of marital status and WTP**

		Married	Others(singles, separated, widowed)	total
WTP ( binary)	Yes	169	71	240
	No	39	21	60
		180	120	300

Source: own survey 2024

**Table 28: Pearson Chi- square2**

	Pearson Chi- square	
Value: 71.624	DF:4	Asymp. Sig.(2-sided): .000

Source: own survey 2024

In terms of education, the cross tab analysis revealed that the higher the educational attainment of the respondents, the higher will be WTP for the improved health care waste management service. In the study, the respondents who were in an educational level of tertiary level (diploma, degree, masters) were found to be more willing to pay than those in the lower educational level.

**Table 29: cross tab analysis of education and WTP**

		Tertiary education	Others( illiterates, elementary level, secondary level)	Total
WTP ( binary)	Yes	59	181	240
	No	11	49	60

Source: own survey 2024

**Table 30: Pearson Chi- square3**

	Pearson Chi- square	
Value: 71.624	DF:4	Asymp. Sig.(2-sided): .000

Source: own survey 2024

In the same way as independent t- test analysis, cross tab too indicates that patients who possess assets have a better tendency for WTP for the improved health care waste management service than those who didn't have assets. The Chi- square indicates there is a statistically significant difference between asset owners and who don't have asset interms of WTP..

**Table 31: cross tab analysis of asset ownership and WTP**

		Asset holder	No asset	Total
WTP ( binary)	Yes	147	93	240
	No	50	10	60

Source: own survey 2024

**Table 32: Pearson Chi- square4**

	Pearson Chi- square	
Value: 71.624	DF:4	Asymp. Sig.(2-sided): .000

Source: own survey 2024

Cross tab analysis was also applied to determine the patient’s condition of satisfaction with the current health care management and WTP. As shown from the table below, there was a statistically significant difference between who were satisfied and not satisfied in WTP for the improved health care waste management service. Patients who were dissatisfied with the current health care waste management practices in the hospitals were more interested than those who were satisfied.

**Table 33: cross tab analysis of satisfaction and WTP**

		Yes	No	Total
WTP ( binary)	Yes	50	190	240
	No	20	40	60

Source: own survey 2024

**Table 34: Pearson Chi- square on asset ownership**

	Pearson Chi- square	
Value: 71.624	DF:4	Asymp. Sig.(2-sided): .000

Source: own survey 2024

## **Binary logistic regression**

As already described in the earlier chapter, binary logistic model was applied to identify the factors which affect patients WTP for the improved HCWMS. In the model the dependent variable, WTP was regressed against eight independent variables. These are sex, age, marital status, educational status, monthly income, asset ownership, family size, presence of dependent family members, and awareness about effects of HCW.

The respondents were also asked to explain the reasons for WTP and unwillingness to pay. Accordingly, among the respondents who were willing to pay 240(80%) , the majority 120 ( 50% ) said that they were willing to pay because they were confident about the effectiveness of the newly proposed improved waste management service that can create comfortable living environment , followed by 90(37.5%) those who mentioned that their reason to willingly pay for the improved health care waste management service was due to all the choices available in the questionnaire, i.e. because they were confident on the newly proposed improved HCWM service, because it can create clean and healthy environment in the hospitals, and because the improper health care waste management of the hospitals can affect health. And who mentioned other were 30(10%)

Similarly when the respondents who were not willing to pay 60(20%) were also asked to explain their reason not willing to pay. Most 49(16.3%) of the respondents who were not willing to pay explained that they were not willing to pay because of lack of money. Followed by those 11(18.3%) who express their reason not willing to pay because it was the responsibility of the government to provide such services.

The classification tables show that the model correctly predicted the observations. As indicated in the table, the chi-square strongly rejected the hypothesis that the model has no explanatory power.

**Table 35: omnibus tests of model coefficients**

	Chi-squer	Df	Sig
Step	121.767	7	.000
Block	121.767	7	.000
Model	121.767	7	.000

Before interpreting the estimates, multicollinearity was checked since it reduces the accuracy of estimating the coefficient of variables. Hence the result of the test indicates that multicollinearity was not a serious problem in the data.

**Table 36: determinants of patients WTP (Binary logistic output)**

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1 <sup>a</sup>	Sex of respondents	2.702	.719	14.111	1	<b>.000</b>	14.908
	Age of respondents	.079	.034	5.391	1	<b>.020</b>	1.082
	educational status of respondents	.297	.382	.603	1	<b>.437</b>	1.345
	respondents occupation type	-.682	.183	13.946	1	<b>.000</b>	.505
	respondents marital status	.636	.326	3.808	1	<b>.051</b>	1.888
	respondents family size	-.796	.199	15.926	1	<b>.001</b>	.0451
	monthly income of household head in ETB	-.001	.000	30.561	1	<b>.000</b>	.999
	Awareness	1.244	1.161	1.148	1	<b>.002</b>	3.468
	Constant	-.687	3.007	.052	1	<b>.819</b>	.503

As shown on the table, seven variables out of ten were statistically significant and theoretically sound. These were, sex, age, occupation type, marital status, family size, , monthly income and mean awareness about effect of health care waste.

According to the results from the above table, willingness to pay was found to be significantly associated with sex of the respondents at a p value < 0.05 (P= 0.000.). This result is supported by a study conducted by Mulat et al (2019) in Injibara that states sex of the household (being male) had significant association with WTP. Similarly Lagis& Matthew (2023) conducting a research in Malaysia- found out that sex had a positive significant relationship with WTP. The likely explanation might be females had lesser economic decision power than their male partners.

The other variable which was found to have significant relationship with willingness to pay was age of the respondents. It can be inferred that, as age increases, people's willingness to pay for

the improved health care waste management will be reduced. In line with this, Muhidin et al (2016) conducting a study in Jimma town has shown that age had negative significant relationship with willingness to pay for solid waste management. The possible explanation for this may be the fact that younger people have exposure for information related to harmful effects of health care waste.

With regard to occupation type of the respondents, we have also found that there was a negative significant relationship at a p value of ( $P= 0.000$ ) with patients willingness to pay for the health care waste management service. In line with this result, Adebo&Ajewole (2012) state that WTP for garbage disposal is significantly affected by occupation of the respondents. In this study, health professionals and teachers were more willing to pay for the improved healthcare waste management. In line with these, Tewodros and Samson(2009) conducting a research on WTP for solid waste management in Mekele, revealed that health professionals and teachers were found to be more willing to pay for the towns solid waste management.

Marital status of the respondents also has a significant relation with willingness to pay at a p value of ( $P=0.05$ ) in line with this, various study results from Lagis& Matthew(2023), Muhidin et al (2016), Bamlaku et al ,( 2019 ) support this result. The other variable which was found to have a negative significant relationship with willingness to pay was family size. Family size of the respondents was found to have a negative significance at a p value of  $<0.05$  ( $P=0.001$ ) as revealed in a study by Bamlaku et al (2019), family size of the respondents was significantly related with respondents willingness to pay decision. All factors keeping constant, at 1% increase of patients family size reduces their willingness to pay by 4.51%. The possible reason for this may be shortage of money as members of the family increases. (Bamlaku et al, (2019)

There was also a positive significant relationship between monthly income and WTP of the respondents. Monthly income of the respondents was significant at a  $p < 0.05$  ( $P=0.000$ ). In line with this various studies have shown that there is significant relationship between respondent's monthly income and willingness to pay. For example, Legas % Matthew (2023), conducting a research in Malaysia found out that there was a significant relationship between monthly income of the respondents and willingness to pay. Similarly, Niringiye and Omortor (2010), Dagneu et al (2013) Conducting studies on WTP for SWM revealed that among other things, peoples WTP

for improved SWM is greatly correlated with their income status. Again, Tewodros and Samson (2009) state that WTP is highly affected by family income.

Finally, according to the results from logistic regression, awareness of the respondents about health effects of HCW was found to be statistically significant with, patients WTP for the improved HCWMS. Ojok et al (2015) using a logit linear regression model to estimate households willingness to pay for better municipal solid waste management in Uganda found out that awareness of the respondents about SWM had a significant relationship with their WTP.

## CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

### 5.1. Conclusions

Proper health care waste management is crucial especially in recent times when world population is growing faster than ever. In Ethiopia, main importantly due to the rapidly growing urbanization and the highly rising patient population in the public health facilities, HCWM service has been very difficult to properly handle. Hence taking into consideration the financial problem to properly manage the health care waste by introducing an improved technology, the student researcher has tried to assess patient's willingness to pay for the health care waste management as an alternative.

In the study two public hospitals – SPMMC and St peters specialized hospitals were selected as a study areas. Based on the results of the study the following conclusion was drawn: According to the study result, the current health care waste management practice in the selected hospitals were found to be unsatisfactory. Majority of the respondents were aware of the health effects of improper health care waste management practices. Therefore inorder to solve the health care waste management problems in the hospitals, majority 240(80%) of the respondents were willing to pay for the newly proposed improved health care waste management service. With regard to the factors which were associated with peoples WTP for the service, demographic and socioeconomic characteristics of the respondents were included. Among these, age, gender, marital status, educational status, monthly income of the respondents, patient's awareness about health effects of health care waste and dissatisfaction of the patients with the current health care waste management system in the hospital were found to be significantly related with willingness to pay for the improved health care waste management service.

With regard to major reasons that affect respondents willingness to pay for the improved health care waste management service, majority of the respondents were explained their reason as they were confident on the newly proposed health care waste management service. And among those who were not willing to pay, the majority described that they were not willing to pay because of shortage of money (financial constraints).

## 5.2. Recommendations

Based on the conclusion from the study results, the following recommendations were suggested to improve the health care waste management services in the public hospitals:

- In order to tackle health care waste management problems that arise from financial problem public health facilities in Addis Ababa should consider patients willingness to pay and implement new and advanced health care waste management service.
- As indicated form the study results, majority of the respondents who do not show their willingness to pay explained their reason as lack of money. This shows that if financial constraint was not obstacle, they would be willing to pay for the service. Hence the government should strive to tackle the financial problem through poverty eradication development programs
- in this study the student researcher has mentioned that there were few studies conducted in the area of health care waste management service and patients WTP, therefore, the study recommends further research studies should be conducted on the topic

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**COLLEGE OF DEVELOPMENTAL STUDIES**  
**DEPARTMENT OF ENVIRONMENT AND SUSTAINABLE**  
**DEVELOPMENT**  
**WILLINGNESS TO PAY FOR IMPROVED HEALTH CARE**  
**WASTEMANAGEMENT IN ADDIS ABABA: APPLICATION OF**  
**CONTINGENT VALUATION METHOD**

*Patients Survey Questionnaire*

**Informed Consent:** Your participation in the survey is voluntary and should take approximately about 45 minutes. Your response is confidential. All data will be reported in the aggregate only. Data will only be maintained by unique code number, not by name, and you will not be identified in the results. All data will be used for research purposes only. The questionnaire is designed to obtain information on your willingness to pay (WTP) towards the health care waste management service in the hospital.

Date \_\_\_\_\_ Questionnaire code \_\_\_\_\_

Name of data collector \_\_\_\_\_

**Section1: Questions related to socio economic conditions of the households**

1. Sex of the respondent/patient: 1= Male    2= Female
2. Age of the respondent: \_\_\_\_\_ years
3. What is your level of education?  
1= Illiterate                      2= Elementary    3= Secondary    4= Tertiary (college/university)
4. What is your Occupation type?  
1= Peasant    4= Driver  
2= Teacher    5= Health professional  
3= Merchant    6= Unemployed  
7= Other \_\_\_\_\_
5. What is your religion?  
1= Christian  
2= Muslim

3= Waqeefanna

4= Other\_\_\_\_\_

6. What is your marital status?

1= Married

3= Divorced

2= Single

4= Separated

5= Widow/Widower

7. What is your family size?\_\_\_\_\_ ( in number)

8. Respondents (patient) relation to the family?

1= household head 2= Spouse 3= Son/daughter

4= relative 5= Other (specify)\_\_\_\_\_

9. How is a family member by age category?

Age	Male	Female	Total
< 14			
14 – 64			
> 64			
Total			

10. Where is your place of Region

1= Oromiya

6= Somali

2= Addis ababa

7= Gambella

3= Amhara

8= Sidama

4= Tigray

9= Benshangul

5= Afar

10= SNNP

11. If you are from Addis Ababa, which sub city you are from?

1= Addis ketema

7= Kolfe keranio

2= Akaki kality

8= Lideta

3= Arada

9= Nifas silk lafto

4= Bole

10= Yeka

5= Gullele

11= Lemi kura

6= Kirkos

12. Where is your Place of residence?

1= Urban

2= Semi-rural

3= Rural

13. How long have you been living in Addis Ababa? \_\_\_\_\_(in years)

14. Monthly income of the household head \_\_\_\_\_ in ETB

15. Monthly income of the patient \_\_\_\_\_ in ETB

16. Monthly income from other members of the household and other sources \_\_\_\_\_ in ETB.

17. Source of income of family members

Ser. No.	Source of income	Amount in birr
1.	Employment	
2.	House rent	
3.	Trade	
4.	Pension	
5.	Part time work	
6.	Others (Specify)	

18. What asset does the family possesses (Multiple responses)?

1= Agricultural land

5= Building

2= Livestock

6= Others (Specify) \_\_\_\_\_

3= Car

4= House

19. How much money does your household spend per month on the following items?

Items	Amount per month (in ETB)
Food	
Clothing	
Energy(electricity, charcoal, wood, etc.)	
House rent	
Medical cost	
School fee	
Transport	
Water	
Waste disposal	

Social affairs (Idir, Ikub, etc.)	
Others	
<b>Total</b>	

20. Type of disease under treatment:

- |                        |                         |
|------------------------|-------------------------|
| 1= Tuberculosis        | 5= Kidney problem       |
| 2= Diabetes            | 6= Liver problem        |
| 3= Hypertension        | 7=Spinal problem        |
| 4= Gastrointestinal    | 8= Neurological problem |
| 9=Other (Specify)_____ |                         |

21. How often do you visit the hospital?\_\_\_\_\_ (in numbers)

22. Are you member of health insurance?

- |       |       |
|-------|-------|
| 1=Yes | 2= No |
|-------|-------|

23. Do you have any kind of disability?

- |        |       |
|--------|-------|
| 1= Yes | 2= No |
|--------|-------|

24. Are you in pension?

- |        |       |
|--------|-------|
| 1= Yes | 2= No |
|--------|-------|

**Section2: Questions about Current Situation of health care Waste Management and Awareness of Respondents**

25. Are you satisfied with the current sanitation of the hospital? 1=Yes 2= No

26. Do you pay for the health care waste management service in the hospital?1= Yes 2= No

27. If Yes, how much do you pay for the service per month?\_\_\_\_\_ETB

28. Are you satisfied with the current healthcare waste management service in thehospital?

- |        |       |
|--------|-------|
| 1= Yes | 2= No |
|--------|-------|

29. How do you evaluate the current situation of health care waste management in thehospital?

- |              |                  |
|--------------|------------------|
| 1=. Very bad | 4= Very good     |
| 2= Bad       | 5= I can't judge |
| 3= Good      | 6= I don't know  |

30. Are you aware of the problem, that stems from improper health care wastemanagement

1= Yes

2= No

If yes, go to question number 28

31. What environmental and health problem (impact) will the current health care wastedisposal do you think create?

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32. Who do you think is responsible for the propermanagement

1= The hospital

2= The patients

3= Other, specify \_\_\_\_\_

33. Do you think that the unsound health care waste disposal is damaging members of your family health?

1= Yes

2= No

34. If yes, have your house hold member suffered any one of the following disease dueto health care waste?

No	Diseases	Mark(x)
1.	Common cold	
2.	Asthma	
3.	Typhoid fever	
4.	Diarrhea	
5.	Cholera	
6.	Other	

35. Does the improper health care waste generated affect your family member's daily life via making the members unable to engage in productive works, school or elsewhere due to sickness?

1= Yes

2= No

**Section 3: The Environmental and Health Problem and Description of Scenario**

In public health facilities of Addis Ababa, due to the rising human population, there is a rapidly growing problem of sanitation due to unsound health care waste disposal. However, attention is not given to the problem and due to this, the sanitation of the hospital has become a serious issue from time to time. If adequate attention is not given to the management of health care waste generated in the hospitals, it causes an adverse effect on the environment, human health and the economy. Therefore, the aim of this study is to improve environmental conditions of the public health facilities and to recommend solution for the existing problem based on your information. The benefits you derive from this improved health care waste management service (environmental quality) are more attractive and pleasant health facilities, and cleaner hospital environment. Because of proper and regular disposal of waste, we might get rid of flies, reduction in bad odor and avoid prevalence of communicable diseases.





Dear respondent, this kind of service will be delivered on regular and sustainable basis if you agree to pay some money for the operators of this activity on monthly basis on service provision. Therefore, we would like you to think carefully about your monthly expenditure on



1= Yes

2= No

40. What is the maximum amount you would be willing to pay per hospital visit? \_\_\_\_\_ETB

41. Would you be willing to pay 20.00\_ETB per hospital visit for SWC service?

1= Yes

2= No

42. Would you be willing to pay 15.00\_ETB per hospital visit for SWC service?

1= Yes

2= No

43. What is the maximum amount you would be willing to pay per hospital visit? \_\_\_\_\_ETB

44. For those who are willing to pay, why are you WTP in support of HCWM service? 1= The negative impacts of poorly managed health care waste will be minimized 2= The newly proposed HCWM service makes the suitable to live in

3= The proposed idea will create clean, safe and healthy environment in the hospital

4= Other, specify

45. For those who are not willing to pay, why are you not WTP in support the HCWMservice?

1= We cannot pay due to lack of income

2= We don't have faith in the proposed service

3= We are satisfied with the existing service

4= It is the responsibility of the government to provide the service

5= Other, specify

Name and address of the respondent

Name \_\_\_\_\_ Kebele \_\_\_ H.No. \_

Thank you for your cooperation!