WILLINGNESS TO PAY FOR CANCER SCREENING IN DAGORETTI NORTH CONSTITUENCY: CONTINGENT VALUATION ESTIMATES

BY

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DECLARATION

I declare that this research paper is my original work and has not been submitted for a degree in any other university or college for examination/academic purposes.

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DEDICATION

To my dearest Mercy, the long wait for Godot is soon ending, hopefully, and to the munchkins- Brent and Mel…and any in tow.

Brent, you kept marveling at the volumes of paper dad had written, you made me feel like Shakespeare.
Mel, I still remember this day you asked me why mom had graduated ahead of me.
The ones in tow, welcome aboard.

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I also want to thank this gentleman who came to my aid in that seminar room when I realized I hadn't prepared my presentation in power-point as was required and so I couldn't be allowed to present. My adrenalin was high, my hands failed me, I couldn't drag the cursor, and there you were. Time did not allow me to present but the gesture was humbling. Sorry you left so fast I did not get to ask your name.

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That said, I'm solely responsible for the contents of this work and any shortcomings it may have.

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LIST OF ACRONYMS AND ABBREVIATIONS

CV	Contingent Valuation
CVM	Contingent Valuation Method
IARC	International Agency for Research on Cancer
IEBC	Independent Electoral and Boundaries Commission
MBDC	Multiple-Bound Dichotomous Choice
NCDs	Non-Communicable Diseases
NOAA	National Oceanic and Atmospheric Administration
RWTP	Revealed Willingness to Pay
TWTP	True Willingness to Pay
VIA	Visual Inspection with Acetic Acid
VILI	Visual Inspection with Lugol's Iodine
VSL	Value of a Statistical Life
WHO	World Health Organization
WTA	Willingness to Accept
WTP	Willingness to Pay

ABSTRACT

Statistical estimates indicate that cancer is the third highest cause of mortality in Kenya with an estimated 7% of deaths per year (20,000 deaths per year) and 28,000 new cases per year. Globally, cancer is recognized as second only to cardiovascular diseases in causing deaths; constituting nearly 13% (over 7.9 million deaths) of global annual mortality. The 'disease burden' exacerbated by cancer is thus a cause for worry in many an economy. Early detection of cancer through screening continue to receive a lot of advocacy as a principal approach to fighting cancer worldwide and more so in low resource settings such as Kenya. But the question is, given that screening for cancer is not free (except for anecdotal cases of free screening campaigns) then what amount are people willing to pay for it and what, if any, influences their willingness and by extension the amount to pay? This study, through a contingent investigation (CVM approach), has attempted to tackle this question. The study focused on Dagoretti North Constituency in where a previous study had found low uptake of cancer screening. A pre-tested interviewer-administered questionnaire was used. A log-log model was used to investigate the relationship or elasticity between WTP and the factors that were hypothesized to influence it. To the extent that few, if any, studies in Kenya have examined the willingness to pay for cancer screening as a lifesaving intervention, this study is a contribution towards filling this gap. Findings from this study have valuable implications for health policy making with respect to fighting cancer. The study is also an addition to the existing literature on healthcare seeking behaviour and more particularly to the hitherto unexplored area of the economics of cancer screening.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

The World Health Organization (WHO) describes cancer as the "generic term for a group of diseases that can affect any part of the body" (WHO, 2002). Normally, the human body is said to have biological mechanisms by which it ensures that the growth of cells and their renewal are well controlled throughout one's life span. In the case of cancer, these mechanisms break down leading to uncontrolled growth and multiplication of cells- instead of undergoing natural attrition and getting replaced, these cells remain to form new abnormal (cancer) cells and even outnumber the normal cells (WHO, 2014). Once they affect one part of the body, these cancer cells may invade neighbouring tissues and move to other hitherto healthy organs and tissues in what is known in medical parlance as metastasis (WHO, 2002). It is said that metastasis take the greatest responsibility for mortalities from cancers. Cancers and some other non-communicable diseases (NCDS) share causes such as failure to exercise the body, obesity, the use of tobacco, unhealthy diet and exposure to environmental risk factors (carcinogens) (Republic of Kenya, 2011).

1.2 Background

The WHO recognizes cancer as second only to cardiovascular diseases in causing deaths worldwide. In its 2012 report, WHO estimated that over 7.9 million deaths in the world were being caused by cancer; a figure that constituted nearly 13% of global annual mortality (WHO, 2012). According to Globocan (2012), the world cancer incidence (new cases) as at 2012 was estimated at 14,067,894 persons per year whilst the world cancer mortality (deaths) was estimated at 8,201,575 persons per year. Using the Online Data Analysis tool of Globocan (2012), the projected world cancer incidence and mortality in 2020 is 17,113,588 and 10,046,745 persons respectively; see table 1 and 2 below.

Table 1: World Cancer Incidence

Year	Category (Age)	Male	Female	Both
2012	Ages <65	3537216	3846166	7383382
	Ages > =65	3873160	2811352	6684512
		7410376	**6657518**	**14067894**
2020	Ages <65	4137727	4410284	8548011
	Ages > =65	5019930	3545647	8565577
		9157657	**7955931**	**17113588**

Source: Globocan (2012)

Table 2: World Cancer Mortality

Year	Category (Age)	Male	Female	Both
2012	Ages <65	1896169	1539484	3435653
	Ages > =65	2757216	2008706	4765922
		4653385	**3548190**	**8201575**
2020	Ages <65	2222176	1782194	4004370
	Ages > =65	3537773	2504602	6042375
		5759949	**4286796**	**10046745**

Source: Globocan (2012)

Table 1 shows the estimated number of new cancer cases in the world as at 2012 and the predicted numbers in 2020. Thus in 2012 there were an estimated 14,067,894 new cases of cancer patients per year and this was projected to increase to 17,113,588 hence a growth of 22%. Male incidence would increase by 24% (from 7,410,376 cases in 2012 to 9,157,657 cases in 2020) while female incidence would go up by 20%. Table 2 on the other hand shows the estimated number of cancer deaths in 2012 worldwide and the corresponding prediction for 2020. The mortality from cancer would increase by 22%; from 8,201,575 deaths in 2012 to 10,046,745 deaths by 2020. Male and female mortalities would increase by 24% (4,653,385 to 5,759,949) and 21% (3,548,190 to 4,286,796) respectively. In both cases of incidence and mortality, males dying or being diagnosed of cancer at the age of 65 years and above were more than those under 65 years. However, for females, incidence was lower for those aged 65 years and above than those under 65 years old and vice versa for mortality.

The WHO (2002) notes that in the past cancer was regarded as a disease of the developed world but this has since changed, with developing countries having in excess of half of the world's cancer cases. It is estimated that about 70% of mortalities from cancer in the world occur in developing countries (Republic of Kenya, 2013). Stomach, liver, colon, lung and breast cancers are leading worldwide in terms of cancer deaths (Republic of Kenya, 2013).

According to the Kenya's National Cancer Control Strategy 2011-2016, cancer is number three cause of death in Kenya, following infectious and heart-related diseases. It accounts for 7% of

overall annual mortality in Kenya, with an estimated 28,000 new cases annually and over 22,000 deaths every year (Republic of Kenya, 2011). It is estimated that over 60% of those affected are below the age of 70 years and a person below the age of 75 years in Kenya has a 14% chance of getting cancer and a 12% chance of dying of cancer. The top types of cancer in women in Kenya are cervical, breast and oesophagus while the most common ones in men are oesophagus, prostate and Kaposi's sarcoma. Tables 3 and 4 below show the incidence of and mortality from cancer respectively according to Globocan (2012).

Table 3: Kenya Cancer Incidence

Year	Category (Age)	Male	Female	Both
2012	Ages <65	11169	17876	29045
	Ages > =65	6362	5592	11954
		17531	**23468**	**40999**
2020	Ages <65	14854	23797	38651
	Ages > =65	8745	8082	16827
		23599	**31879**	**55478**

Source: Globocan (2012)

Table 4: Kenya Cancer Mortality

Year	Category (Age)	Male	Female	Both
2012	Ages <65	6930	10052	16982
	Ages > =65	6484	4987	11471
		13414	**15039**	**28453**
2020	Ages <65	9299	13375	22674
	Ages > =65	8717	7083	15800
		18016	**20458**	**38474**

Source: Globocan (2012)

Table 3 shows that the estimated cancer incidence in Kenya in 2012 was at 40,999 persons every year; of which 23,468 were women whilst 17,531 were men. It also shows that the cancer incidence in Kenya is predicted to grow by 35% by 2020 (from 40,999 persons to 55,478 every year). However, contrary to the world incidence trend, the number of women diagnosed in Kenya was higher than men in 2012 and would still be higher in 2020 with a majority in both years being women aged 65 years and below. Table 4 shows that the estimated annual mortality in Kenya in 2012 was 28,453 persons (15,039 women and 13,414 men). By 2020 annual mortality in Kenya would have increased to 38,474 persons; a 35% surge. There would be more women than men dying of cancer and here also, a majority of the dying women would be below the age of 65 years.

Cancer Screening

The WHO defines screening as "the presumptive identification of unrecognized disease or defects by means of tests, examinations, or other procedures that can be applied rapidly" (WHO, 2002). The Republic of Kenya (2013) defines (cancer) screening as the "use of simple tests across a healthy population in order to identify individuals who have the disease but do not yet have symptoms." It can then be said that whereas screening is done on asymptomatic populations, diagnostic investigation is done on symptomatic population to confirm the presence of cancer and its stage, and thereafter the kind of treatment to be administered.

It is now a widely held view among the medical practitioners (oncologists) that early detection of cancer enhances the chances of a total cure. The benefits of early detection of cancers have been placed at 30% total cure, 30% treatment with prolonged survival period and 30% palliative care (end life issues and pain relief management) (WHO, 2012). The Kenya's National Cancer Control Strategy 2011-2016 estimates that in 80% of cancers that are reported, there can be very little achievement in terms of curative treatment since they are diagnosed at very advanced or late stages when the tumours have metastasized (Republic of Kenya, 2011). Cancer screening has received a lot of emphasis as an approach to cancer control. Its primary theme is to promote detection of cancer cells at an early stage (phase) so as to increase chances of cure. The earlier the cancer cells are discovered, the higher the chances of total cure. But even if the screening revealed cancer that has metastasized, there would still be benefit in the discovery in the sense that it would still help make a decision on what care to give to the patient, for example, palliative care.

Cancer Screening and the Value of a Statistical Life

If cancer screening saves life, what then is the value of the life saved through cancer screening? There is controversy on the issue of assigning monetary values to human life. However, the need for policies and strategies around projects or initiatives that are aimed at saving human lives makes the need to attach some form of monetary value to such projects unavoidable. The value of a statistical life (VSL) is one such way of expressing the value of an initiative that saves life. VSL measures the tradeoff between what one is willing to pay for an initiative that decreases the risk of dying and the amount of fatality (death) risk reduction, usually life years saved in numbers (Ashenfelter, 2006). Viscusi (2013) defines VSL more precisely as the "tradeoff rate between

money and risks of death". In other words, VSL is the wealth ratio that we are willing to dispense in exchange for a change in the likelihood (probability) of death. Thus suppose cancer screening requires spending such that one's wealth (W) is reduced by ΔW but it results in a reduction of probability of death (P) by ΔP. Then for any person willing to pay for cancer screening, $\Delta W/\Delta P$ would be the acceptable tradeoff to this person and it would be the VSL for cancer screening.

Available literature on VSL points to the fact that it cannot be observed directly and more so when the intervention or the good to be priced is 'non-market' like cancer screening. An indirect method is thus necessary for the estimation of VSL. Such a method would involve, for instance, asking a population the amount it is willing to pay (WTP) for an intervention that reduces the risk of death such as cancer screening. The contingent valuation method (CVM) comes in handy. It employs a 'stated' preference approach whereby hypothetical questions are put to respondents in a survey to answer, and from these answers their home-grown valuations are thus revealed (Whitehead and Dickinson, 2015). The hypothetical questions may involve asking the respondents the amount they would be willing to spend (pay) on an intervention like cancer screening. Once the WTP amount is elicited (either as a mean or median), VSL can be computed by dividing the WTP amount by the change in the probability of fatality (death) if known. Viewed this way, WTP is thus a precursor to VSL. The WTP for screening of cancer and what influences this WTP was the focus of this study whereas VSL for cancer screening in Kenya has been suggested for further research.

1.3 Problem Statement

The Republic of Kenya (2011) estimates that in 80% of cancer cases reported in Kenya, little can be achieved in terms of curative treatment since they are discovered very late when the tumors have metastasized (invaded secondary organs). The paradox is the low turn-out of people even when there are free cancer screening drives. Statistics obtained from the Africa Cancer Foundation on some cancer screenings carried out in Kenya on various dates between 2012 and 2014 reveal very dismal turnout by people as compared with the population of the areas where the screenings were held. For instance, in a free cancer screening exercise held on 26th and 27th October 2012 in downtown Nairobi at the Kenyatta International Convention Centre (KICC) only 1,821 people turned up for screening. In another free screening exercise on 23rd May 2014 at the Kisumu's Jomo Kenyatta Sports Ground, only 883 people were screened; while in another free screening exercise held at Mombasa's Tononoka Grounds on 25th July 2012 a paltry 460 people turned up for

screening (Africa Cancer Foundation , 2014). The 2009 Kenya Population and Housing Census shows that Nairobi, Kisumu and Mombasa have 3,133,518, 259,258, and 915,101 core-urban populations respectively (Republic of Kenya, 2010).

The question then is what are these things that make people shy away from cancer screening despite its being free? How much value do people attach to cancer screening as a fatality–reducing intervention? Assuming that people were willing to go for cancer screening, how much would they be willing to pay to save their lives and what factors would be driving their willingness to pay? Understanding people's willingness to pay for cancer screening is very important if stakeholders in the fight against cancer are to continue promoting screening as one of the best strategies in this fight.

Studies on WTP abound in Kenya but few, if any, have been carried out on WTP elicitation for screening of cancer despite this intervention being ranked highly as a cancer-death control initiative. Studies on factors influencing willingness to pay for cancer screening are equally scanty in Kenya. This study sought to fill this gap by examining the factors that influence peoples' WTP for cancer screening, how much they would be willing to pay, and in so doing came up with a 'price' estimate for cancer screening. The study took a contingent valuation approach in which a sample population in Nairobi County, Dagoretti North Constituency residents, was asked questions regarding their willingness to pay amount for cancer screening at certain price tags.

1.4 The Study Objectives

In a broad context, an investigation into the willingness to pay, and therefore the value that residents of Dagoretti North Constituency attach to cancer screening as a life-saving initiative was the objective of this study. The more specific objectives were:

i) To explore the factors driving the willingness to pay for cancer screening among the residents of Dagoretti North Constituency.

ii) To estimate the amount that residents of Dagoretti North Constituency are willing to pay for cancer screening.

iii) To make policy recommendations and suggest areas for further research based on study findings.

1.5 Justification of the Study

Early detection of cancer continue to receive a lot of advocacy as a principal approach to cancer control not just in Kenya but worldwide (WHO, 2006, 2002; Republic of Kenya 2013, 2011). One of the critical interventions for early detection of cancer is screening of asymptomatic populations. But the question is, given that screening for cancer is not free (except for anecdotal cases of free screening campaigns) then what amount are people willing to pay for it and what, if any, influences their willingness and by extension the amount to pay? This study makes an attempt at tackling this question through a contingent investigation. To the extent that there is almost no study in Kenya that has examined the willingness to pay for cancer screening as a lifesaving intervention, this study is a contribution towards filling this lacuna.

The results from this study may give valuable insights into screening for cancer which should then be taken into consideration when developing cancer control programmes (such as screening) as recommended by the World Health Organization (WHO, 2002). For instance, from this study we may get to know how willingness to pay for cancer screening varies with age so that we can take necessary steps to tweak screening programmes to suit the various age groups. In its 2011 publication, the WHO lists a number of priority areas for research in the area of NCDs and particularly cancer (WHO, 2011). In the area of cancer, this publication prioritizes research on the development of methods necessary for implementing strategies for cancer prevention such as early detection whilst factoring local culture and local resources (WHO, 2011). By examining the possible influence of such factors as religion and distance to the nearest health facility on the willingness to pay for screening of cancer, this study is thus awake to the need to factor in local culture and resources in a cancer prevention strategy such as early detection through screening, and in so doing this study hearkens to this call for research by the WHO.

Further, it is hoped that this study will contribute in enhancing health policy making with respect to fighting cancer and NCDs in general. A government policy to offer free cancer screening services or to subsidize the screening services would be informed by findings from such a study as this one. The study is also an addition to the existing literature on healthcare seeking behaviour and more particularly to the hitherto unexplored area of the economics of cancer screening.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter delves into a review of some theoretical and empirical literature that underpin the key concepts relating to this study. These concepts include contingent valuation and willingness to pay as used in valuation surveys, and health care seeking behaviour. Broadly categorized into two sections, the first section delves into the theoretical literature whereas the second section looks into the empirical literature. The chapter wraps up with an overview of the reviewed literature in the last section.

2.2 Theoretical Literature

The concepts contingent valuation method (CVM) and willingness to pay are generally founded on welfare economic theory and the microeconomic theory of consumer choice and demand. CVM is founded, one, on the constructed market theory which in turn is founded on the market failure phenomenon propagated by welfare economic theory and two, on consumer choice or preference elicitation.

Welfare economic theory identifies non-market goods and services for which information about their market is scanty or not available altogether. Therefore, behaviours that mimic real markets have to be constructed hence the term constructed market (Munasinghe, 1993). CVM is a constructed market tool that can help in simulating a market and consequently valuing non-market goods and services. It involves asking a sample of consumers about their willingness to accept (WTA) compensation or willingness to pay (WTP) in monetary values. CVM can take either WTA or WTP approach. WTP approach is preferred when determining what, if any, a respondent would be willing to give in order to get a positive result or avoid a negative one whereas WTA is preferred when looking at how much he or she would want to be paid so as to accept the negative consequence of something (or to forego a positive outcome he would otherwise enjoy) (Hausman, 2012). From economic theory, one would expect that both WTP and WTA give the same result but empirically they have been observed to give different results. In particular, it has been observed that questions on WTA tend to give higher values than WTP questions but this is not supported by economic theory. One suggestion to explain this discrepancy has been that people are more willing

to spend the 'opportunity' income or wealth they do not yet have than they are willing to spend actual income or wealth. There is preference for WTP as it is considered more consistent and credible. However, in valuation issues that involve compensation for loss of benefits, WTA tends to give higher figures and is thus considered more appropriate (Munasinghe, 1993).

The theoretical underpinning of WTP is to be found in consumer surplus theory and the Hicksian demand function. In a competitive model, demand curves represent the highest price that consumers are willing to pay for a unit of a good or service (Henderson, 2005). Most of the time, the value placed on a product exceeds its price and when this happens, consumers are said to be enjoying surplus value (Frank, 1991). In the case of market failure such as that of non- market good and services, the surplus value (consumer surplus) cannot be determined directly from the market demand functions. One way is to construct a market, a hypothetical one, in order to estimate the WTP of an individual. Looked at from a Hicksian demand perspective, WTP is akin to an individual's equivalent variation.

A consumer's preference can either be revealed or stated. Revealed preference approach looks into already existing data on wage or consumer behaviour whereas stated preference approach requires the respondent consumer to 'state' his preference in a survey. A stated preference approach, CVM can be used to elicit willingness to pay or accept compensation (Wang and He, 2014). The theoretical underpinning of WTP is thus to be found in consumer surplus theory and the Hicksian demand function. WTP is also a case of an inverse demand function.

McGuire, Henderson and Mooney (1988) hold that the value of health is in its use but not in the way it can get exchanged meaning that one cannot trade health and so there are no markets in health. Health care, however; can be purchased directly though its consumption is driven by the belief that it is a good investment towards a good health status. Viewed this way demand for health care is a 'derived demand' (from consumers' desire for a good health status). A distinction between health care and medical care is not clear in the existing theoretical literature on health seeking behaviour. The closest it has come to a distinction is implying that medical care is a subset of heath care. Consumer demand theory is at the root of studies of consumer demand for healthcare or

health seeking behaviour in general. Here too, consumers are constrained by a budget line in trying to choose health care commodities that maximizes their utility.

Cancer screening is a health care commodity that can be traded but as a non-market commodity, and as a non-market commodity, this study applies the CVM approach as propagated by welfare theories in simulating a market for cancer screening. The stated preference approach is used to elicit WTP for screening of cancer. The Grossman theory as found in McGuire *et. al* (1988) and Henderson (2005) is applied in this study as a foundational insight into health seeking behaviour and more particularly in trying to explain why people would or would not seek cancer screening as expressed by their willingness (or unwillingness) to pay for cancer screening.

2.3 Empirical Literature

2.3.1 CVM and WTP

The Exxon Valdez oil spill of 1989 resulted into focused attention on CVM as a measure of people's value for environmental resources. The ensuing period saw a lot of debate on CVM and at its peak were the works of Mitchell and Carson on CVM published in 1989 and the Blue Ribbon Panel constituted by the National Oceanic and Atmospheric Administration (NOAA) of the US government and was tasked with assessing the validity of measures of nonuse value obtained through contingent valuation (Mitchell, 2003; Carson *et al.*, 1996; Mitchell, Leggett, Kleckner, Boyle & Duffield, 2003; Whitehead and Dickinson, 2015). Both the NOAA panel and the work of Mitchell and Carson in 1989 recommended face-to-face interviews or in- person survey where the interview is conducted in the respondents dwelling place (Mitchell *et al.* 2003). Over the years CVM has tended to take a stated preference approach as opposed to revealed preference approach and a number of studies have preferred stated to revealed preference in eliciting WTP. Freeman (1993) observed that where behavioural trail is missing, little help should be expected of revealed preference methods and instead stated preference methods should be used. Some studies also support stated preferences in the sense that consumers directly state their WTP with no financial commitments imposed on them (Voelckner, 2006; Hauber, 2008). Vega and Alpizer (2011) support stated preference given that it makes it possible to estimate both use and nonuse values.

Prosser, Ray, O'Brien, Kleinman, Santoli and Lieu (2004) used CVM to elicit WTP for pneumococcal conjugate vaccine in a US community sample of 109 respondents. The vaccine reduces the risk of falling ill from 6 diseases. They found out that the coefficient for income and education were significant whereby people with higher income gave higher WTPs while those with higher education levels gave lower figures (Prosser *et. al* 2004).

Hakes and Viscusi (2007) examined the value of wearing seatbelt using stated preference (CVM). Frequent users of seatbelt attached a higher value to it (USD 5.3 million) compared to occasional or non-users of seatbelts (USD 3.9 million). The rate of seatbelt use was observed to increase with age and level of education. In terms of gender, there were more women wearers than men which is consistent with risk-taking behaviour theories. The likelihood of cigarette smokers to wear seatbelts always was seen to be low but this is not uncommon for hazardous consumption activities (such as smoking) that are connected to risky behaviours (Hakes and Viscusi, 2007).

Milligan, Bohara and Pagan (2010) assessed WTP for the prevention of cancer in the US based on an existing survey data. Age was found to have an inverse relationship with WTP whereas the probability of developing cancer and one's income were seen to vary positively with WTP. Self-assessed risk was seen to be lower in respondents who scored low on numeracy than those who scored higher. The numeracy skills here were a measure of how literate the respondents were in matters of health in addition to their cognitive strengths in relation to assessment of cancer risk (Milligan *et al.* 2010).

Another study on WTP for cancer mortality risk reduction was done by Wang and He (2014). In this study, a contingent valuation approach was applied on households in three rural villages of China to elicit the households' WTP amount for a hypothetical vaccine for cancer that would ensure the respondents do not develop cancer for one year. The respondents were asked Multiple-Bounded Dichotomous choice questions to get their willingness to pay for the cancer vaccine. The WTP amount was further used to estimate the VSL of a cancer vaccine and was found to be between USD 58000 and 98,000.00. They found out that as the level of risk reduction went up, WTP also increased but at a decreasing rate. This view is also shared in the works of Persson *et al.* (2001) who observed that WTP increases at a decreasing rate relative to mortality risk reduction

(Persson *et al.*, 2001 as cited by Wang and He, 2014). In their study, Wang and He (2014) estimated the mean and median WTP for the hypothetic cancer vaccine at 759 and 171 yuan per year respectively. Respondents who had better education, higher levels of income, relatives suffering from cancer, uncertain or less income in the future and exercised regularly had higher WTP values. There was also a positive correlation between WTP and the level of trust in the medicine. The attitude of the respondents towards the cancer vaccine was seen to be a function of age, gender and geographical location. In a certain village called Jiangon, men who were aged 65 years and below were more willing to pay than their counterparts aged above 65 years but in general, males had a higher WTP than the females (Wang and He, 2014). This is a departure from Hakes and Viscusi (2007) who observed that more women than men were willing to pay for and wear seatbelts as fatality risk–reducing intervention.

Fonta and Ichoku (2005) assessed the application of CVM to community led financing schemes in Ndop area of Cameroon. Interviewer- administered structure questionnaire was used to interview a total of 387 households drawn from six communities to elicit their willingness to pay to help introduce some new fish species into a reservoir in the area for poverty reduction. In this study, household income was measured in terms of possession of household assets, crops and animals. Having removed 24 invalid responses characterized by protest zeros and outliers, the median WTP for the valid responses was USD 1.08 while the mean WTP was USD 1.35. Amongst the variables of which influence on WTP was assessed, household income (wealth) and education attainment had the expected positive sign and both were statistically significant. Female respondents bided lower than their male counterparts.

Kabubo-Mariara *et.al* (2010). Fonta and Ichoku (2005) used a pretested interview – administered questionnaire to interview 1000 households living in a community called Bambalang in Northwest Cameroon. The households were randomly selected. A dichotomous choice supported by a follow up question was applied to assess WTP for restocking Bamendjim dam with the (mosquito) larva-eating fish species in order to combat malaria. Among their findings was that the starting price had a negative relation to WTP thereby implying that the higher the initial price, the higher the possibility of not paying or of protest voting. Younger people were found to be less likely to pay. Household incomes, knowledge of malaria illness, certainty about future income were seen to have

a positive correlation with WTP. Those respondents who preferred unorthodox means of treatment (e.g. traditional doctors) to conventional medicine were more likely to protest.

In his study, Abala (1987) employed CVM to investigate the willingness to pay for recreation at the Nairobi National Park. He found out that income, educational attainment and distance were statistically significant whereas marital status, entry fee and age were WTP influencers but were not statistically significant (Abala, 1987).

2.3.2 Health Seeking Behaviour:

Following Grossman (1972), Feldstein (1983), McGuire *et al.*(1988) and Henderson (2005), medical or health care demand is a derivation of 'health' demand whereby health is not to be defined simply as not ailing from any disease or infirmity but as a state of well-being; physically, socially and even mentally (McGuire *et al.*,1988). But the health demand, in what constitutes the Grossman model, has been observed as a derivation in itself whereby consumers are seen to demand health both as a commodity to be consumed for utility and as a commodity to be invested for production. McGuire *et al.* (1988) observes that Grossman model focuses more on the investment-driven health demand.

Henderson (2005) categorizes determinants of health seeking behavior (viewed as factors influencing demand for medical care) into two: those relating to patient and those relating to physician characteristics. Economic status, demographic features and health status constitute patient factors. In terms of health status, preventive or primary care demand may go up by the sheer desire to stay healthy. Demographic characteristics such as family structure changes (more single parents, more women in labour force, late marriages, fewer children per family) translate into fewer opportunities for direct family care and greater reliance on medical providers. Age was observed to increase demand for medical care. Women were observed to spend more than men in their child-bearing years. Men were more able to substitute home care for hospital care because they have wives at home to take care of them. Single individuals were more likely to seek medical care than married ones. Individuals with high income were seen to demand more medical care. People who are not directly responsible for paying for medical bills- where they are under insurance cover- are more likely to demand medical care. Physician factors may include a medical services provider recommending additional procedures, follow up sessions among others.

Mwabu, Wang'ombe and Nganda (2003) used a quantile regression model to analyze demand effects of user fees using secondary data from Kenya's Ministry of Health. The data set used comprised 58 health facilities and four districts from which 2018 households were picked. Price elasticity of medical care demanded was seen to be small and declining with the quantiles, which means, a relatively large increase in user fees had a small impact on visits to the health facilities and mainly impacted the lower quantile (the poor) whilst for the upper quantile (e.g. 75th percentile) it was almost unimportant. Income elasticity rose then declined with the quantile whereas education increased steadily with the quantiles. Age and distance were also seen to rise then fall with the quantiles. Marital status was found to have a negative effect -married people made fewer visits to health facilities compared to single people, causally suggesting that married people are healthier than unmarried people or that the opportunity cost of seeking health care for married people is higher than for unmarried people. Urban people were more likely to visit health facilities than rural people. Distance was found to be insignificant perhaps due to close proximity of households to health facilities. Attendance was positively correlated to being a Christian and to a government health facility. In terms of occupations, farmers visited health facilities more times than people in other occupations but when interacted with schooling, educated farmers made less visits to health facilities than uneducated ones.

Muriithi (2013) conducted a study in a slum environment (Kibera Slum) to investigate the health seeking behaviour drivers (determinants) in such environs. Data was collected at facility level and in total 483 observations were made. He applied the multinomial logit model in his analysis and found that distance had a negative influence on choice of health facilities whereas quality of care was significant albeit small in public hospital. Information about the service offering of a health facility was positively correlated to its being chosen. Females were more likely to visit health facilities than the males. Education had a significant positive coefficient meaning that educated people were more likely to visit professional health facilities. Household size was positive and statistically significant to choice of the facilities. Age was found to be significant and positive to the demand for health facility, which means that probability of using professional health care increased with age. User charges had a negative co-efficient but very significant. Compared to self-treatment, formal health care facilities had a negative correlation with user fees whereby the

higher the user charge the lower the likelihood of visiting a formal health facility. Those who had formal employment preferred professional health care to self-treatment. The finding on waiting time was however surprising. Waiting time coefficients were high, positive and statistically significant suggesting that people did not care much about the time they took to get treatment as long as it was worth it (Muriithi, 2013).

2.4 Overview of Literature

The above reviewed literature has expounded the concepts of CVM, WTP and health seeking behavior (demand for medical care). Notwithstanding fierce criticism of CVM notably from the two fiercest critics of CVM, Peter Diamond and Jerry Hausman (Hausman, 2012), contingent valuation method was used in many of the studies in elicitation of the willingness to pay (Abala, 1987; Fonta and Ichoku, 2005; Wang and He, 2014 among others). It was not by accident that these studies applied CVM approach; there were no direct markets in which WTP could be elicited. The fact that there is no direct market for screening of cancer makes CVM the preferred approach for this study as well given CVM by its nature is a constructed market tool. Stated preference approach is preferred to revealed preference approach (Loomis, 2011; Voelckner, 2006; Hauber, 2008). Some studies have supported the use of in-person surveys (Mitchell *et al.* 2003). There is evidence on the use of CVM in cancer prevention studies (Milligan *et al.* 2010, Wang and He, 2014).The dichotomous choice format seems to have many advocates especially due to its ability to minimize biases in CVM. In fact, some studies made improvements to the dichotomous choice format: Wang and He (2014) used Multiple-Bounded Dichotomous Choice; Kabubo-Mariara *et.al* (2010) buttressed Dichotomous Choice with a follow up question. From the literature reviewed, there seems to be a general consensus that socio- economic and demographic characteristics of individuals have an influence on their WTP even for fatality-preventing initiatives. However, there exist mixed findings with regards to some factors. Generally, income was found to correlate positively with WTP and demand for medical care. Age elicited the most controversy. Milligan *et al.* (2010) found that younger people elicited higher WTP amounts than older people, Henderson (2005), Hakes and Viscusi (2007), Kabubo-Mariara *et al.* (2010) found WTP to correlate positively with age whereby older people had a higher WTP. Some studies supported the expectation that men should have a higher WTP (Fonta and Ichoku, 2005; Wang and He, 2014) but others arrived at a different finding whereby women were found to have a higher WTP and demand for medical care (Henderson, 2005; Hakes and Viscusi, 2007; Muriithi, 2013). While level of education was

seen to influence WTP and demand for medical care positively. Muriithi (2013) found those with higher levels of education visiting private hospitals while those with lower levels of education frequented public health centers.

Though a number of the reviewed literature has focused on health care, none of them has attempted to assess the value, in economic terms, of cancer screening in Kenya and perhaps in eastern Africa as a whole despite cancer screening being promoted as the number one primary care in the fight against cancer. This study is therefore an effort to bridge this gap by attempting to estimate the value that people attach to cancer screening as a fatality-reducing (death reducing) intervention and in doing so, investigate the factors influencing demand (willingness to pay) for cancer screening in a representative Kenyan population.

CHAPTER THREE: METHODOLOGY

3.1 Theoretical Framework

CVM has been found to be suitable for both use and non-use value measurement (Mitchell *et al.*, 2003; Munasinghe, 1993). The bidding game, payment card, open-ended and dichotomous choice formats are the main WTP elicitation approaches in surveys involving contingent valuations (Kabubo-Mariara *et al.*, 2010). In an open-ended format, the respondent is asked and given the opportunity to quote his maximum WTP amount for a commodity. But for high non-response and protest zeros that characterizes this format, it tends to give unexaggerated figures. In bidding game, the WTP amounts are varied up and down like in an auction and then the highest amount is recorded. This format has been observed to trigger anchoring biases such as starting-point. The payment card format stands between the open-ended and the bidding game. Here, a 'card' with an array of WTP amounts is presented to the respondent then he is asked to pick the highest amount he is willing to pay for the commodity under valuation. But the payment card has been blamed for its susceptibility to implied-value-cue bias. A dichotomous choice (DC) format is akin to a referendum (either yes or no). Even though the respondent can be presented with an array of prices, he is required to express a yes or no willingness against each price. Among its advantages is that a DC format has room for follow up questions which mitigates the chances of non-response and even protest zeros. An advancement of the DC format is the multiple-bound dichotomous choice (MBDC) which further breaks down the yes/no responses into 'definitely yes/no' or 'probably yes/no' or 'not sure'. This study prefers the MBDC technique to the other formats due to its ability to mitigate protest zero and non-response bias. MBDC also helps in minimizing hypothetical bias.

The willingness to pay is influenced by a myriad of factors which are founded on health seeking behaviour or health care demand theories. The widely known health care demand theory is that of Michael Grossman. Following Grossman (1972), Henderson (2005), a number of factors have been modeled as traditionally affecting medical care demand: level of education, income, age, size of the household, gender, marital status, health status, among others. Essentially these are the same factors that affect willingness to pay for a product since WTP, so to speak, is the same as the demand for the product (cancer screening). Such that WTP can generally be given as:

$$WTP=\alpha+\beta_1X_1+\beta_2X_2+\ldots\ldots+\beta_nX_n+e$$

Where, βs are parameters to be estimated, Xs are explanatory variables and e is the error vector which is made up of the unobserved characteristics.

3.2 Study Design

3.2.1 Study Area

The study was done in Dagoretti North Constituency. Dagoretti North constituency is located in Nairobi County, Kenya. According to IEBC (2015), the constituency has a population of around 181,365 and covers an area of 29Km^2. It is further divided into 5 County Assembly wards comprising of 6 administrative sub-locations. These wards are: Gatina Ward (Gatina sub-location), Kilimani Ward (parts of Kilimani and Maziwa sub-locations), Kawangware Ward (spans part of Kawangware sub-location), Kabiro Ward (parts of Kawangware sub-location) and Kileleshwa Ward (Muthangari and Kileleshwa sub-locations). The constituency has a mix of socio-economic and demographic characteristics –the informal low-income residents (mainly in Kawangware, Gatina and Kabiro Wards); the middle-income residents (in parts of Kilimani Ward, Amboseli and Lavington West areas) and the high-income residents (parts of Kileleshwa, Kilimani, and Lavington). The residents are also of diverse ethnic backgrounds. Cancer is sometimes said to be a lifestyle disease and this cosmopolitan nature allowed for this to be somewhat ruled out based on study findings. The uptake of cancer screening in the constituency is low. A previous study on cervical cancer screening, for example, revealed an uptake of 19% across 6 health centres in Dagoretti (Nasambu, 2016). There was; however, no data to suggest that the constituency was at a higher or lower risk of cancer than any other constituency in Kenya.

3.2.2 Sampling

A representative sample was obtained by randomly selecting households within Dagoretti North Constituency. This constituency covers six administrative sub-locations (Gatina, Kawangware, Muthangari, Kileleshwa, Kilimani and Maziwa) with a total of approximately 57,342 households (Republic of Kenya, 2010). To calculate the desired sample size, we assume our sample covers 50% of the population (p= 0.5). However, taking cervical cancer screening as an example, evidence pointed to a less than 30% turn-out for screening in low-resource settings. Ati, Kim, Lambe, Lu, Rajbhandari, Soetikno, Tergas and Wysong (2013) found a 24.4% uptake rate in Indonesia. Estep, Martin, Reinsel, Tergas, Varallo and Wysong (2014) found a VIA turn-out rate

in Guyana at 13% whereas a study in Dagoretti, Nairobi County, gave an uptake of 19% (Nasambu, 2016). But still, we were interested in an asymptomatic population which was of an unknown proportion of our target population and so based on existing literature, we assumed a proportion of 50% (p=0.5). Therefore, at 95% confidence level (Z=1.96) and allowing only 5% error margin (d=0.05), our desired sample size was,

$S = Z^2.p(1-p)/d^2 = 384.16$

Where,

Z is the standard score for confidence level

p is the proportion of population to be covered

d is the error margin or confidence interval

S is the sample size

Thus the calculated sample size was 384 households. However, on cost considerations this sample size was too large for this study. This study was able to interview 80 households, whereby on average each ward had 16 of its households interviewed. The interviews were conducted during day time and mostly over the weekends when the household heads were expected to be around. The interviewer went around knocking on the households at random and inviting the heads of the households or in their absence, any benevolent leaders or dictators present, to the interview. In the absence of such heads, leaders or dictators or in case they refused to be interviewed, the neighbouring households were approached for interview.

3.2.3 Elicitation Method

The study employed a contingent valuation approach in which the respondents were asked to state how much they would be willing to pay for cancer screening. Following Wang and He (2014), the study adopted a multiple–bound dichotomous choice (MBDC) referendum format. Different price levels mirroring the charges for cancer tests by health facilities in Nairobi were presented to the households to vote on but instead of a simple Yes or No, the respondents were required to express certainty in their votes by choosing either "Definitely yes, Definitely no, probably no, not sure, probably yes " for each price level. The hypothetical WTP elicitation question was framed as follows:

Suppose testing for presence of cancer cells in your body every year prevents you from dying of cancer by ensuring that it is discovered early, treated and you become totally cured, and conversely, suppose failing to test for cancer in a year means that in case cancer is discovered in your body it would be too late to totally cure leading to your death. We would like to know the probability that you would pay for the cancer testing (screening). One annual test may require you to pay a certain amount of charge (which goes towards doctor's fees, cost of equipment to be used, procedures etc). If you were presented with different charges for a complete cancer screening as shown below, what is the possibility that you would pay each charge? Remember that people are at different risk levels of getting cancer and so the motivation for and likelihood of testing for cancer may vary. Also, there is no additional income that you are given for cancer screening; it is from the same income (salary) that you would buy other things like food, pay rent, clothes or even pay for treatment of other diseases. Given the following list of charges for a complete cancer screening, we only want to know the possibility that you would pay for the test. Please tick one likelihood for each charge (price) given below. No answer is right and none is wrong; we just want to know your reaction to the different charges. This research is important in understanding cancer screening as a life-saving intervention and so it is important you be as much realistic and honest as possible.

Charges in Kshs.	**Definitely not**	**Probably not**	**Not sure**	**Probably yes**	**Definitely yes**
25001 - 40000					
15001 - 25000					
5001 - 15000					
1001 - 5000					
50 - 1000					
Free (0 Ksh)					

A departure from Wang and He (2014) is that the bids (price levels) were arranged in a descending order following Deshazo (2002) as cited in Flachaire and Hollard (2006). This was to minimize starting point bias. Semi-structured questionnaires were administered through face to face interviews. Another departure from Wang and He (2014) was that only the 'definitely yes' were chosen from the polychotomous responses. This was to help minimize hypothetical bias (Blomquist, Blumenschein, Johannesson, Liljas and O'Conor, 1998).

A development by this study is that from the 'definitely yes' responses given by each respondent, we selected the highest amount of the 'definitely yes' responses. This 'condensed form' of a

multiple-bound dichotomous choice elicitation format mirrored an auction bid format in which the respondent is asked to give the highest amount he is willing to pay only that in this 'condensed form of MBDC' the bid was not obtained through open-ended format as would happen with auction bids. This condensed form had some advantages. First, as opposed to the usual auction bid (open ended format) in which the respondent is asked to give some hypothetical highest amount he is willing to pay, in this condensed form the respondent indirectly chose the highest amount from a list of real market prices (prices depicted real charges by hospitals and as per doctors' fee guidelines recommended by the Kenya Medical and Dentist Board 2013). Second, having come from a multi-bound dichotomous choice format, this condensed form minimized hypothetical bias whilst coming closer to real WTP. Third, in this condensed form, the relationship between the highest WTP amounts and the hypothesized explanatory variables could be analyzed using a multi-linear regression model without having employed the complex likelihood estimations (Pham *et al.*, 2008). Finally, having a list of 'definitely yes' answers per respondent then picking the highest amount was akin to employing a single dichotomous choice in which the respondent is asked whether or not he would be willing to pay for some product or initiative then he is presented with a list of bids (prices) and asked to select the highest amount he would pay. As with other dichotomous choice formats, this mitigated both protest zero and hypothetical biases.

Another development by this study was that rather than presume that the respondents were willing or not willing to pay for cancer screening, the study first sought to find out whether the respondents were willing to be screened for any health problem and in particular cancer. For WTP elicitation, the study thereafter narrowed down to those who were already willing to be screened for cancer *ex ante*: without cost consideration. This approach, in the view of this study, helped establish if indeed, cancer was a valued health problem or whether there were other health problems that the people were more concerned about and which they had rather be screened for. In narrowing down to only those who expressed willingness to be screened for cancer *ex ante*, the study in effect minimized protest zero bias.

3.3 Econometric Model:

3.3.1 Dependent variables

This study focused on elicitation of willingness to pay for cancer screening. Thus, WTP was the dependent variable that was regressed against some explanatory variables broadly grouped into personal, socio- economic and demographic characteristics.

3.3.2 Explanatory (Independent) variables.

This study hypothesized that WTP is affected by personal, socio- economic, demographic and other characteristics of the individuals. Most of these variables are the same ones that influence demand for health care and include: education level, income level, occupation, household size, type of health facility preferred, religion, age, gender, marital status, smoking, physical exercises, basic information about cancer, cancer screening awareness, relative diagnosed with cancer, attitude towards cancer screening, distance and fear of cancer screening.

Education level

With a few exceptional findings, most studies agree that education level increases the demand for health care especially in formal health facilities. Cancer screening can only be done in a formal health facility (as opposed to traditional healers) hence was expected that the higher the level of education the higher the WTP. In this study, education level will be categorized into: no education, primary, secondary, higher.

Income level

The hypothesis from economic theory is that the higher the income, the higher the WTP. Respondents were asked to state their net monthly salaries and an estimate of their monthly expenditures. For those in informal employment (with no regular salary), monthly expenditures were used as proxy for income.

Occupation

This describes the types of work the individuals do; whether formal or informal. The study area is cosmopolitan, both high income and low income, blue collar and white collar hence it was necessary to assess whether the type of work influences WTP. The *a priori* expectation was

ambiguous but generally the study hypothesized that people in formal occupations have regular income hence more certain of future income and so would elicit higher WTP than those in informal occupations.

Household Size

Household size influences family budget allocation, it would appear that the larger the family size the higher the demand for medical care but at the same time large size may mean resources are allocated towards more pressing needs (such as food) than prevention care such as cancer screening hence low WTP. In this study, it was hypothesized that larger household size would give higher WTP.

Type of Health Facility Preferred

The types of health facility here would be broadly categorized into either formal (hospital, health centre, clinic, medical camp etc) or traditional healer. The respondents were asked to state between the two which one they would prefer to seek treatment or consultation from whenever they fell ill. Since cancer screening facilities can only be available in formal health facilities, it was expected that those who prefer formal facilities to traditional healers would elicit higher WTPs.

Religion

This variable was included to test whether religious beliefs affect WTP for cancer screening as a life–saving intervention. Religion was categorized as Christian, Muslim, Hindu, Traditional or none of the above.

Age

Study findings are divided on the influence of age on WTP and generally on health seeking behavior. In this study, older people are presumed to be at higher risk of getting cancer than younger people hence the more need to go for cancer screening. Thus age was hypothesized, in this study, to vary positively with WTP.

Gender

Most studies have found men to have a higher WTP than women since they are most often in charge of family income. It was also expected in this study that men would be found to elicit higher WTP than women.

Marital Status

This variable is included to test whether WTP for cancer screening is influenced by marital status. The respondent was required to state whether married or unmarried (divorced, separated, single, and widowed). Being married here was "defacto," that is, we took the simple meaning whereby as long as the respondent was staying with a spouse and said that they are married we would not get into details of whether, for example, they were simply cohabiting, among others. In this study, married people were expected to be more supportive of each other in pursuit of health lifestyles such as going for health checks and so being married was expected to be positively correlated with WTP.

Smoking

Whether the individual smokes was included as a variable to show the individual's perception of risky lifestyles. Smoking in this case was an indication of risk-taking behavior and so those who smoke were expected not to care about cancer screening hence low WTP.

Exercises

Engaging in physical exercise is regarded as a healthy lifestyle that should keep some cancers away. Thus people who engage in healthy lifestyle such as physical exercises should have no problem with going for cancer screening hence the WTP for cancer screening was expected to vary positively with physical exercising. On the other hand, people who exercise regularly may see themselves as at a lower risk of cancer hence may not see the need for cancer screening.

Basic Information about Cancer

Respondents were asked a basic question about cancer, that is, whether or not they had heard of a disease called cancer. It was expected that WTP for cancer screening would be positively related

to awareness of the disease among the people. This study hypothesized that lack of information about cancer was also to blame for low screening uptake.

Cancer Screening Awareness

This variable was included to test whether the respondents had heard about cancer screening. The expectation was that those who were aware of cancer screening and its benefits in reducing mortality would be more willing to pay for it.

Relative Diagnosed with Cancer

We expected that those with relatives who were already diagnosed with cancer would be more willing to pay for cancer screening due to a higher level of awareness about the disease. Where respondents themselves were already diagnosed with cancer (any type of cancer), we expected no elicitation of WTP since they already had the disease. Following Wang and He (2014), such respondents who were already diagnosed with cancer were removed from the sample observations during analysis.

Attitude (towards cancer screening)

The belief system among the people can have a negative or positive influence even on an obviously valuable good like cancer screening. This belief system presents itself in terms of attitude towards the commodity. The study incorporated this variable by asking whether or not the respondent thought cancer screening is useless. Logically, those who had a poor attitude towards cancer screening (considered it to be useless) were expected to elicit a lower WTP.

Distance

From theory, distance to the nearest health facility has been found to have a negative influence on demand for health care. We therefore included this variable in the study to assess whether proximity to a health facility had an influence on WTP for cancer screening. In our case, a health facility included a medical camp or mobile clinic. We expected theory to hold.

Fear (of Cancer Screening)

It has been observed that some cancer screening procedures are overly intrusive and this has created some kind of fear on people who may otherwise be willing to go for cancer screening. A question on whether or not the respondents feared cancer screening procedure was asked. The expectation was that those who feared cancer screening procedure would elicit low WTP.

3.3.3 Definition of Variables and Model Specification

VARIABLE	DEFINITION & MEASUREMENT	A *PRIORI* EXPECTATION
Dependent variables		
WTP	Willingness to pay amount in Kenya Shillings. This will be presented in price ranges and the mid-points will be taken as the WTP amounts.	
Explanatory variables		
Education Level (EDUC)	Education level =0 if respondent has no education Education level = 1 if respondent has primary education Education level = 2 if respondent has secondary education Education level = 3 if respondent has higher education	Those with primary, secondary and higher education give higher WTP amounts than those with no education
Income level (Y)	Monthly expenditure or take home pay in Kenya Shillings (Ksh)	Positive
Occupation (OCCUP)	Informal = 1 or otherwise =0	Negative for informal i.e those in informal occupations give lower WTPs than those in formal occupations
Household size (HSIZE)	The number of dependants in a household plus the household head/respondent	Positive
Type of Health Facility Preferred (HFAC)	0 = if traditional healer is preferred 1=if formal health facility is preferred	Those who prefer formal facilities give higher WTP than those who prefer traditional healers
Religion (REL)	Religion = 0 if traditional Religion = 1 if Christian Religion =2 if Muslim Religion = 3 if Hindu Religion = 4 if none of the above	Ambiguous
Age (AGE)	Age as at immediate last birth day in years	Positive
Gender (SEX)	1= male; otherwise =0	Males give higher WTP than females
Marital status (MARR)	1 = married: otherwise =0	Positive for married i.e married people give higher WTP than unmarried ones
Smoking (SMOK)	1 = smokes; otherwise =0	Negative: smokers give lower WTP than non-smokers
Physical exercise (PHYSIC)	0 = no physical exercise in last 7 days 1= has engaged in physical exercise in last 7 days	Positive for those who engage in physical exercise i.e those who engage in physical exercises give higher WTP than those who do not.

VARIABLE	DEFINITION & MEASUREMENT	A *PRIORI* EXPECTATION
Information about cancer = (INFO)	1= has never heard of cancer ; otherwise=0	Positive for those who have heard of cancer i.e those who have cancer information give higher WTP than those who do not.
Cancer screening Awareness (AWARE)	1= has heard of cancer screening; otherwise =0	Positive for those who are aware of cancer screening i.e those who are aware of cancer screening give higher WTP than those who are not aware of it.
Relative diagnosed with cancer (RCANCER)	1 = has a relative suffering from cancer; otherwise =0	Positive for those whose relative (s) have been diagnosed of cancer i.e those whose relative(s) have been diagnosed of cancer give higher WTP than those who do not have relatives who have been diagnosed of the disease.
Attitude towards cancer (ATT)	1 = thinks cancer screening is useless; otherwise =0	Negative for poor attitude i.e those who think cancer screening is useless give lower WTP than those who think it is useful.
Distance to the nearest health facility (DIST)	Estimated distance, in Kilometers (Km), from the household to the nearest health facility.	Negative
Fear of cancer screening procedure (FEAR)	1= fears cancer screening procedure; otherwise =0	Negative for fear i.e those who fear cancer screening procedure give lower WTP than those do not fear.

The WTP having been elicited through the condensed MBDC, a multiple regression model was applied to establish the relationship between WTP and the explanatory variables that were hypothesized to influence the WTP. WTP is an indirect demand function (though a competitive market condition has to be assumed). In our case, price (bid amount) was the proxy for WTP.

Now, let the WTP for the respondent i be WTP_i. Taking WTP_i as the dependent variable, random in nature and influenced by his characteristics and other factors as described in sections 3.3.2 and 3.3.3, then the WTP model can be given as:

$$WTP_i = X_i\beta + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Which can be rewritten as

$$WTP = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots + \beta_n X_n + e \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where,

βs are parameters to be estimated(coefficients of the explanatory variables)

X_i is a vector of observed characteristics of the respondent (i.e the explanatory variables)

ε is the error term (the unobserved explanatory variable vector)

Logarithmic Transformation:

Estimating equation 2 assumes a linear relationship between WTP and its determinants such that the coefficient estimates, βs, will be depicted as constant. However, the complexity of the real world makes such a linear relationship a rarity. Besides, the WTP function being a demand function, we may be interested in the elasticity of the variables. We also need to be cognizant of the interactive influence with which some of the independent variables may operate. To this extent, we adopt a multiplicative model instead of the simple linear relationship expressed in equation 2 above. Some studies on WTP have applied multiplicative model (Cocheba and Langford, 1978; Abala, 1987). Hence, our model becomes:

$$WTP = \beta_0 EDUC^{\beta_1} Y^{\beta_2} OCCUP^{\beta_3} HSIZE^{\beta_4} HFAC^{\beta_5} REL^{\beta_6} AGE^{\beta_7} SEX^{\beta_8} MARR^{\beta_9} SMOK^{\beta_{10}}$$
$$PHYSIC^{\beta_{11}} INFO^{\beta_{12}} AWARE^{\beta_{13}} RCANCER^{\beta_{14}} ATT^{\beta_{15}} DIST^{\beta_{16}} FEAR^{\beta_{17}} \mu \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Equation 3 has two properties that may not allow for its proper estimation. One is that a majority of the explanatory variables are either dummy or categorical. Two, this being a multiplicative model, if the error term were to be zero, E (μ=0), the model would collapse. Therefore, we express them to base 'e' (where 'e' is approximately 2.718). The dummy or categorical variables are: *EDUC, OCCUP, HFAC, REL, SEX, MARR, SMOK, PHYSIC, INFO, AWARE, RCANCER, ATT, FEAR.* Thus we have our WTP model as follows:

$$WTP = \beta_0 Y^{\beta_2} HSIZE^{\beta_4} AGE^{\beta_7} DIST^{\beta_{16}} e^{\beta_1 EDUC} e^{\beta_3 OCCUP} e^{\beta_5 HFAC} e^{\beta_6 REL} e^{\beta_8 SEX} e^{\beta_9 MARR} e^{\beta_{10} SMOK} e^{\beta_{11} PHYSIC}$$
$$e^{\beta_{12} INFO} e^{\beta_{13} AWARE} e^{\beta_{14} RCANCER} e^{\beta_{15} ATT} e^{\beta_{17} FEAR} e^{\mu} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Transformed into logarithmic form, equation 4 becomes

$$\ln WTP = \ln \beta_0 + \beta_2 \ln Y + \beta_4 \ln HSIZE + \beta_7 \ln AGE + \beta_{16} \ln DIST + \beta_1 EDUC + \beta_3 OCCUP + \beta_5 HFAC$$
$$+ \beta_6 REL + \beta_8 SEX + \beta_9 MARR + \beta_{10} SMOK + \beta_{11} PHYSIC + \beta_{12} INFO + \beta_{13} AWARE$$
$$+ \beta_{14} RCANCER + \beta_{15} ATT + \beta_{17} FEAR + \mu \ldots\ldots\ldots\ldots\ldots (5)$$

As shown so far in this section, Education Level (EDUC) and Religion (REL) are categorical variables. For Education Level, the base variable was "if respondent has no education" whereas for Religion, the base variable was "if traditional". In effect, from the four categories under

Education Level we had three variables and from the five categories under Religion we had four variables:

Education Level (base= no education)	
Primary Education ($EDUC_1$)	1; otherwise 0
Secondary Education ($EDUC_2$)	1; otherwise 0
Higher Education ($EDUC_3$)	1; otherwise 0
Religion (base= traditional)	
Christian (REL_1)	1; otherwise 0
Muslim (REL_2)	1; otherwise 0
Hindu (REL_3)	1; otherwise 0
None of the above (REL_4)	1; otherwise 0

Assigning coefficients to these variables, we can then rewrite equation 5 as follows:

$$\ln WTP = \ln \beta_0 + \beta_{1a} EDUC_1 + \beta_{1b} EDUC_2 + \beta_{1c} EDUC_3 + \beta_2 \ln Y + \beta_3 OCCUP + \beta_4 \ln HSIZE + \beta_5 HFAC + \beta_{6a} REL_1 + \beta_{6b} REL_2 + \beta_{6c} REL_3 + \beta_{6d} REL_4 + \beta_7 \ln AGE + \beta_8 SEX + \beta_9 MARR + \beta_{10} SMOK + \beta_{11} PHYSIC + \beta_{12} INFO + \beta_{13} AWARE + \beta_{14} RCANCER + \beta_{15} ATT + \beta_{16} \ln DIST + \beta_{17} FEAR + \mu \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Equation 6 was then be estimated using Ordinary Least Squares (OLS) (Wooldridge, 2000). This log-log model is most suited to take care of the interactive nature of some of the variables. The signs of the coefficients were evaluated *a priori* to determine whether or not they were consistent with economic theory. Estimating the bid equation and analyzing the magnitude and signs of the parameter estimates in order to verify whether they agree with economic theory was in effect a test for construct validity (Bishop and Romano, 1998).

3.3.4 Diagnostic Tests

The t-statistic was used to test for significance. The model was also subjected to multicollinearity and heteroskedasticity tests using Variance Inflation Factor (VIF) and Breusch-Pagan tests respectively. The Ramsey's (RESET) test was used to detect any misspecification due to omitted non-linearity.

3.4 Study Validity and Reliability Enhancement

A major drawback of CVM is its susceptibility to biases. Biases are said to be those features of an elicitation process in a CV survey that deviate the estimated willingness to pay amount (contingent

valuation amount) from an individual's true valuation (Bayoumi, 2004). The presence of biases in contingent valuation studies affect the latter's validity and reliability. Validity here refers to an assessment as to whether the measures obtained in the CVM survey reflect what the individual would actually pay in a real market. Reliability refers to whether or not the measure remains consistent on repeated evaluation. In this study, a number of measures were taken to minimize biases and thereby enhance validity and reliability. These measures included: arranging bid prices in descending order so as to minimize starting point bias (Deshazo, 2002 as cited in Flachaire and Hollard, 2006), using dichotomous choice referendum buttressed with a follow up question so as to minimize protest zero bias. To minimize hypothetical bias, respondents were told of how their answers would be used (Loomis, 2011).The dichotomous choice format also helped minimize hypothetical bias (Blomquist *et al.*, 1998; Wang and He, 2014) as well as a "cheap talk" script urging respondent not to overstate their WTP. The WTP question painted a more realistic scenario. Though strategic bias has not been found to be present in health care (Mahmud, 2009), the respondents were informed that they would be the ones to pay for cancer screening (and not the government). The use of dichotomous choice format was also helpful in minimizing protest zero (Kabubo-Mariara *et al.* 2010).

Further effort was made to mitigate any likelihood of information bias by, for instance, being specific on the target (herein cancer screening) and providing information in the elicitation question that was sufficient to enable the respondents' proper understanding of screening (Boyle, 1989), providing a 'cheap talk' that dissuaded respondents from overstating their WTP, providing a budget or cost information whereby they were informed that costs of screening would come from the same expenditure budget as for other family expenses besides asking them what they would forego to pay for screening; these would help mitigate the likelihood of naïve free riding (Bergstrom *et al.*, 1989). In addition, there was a pretest survey to gauge the respondents' understanding of the WTP question among other information.

Since the questionnaire for this study specified the target or rather, amenity (in this case cancer screening) on its own and not as a subset of another commodity or a commodity embedded in another package, the likelihood of embedding effects and related biases such as part-whole bias were minimized.

This study employed a multi-bound dichotomous choice (MBDC) format as opposed to the bidding game technique. The latter is akin to an auction in which some initial WTP amount is presented to the respondent to say whether or not they would pay it. The amount is then changed iteratively higher or lower and eventually the highest 'yes' amount is recorded as the maximum WTP (Kabubo-Mariara *et al.*, 2010). The bidding technique is thus susceptible to biases such as starting-point and its being lengthy and iterative may lead to non-response arising from respondents becoming bored. The MBDC thus helped us to avoid the bidding game challenges. Besides, effects or biases from bid-design tend to be minimal with MBDC since MBDC by its design tends to eliminate attention to just one or a few bid prices (Boyle, Roach and Welsh, 2002).

3.5 Ethical Considerations

Having obtained a go-ahead from the School of Economics, University of Nairobi, to proceed with the topic of study, a research permit was further sought and obtained from the Kenya's National Commission for Science, Technology and Innovation (NACOSTI).

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Introduction

In this chapter, we delve into the analysis and interpretation of data collected from the field as well as a discussion of the study findings. In doing so, descriptive statistics of the data collected will be presented followed by the Log-log model results upon regression using OLS. This chapter will wrap up with a discussion of the study findings. Tables will be used for presentation.

4.2 Descriptive Statistics

A total of 80 respondents were interviewed. Out of the 80 completed questionnaires, 2 were considered 'spoilt' since one of the respondents was underage (17 years) and so was neither a household head nor a benevolent dictator in the household. The other one was rendered 'spoilt' since the respondent did not give a 'definitely yes' answer for any of the price ranges presented and at the 'free charge', he was indifferent about 'not sure' and 'probably yes'. Seven respondents would not be willing to be screened for cancer at whatever price. 5 out of the 7 respondents who would not be willing to be screened for cancer chose a 'definitely no' answer at the price of zero (free screening). These are the protest zeros. There were 4 respondents who were already suffering from cancer and so screening would be meaningless in their case. Thus, there were a total of 13 respondents (2 spoilt, 7 not willing to be screened and 4 cancer patients) that were rendered invalid. The valid respondents were therefore 67. Within the 67 respondents, there were 3 who exhibited 'extreme demand' for cancer screening in the sense that their highest 'definitely yes' amount exceeded their monthly income. These were, however, corrected by the interviewer whereby the immediate price range that falls within the respondent's income was chosen. Table 5 summarizes this data clean up.

Table 5: Statistics of Responses from the Survey

Category	Description	Number of Respondents
1	Spoilt	2
2	Unwilling to screen plus protest zeros	7
3	Cancer patients	4
4	Valid responses: - Normal demand (WTP amounts are within the price ranges and monthly income) - Corrected Extreme Demand	64 3
5	Total number of respondents	80

Source: own

Distribution of WTP Responses Based on the Multi-Bond Dichotomous Choice Format

The WTP amounts for screening were presented to the respondents in 6 price ranges (classes) as shown in Tables 6 and 7 below. The respondents were asked to express their certainty of paying for cancer screening. A respondent was to choose either 'definitely not' or 'probably not' or 'not sure' or 'probably yes' or 'definitely yes' for every price range. Tables 6 and 7 show the distribution of the responses by count and percentages respectively.

Table 6: Distribution of WTP Responses by Count

Charges in Ksh	Mid-point (Ksh)	Definitely Not	Probably Not	Not Sure	Probably Yes	Definitely Yes	Total
25001-40000	32500.5	48	7	7	5	13	80
15001-25000	20000.5	40	4	5	9	22	80
5001-15000	10000.5	26	4	7	10	33	80
1001-5000	3000.5	15	2	8	10	45	80
50-1000	525	10	0	1	6	63	80
0	0	5	1	1	1	73	81

Table 7: Distribution of WTP Responses by Percentages

Charges in Ksh	Mid-point (Ksh)	Definitely Not	Probably Not	Not Sure	Probably Yes	Definitely Yes	Total
25001-40000	32500.5	60.0	8.8	8.8	6.3	16.3	100
15001-25000	20000.5	50.0	5.0	6.3	11.3	27.5	100
5001-15000	10000.5	32.5	5.0	8.8	12.5	41.3	100

1001-5000	3000.5	18.8	2.5	10.0	12.5	56.3	100
50-1000	525	12.5	0.0	1.3	7.5	78.8	100
0	0	6.2	1.2	1.2	1.2	90.1	100

The results depicted in Tables 6 and 7 show that the percentage of those who would definitely pay for cancer screening increased when the charges declined. Thus at the highest price range of between Kshs. 25,001 to Kshs. 40,000 (Kshs.32, 500.50 midpoint), only 16.3% of the respondents chose 'definitely yes' whereas at the free charge, 90.1% of the respondents chose 'definitely yes'. This finding is consistent with economic theory of demand whereby the higher the price of a commodity, the lower the quantity demanded, *ceteris paribus*. A similar observation was also made in Wang and He (2014). Effort was made to minimize protest zero bias by using MBDC technique (as opposed to a simple Yes or No) and by asking follow up questions. Thus, we can be certain that out of the 9.9% who chose negative responses (definitely not, probably not, not sure, probably yes) at the price of zero (free charge), the 6.3% who chose 'definitely not' were the real 'protest zeros'. The remaining 3.6% would perhaps change their minds if, for example, some of their concerns around cancer screening such as 'fear' or 'poor attitude' were alleviated.

Extreme Demand

There were 3 cases of 'Extreme Demand' whereby the highest 'definitely yes' amounts chosen by the respondents were higher than their income levels. This means that they were willing to pay for cancer screening even at prices beyond their ability. These respondents could have been driven by the value they attach to cancer screening. One thing that was common in them was that they all had relatives who had been diagnosed with cancer and this may explain the high value that they attach to screening. Here, we see the benefit effect as opposed to the income effect of cancer screening come into play. In contrast to Wang and He (2014) who exclude such cases of extreme demand from their model of 'normal demand', this study corrected the extreme demands by selecting the highest 'definitely yes' from the immediate next price range that falls within the respondent's income.

Protest Zero Bias and the Unwilling-to-Screen

In total, 7 respondents would be unwilling to be screened for cancer. 2 respondents though unwilling to be screened for cancer, gave the amounts that they would otherwise be willing to pay were they to go for screening. The remaining 5 were real protesters in the sense that they chose 'definitely not' even at the price of zero. When the 5 protest zeros were subjected to follow up questions, the following were the reasons they gave for their protest:

Reasons for protest zeros:

"I would get worried to know my status"

"Once cancer was discovered in my sister, she died a week later"

"No screening in my house. Cancer, once known, kills."

"I would be devastated to know my cancer status if positive"

"I am already sick with cancer"

The other two who were unwilling to be screened but otherwise gave the amounts they would be willing to pay expressed the following sentiments:

"Traditional medicine can cure cancer"

"I'll hate to discover I have cancer"

Thus, the fear of discovering cancer was the most common reason for the unwillingness to be screened for cancer.

The 'Give Up' Question:

The respondents' choices regarding the highest 'definitely yes' amounts they were willing to pay were further subjected to a budget constraint question asking what they would give up in order to pay their highest 'definitely yes' amounts. This was necessary to further mitigate the likelihood of hypothetical bias and naïve free riding. 19 out of the 67 respondents whose responses were considered valid would give up at least one expenditure item in their budget in order to meet the

highest definite yes amount. Asked whether they would pay the same, less or more if the item to give up was food, 16 respondents said they would pay same amount, 2 would pay more and only one would pay less. The remaining 48 respondents would not have to give up anything to pay the highest definite yes amounts they had chosen.

The remainder of this section and the subsequent analyses will now focus on the 67 valid responses.

Tables 8 and 9 show the descriptive statistics of the 67 respondents. Table 8 gives the statistics with regards to the four continuous variables prior to transformation into natural logs whereas Table 9 gives the descriptive statistics of all the variables including after transformation into natural logs:

Table 8: Descriptive Statistics Based on the Untransformed Continuous Variables

	Willingness to Pay	Income	House Size	Distance to the nearest health facility	AGE
Mean	9334.634	105.747	3.58209	2.407463	35.38806
Median	3000.5	68.000	3	2	33
Maximum	32500.5	800.000	14	13	72
Minimum	0	1.650	1	0.2	19
Std. Dev.	11648.55	128.740.50	2.316929	2.079213	11.20465
Observations	67	67	67	67	67

Source: Own analysis using EVIEWS

Table 9: Descriptive Statistics after Transformation into Natural Logs

Variables	Observations	Mean	Maximum	Minimum	Std. Dev.
LN_WTP	67	7.139068	10.38901	0	3.343557
LN_HSIZE	67	1.06444	2.639057	0	0.686638
LN_DIST	67	0.484234	2.564949	-1.60944	0.990391
LN_AGE	67	3.521208	4.276666	2.944439	0.298486
INFO	67	0.970149	1	0	0.17146
HFAC	67	0.925373	1	0	0.264772
FEAR	67	0.253731	1	0	0.43843
EDUC3	67	0.61194	1	0	0.490986
EDUC2	67	0.164179	1	0	0.373234
LN_Y	67	10.87707	13.59237	7.408531	1.316599
MARR	67	0.626866	1	0	0.487288
OCCUP	67	0.686567	1	0	0.46739
PHYSIC	67	0.402985	1	0	0.4942
RCANCER	67	0.343284	1	0	0.478389
REL1	67	0.791045	1	0	0.409631
REL2	67	0.059701	1	0	0.238721
REL3	67	0.029851	1	0	0.17146
REL4	67	0.074627	1	0	0.264772
SEX	67	0.58209	1	0	0.496938
SMOK	67	0.134328	1	0	0.343578
AWARE	67	0.761194	1	0	0.429572
VT1	67	0.029851	1	0	0.17146

Source: Own analysis using EVIEWS

From the above, based on the mid-points of the price ranges, the average amount one is willing to pay for cancer screening was at Ksh. 9,334.63 with a maximum value of Ksh.32,500.50 and a minimum of Ksh.0. The median WTP amount was Ksh. 3,000.50. The mean income per month of household stood at Ksh.105,747.00 with the highest earning Ksh.800,000.00 and lowest averaging Ksh.1,650.00. On average the household size was found to be 3.5 per person with a maximum of 14 persons per household and a minimum of 1 person per household. Averagely, households were

2.4 Kilometers away from the nearest health facilities. The household with the closest proximity to a health facility was 0.2 Kilometers away while the farthest was 13 Kilometers away. The respondents aged 35 years on average with the oldest being 72 years old whilst the youngest was 19 years (having removed the 17-year old whose response was rendered spoilt).

The WTP Amounts (The Highest 'Definitely Yes' Amounts):

Following Blomquist, Blumenschein, Johannesson, Liljas and O'Conor (1998) and in order to minimize hypothetical bias, only the definitely yes responses were selected. A development by this study is that for each respondent, the maximum WTP amount was the midpoint of the price range with the highest 'definitely yes' selected by the respondent. Table 10 shows the frequency distribution of willingness to pay amounts.

Table 10: Frequency of WTP Amounts (Highest 'Definitely Yes' Amounts)

Charge in Kshs	Midpoint (Kshs)	Frequency	Cumulative Frequency	Percentage Frequency	Percentage Cumulative Frequency
0	0	10	10	14.9	14.9
50-1000	525	16	26	24.0	38.9
1001-5000	3000.50	14	40	20.9	59.8
5001-15000	10000.50	9	49	13.4	73.2
15001-25000	20000.50	8	57	11.9	85.1
25001-40000	32500.50	10	67	14.9	100
Total		67			

Source: Own tabulation

Table 10 shows among other things that 85.1% of the respondents would be willing to pay up to 25,000.00 Kenya Shillings for cancer screening. The modal class was 50 – 1000 which suggests that for a majority of the respondents, the maximum WTP amount lay between Kshs. 50 to Kshs.1000. As suggested in Loomis (1990), a simple way to arrive at the value the respondents attach to cancer screening would be to take the WTP amounts as depicted by the midpoints, multiply them by their respective frequencies and sum the totals. Another approach would be to use the WTP amounts to determine the 'value of a statistical life' saved by screening for cancer. This approach is suggested for further research.

4.3 Correlation Analysis

Since we are using OLS, one assumption is that the explanatory variables are not perfectly linearly correlated. The problem with this assumption not being met is that the OLS estimates become inefficient in their prediction and the standard errors can be very large infinitely. In this study, use of the measures to eliminate perfect correlation is that the base variables of the categorical/dummy variables have been excluded from the regression model (Wooldridge, 2000). Inefficiency of the OLS estimates can also be caused by serial correlation, whereby, the error term from different cross-sectional observations are correlated. Though serial correlation problem is more with time series, it can also be there in cross-sectional data. Table 11 shows the correlation coefficients between the explanatory variables.

Table 11: Correlation Coefficients

	LN_WTP	LN_HSIZE	LN_DIST	LN_AGE	INFO	HFAC	FEAR	EDUC3	EDUC2
LN_WTP	1								
LN_HSIZE	0.099	1							
LN_DIST	-0.301	0.031	1						
LN_AGE	-0.036	0.456	0.085	1					
INFO	0.212	0.043	-0.11	0.145	1				
HFAC	-0.367	0.171	-0.131	-0.086	0.284	1			
FEAR	-0.128	-0.069	-0.04	0.031	0.102	0.035	1		
EDUC3	0.255	0.026	0.019	0.244	0.22	0.24	0.324	1	
EDUC2	0.343	0.065	-0.003	-0.126	0.078	-0.027	-0.356	-0.557	1
AWARI	0.354	0.21	-0.105	0.251	0.313	0.241	0.005	0.56	-0.13
ATT	-0.377	-0.274	0.073	-0.245	-0.485	-0.284	-0.102	-0.22	-0.078
SEX	-0.052	-0.019	0.149	0.219	-0.149	-0.01	-0.062	-0.116	0.13

	LN_WTP	LN_HSIZE	LN_DIST	LN_AGE	INFO	HFAC	FEAR	EDUC3	EDUC2
SMOK	-0.538	-0.066	0.228	0.039	-0.445	-0.554	0.072	-0.225	-0.056
LN_Y	0.324	0.253	0.154	0.418	0.192	0.219	0.228	0.606	-0.003

MARR	0.196	0.667	0.178	0.419	0.046	0.133	-0.047	0.019	0.092
OCCUP	0.17	-0.132	0.075	-0.056	0.071	0.175	0.32	0.716	-0.135
PHYSIC	0.088	-0.044	-0.163	0.041	-0.035	0.118	0.15	0.28	-0.2
RCANCER	0.291	0.1	-0.29	0.175	0.127	0.205	-0.205	0.06	-0.066
REL2	-0.226	0.16	0.039	0.19	0.044	0.072	-0.147	-0.187	0.228
REL3	0.063	0.207	0.161	0.219	0.031	0.05	-0.102	-0.04	0.159
REL4	-0.337	-0.155	0.131	-0.092	-0.284	-0.135	-0.166	-0.124	-0.126
REL1	0.491	-0.064	-0.228	-0.255	0.341	0.413	0.215	0.269	-0.07
EDUC1	-0.303	-0.091	0.009	-0.162	-0.396	-0.181	-0.166	-0.557	-0.196

	AWARE	ATT	SEX	SMOK	LN_Y	MARR	OCCUP	PHYSIC	RCANCER
AWARE	1								
ATT	-0.313	1							
SEX	-0.12	-0.029	1						
SMOK	-0.395	0.445	0.068	1					
LN_Y	0.48	-0.199	-0.014	-0.146	1				
MARR	0.075	-0.227	0.285	-0.149	0.244	1			
OCCUP	0.452	-0.071	-0.051	-0.206	0.445	-0.122	1		
PHYSIC	0.246	0.035	0.326	-0.056	0.05	0.068	0.293	1	
RCANCER	0.331	-0.127	0.103	-0.285	0.049	0.038	-0.054	0.303	1
REL2	-0.007	-0.044	-0.042	-0.099	0.186	0.194	-0.237	-0.207	-0.05
REL3	0.098	-0.031	0.149	-0.069	0.278	0.135	-0.071	-0.144	0.058
REL4	-0.241	0.618	0.125	0.388	-0.168	-0.133	-0.053	-0.118	-0.205
REL1	0.229	-0.341	-0.138	-0.443	-0.026	-0.017	0.286	0.347	0.217
EDUC1	-0.413	0.159	0.049	0.18	-0.61	-0.075	-0.569	-0.036	0.019

	REL2	REL3	REL4	REL1	EDUC1
REL2	1				
REL3	-0.044	1			
REL4	-0.072	-0.05	1		
REL1	-0.49	-0.341	-0.553	1	
EDUC1	0.058	-0.078	0.027	-0.169	1

Source: Own analysis using EVIEWS

Literature suggests that correlation coefficients that are close to 1 or -1 are indicative of strong linear dependence (Wooldridge, 2000). Table 9 shows correlation coefficients with majority falling below 0.5. This suggests the absence of correlation between the observed values of the explanatory variables or that it is not a serious problem in our observations such as to cause our regression to be spurious.

4.4 Empirical Model Estimation and Results

Table 12 presents the log-log regression result using least square estimation.

Table 12: Log-log Regression Results

Dependent Variable: LN_WTP
Method: Least Squares
Included observations: 67

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_AGE	0.868018	2.306420	0.376349	0.7085
SEX	-0.971903	1.254784	0.774558	0.4427
MARR	0.190230	1.517318	0.125373	0.9008
LN_HSIZE	0.302674	1.095463	0.276298	0.7836
OCCUP	-3.851984	1.941391	1.984136	0.0535
LN_Y_	1.027654	0.665383	1.544454	0.1296
$EDUC_1$	0.723538	2.656978	0.272316	0.7867
$EDUC_2$	5.675919	2.965308	1.914108	0.0621
$EDUC_3$	3.478565	3.565666	0.975572	0.3346
SMOK	-6.872495	2.272242	-3.024544	0.0041
ATT	-4.520804	5.125750	-0.881979	0.3826
AWARE	0.058342	1.577960	0.036973	0.9707
FEAR	-0.583530	1.231563	-0.473813	0.6380
HFAC	0.443298	3.569002	0.124208	0.9017
INFO	-7.813597	4.284058	1.823877	0.0750
LN_DIST	-0.053211	0.536825	-0.099122	0.9215
PHYSIC	0.052235	1.312074	0.039811	0.9684
RCANCER	0.536025	1.184697	0.452458	0.6532
REL_1	3.034000	5.854624	0.518223	0.6069
REL_2	-7.283153	6.441453	1.130669	0.2643
REL_3	-1.540831	6.769596	0.227610	0.8210
REL_4	2.328778	5.970758	0.390031	0.6984
C	-2.133371	10.08334	-0.211574	0.8334

R-squared	0.640862
Adjusted R-squared	0.461293
S.E. of regression	3.586362
Sum squared residual	565.9278
Log likelihood	-166.5503
F-statistic	3.568886
Prob(F-statistic)	0.000162

Source: Own Estimation using EVIEWS

The F-statistic of 3.57 (p-value=0.000) affirms that the model used is good and fits the data. This is also an indication that if not all then at minimum one of the regression coefficients has no zero value. This also means that the explanatory variables explain the dependent variable, WTP. R-squared indicates that 64.1% of the total variation in the willingness to pay for screening of cancer is explained by the changes in the explanatory variables used in the model. From the regression

output, a glance at the t-values reveal that the nature of one's occupation (OCCUP) and whether one smokes or not (SMOK) significantly contribute to the dependent variable since their t-values are greater than 1.96 (at 5% level of significance). With a p-value of 0.0535, the coefficient of the nature of occupation (OCCUP) is thus statistically different from zero and therefore the probability of being in 'formal' (as opposed to informal employment) significantly affect WTP for cancer screening. The coefficient of probability of being a smoker is statistically different from zero (p-value=0.0041) therefore being a smoker significantly impacts on the willingness to pay for cancer screening. These and other findings are discussed in detail in section 4.6.

4.5 Post Estimation Diagnostics

Ramsey's Regression Specification Error Test (RESET)

This was carried out to ascertain if the estimated model was properly specified. The Ramsey's RESET basically looks at likelihood of omitted variables by testing for the presence of omitted non-linearity. It involves adding some polynomials to the regression model already done using OLS to detect presence of misspecification of a functional form (Wooldridge, 2000). A RESET based on the null hypothesis of a correctly specified model, against the not-correctly-specified alternative hypothesis was used and the results are as shown in the table below

Table 13: Ramsey's RESET Results

	Value	df	Probability
t-statistic	2.388754	43	0.0214
F-statistic	5.706144	(1, 43)	0.0214
Likelihood ratio	8.348540	1	0.0039

Table 13 above indicates that the model has no omitted variables and it is well specified as indicated by the p-values of the F-statistics at 5% level of significance.

Breusch-Pagan/Cook-Weisberg Test for Heteroskedasticity

This was conducted based on the null hypothesis of homoskedasticity, against the alternative of heteroskedasticity and the results are shown below.

Table 14: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.693088	Prob. F(22,44)	0.8217
Obs*R-squared	17.24300	Prob. Chi-Square(22)	0.7498
Scaled explained SS	27.14290	Prob. Chi-Square(22)	0.2058

Source: own analysis using EVIEWS7

Table 14 shows that the residuals of the model are homoskedastic at the 5% levels of significance as indicated by the p-values. Therefore we fail to reject the null hypothesis.

Test for Multicollinearity: The Variance Inflation Factor (VIF)

Apart from the correlation analysis as depicted in section 4.3 and Table 11, the regression was further tested for the presence of correlation between the explanatory variables using the Variance Inflation Factor (VIF). Presence of collinearity would imply that an explanatory variable is a linear function of the other. Table 15 shows the result of the multicollinearity test:

Table 15: Multicollinearity Test: Variance Inflation Factor

Variable	Uncentered VIF	Centered VIF
LN_HSIZI	9.986051	2.903266
LN_DIST_	1.802493	1.450492
LN_AGE_	346.0111	2.431987
INFO	92.75038	2.768668
HEAC	63.40119	4.582179
FEAR	2.004720	1.496060
EDUC3	40.52816	15.72734
EDUC2	7.529104	6.285460
EDUC1	6.037541	5.046303
AWARI	9.873109	2.357757
ATT	4.085418	3.963465
SEX	4.774129	1.995158
SMOK	3.612794	3.127494
LN_Y_	276.7941	3.938095
MARR	7.517858	2.805171
OCCUP	13.47955	4.224934
PHYSIC	3.613865	2.157531
RCANCER	2.509769	1.648207
REL1	141.2426	29.51337
REL2	12.90385	12.13347

REL3	7.126022	6.913305
REL4	13.85864	12.82441
C	529.6334	NA

Source: Own analysis using EVIEWS7

From the test, save for the dummy variables on education and religion, the centered VIF values for the other explanatory variables are below the threshold of 10. This points to the absence of collinearity of the variables implying that no explanatory variable is a linear function of the other.

4.6 Simulation Results

We use the regression model as estimated using equation 6 with the resultant coefficients as shown in Table 12, to simulate the following scenarios, *ceteris paribus*:

1. (a) A male with the following attributes: aged 30 years, married, has 3 people in his household (including himself), he is in an informal employment, earns Ksh. 100,000.00, has attained higher education, does not smoke, thinks cancer screening is useful, has heard about cancer screening, does not fear cancer screening procedure, he would visit a formal health facility when sick (and not a traditional healer), has heard about cancer disease, resides 0.5KM away from nearest health facility, does physical exercises, has a relative who has been diagnosed of cancer and he is a Christian.

   (b) A female but all other attributes are the same as those of the male in 1(a)
2. The male in 1 (a) has grown to 53 years from 30 years.
3. (a) A male with no education but all other attributes remain as for the male in 1 (a)

   (b) A male with primary education but all other attributes remain as for the male in 1 (a)
4. A reduction of 25% in the income of the male in 1 (a)
5. A smoking male but with all other attributes as for the male in 1(a)
6. A male in formal employment but all other attributes remain as with the male in 1 (a)

Table 16 presents the simulation results based on the above scenarios:

Table 16: Simulation Results

SCENARIO	C	AGE	$\beta_2$lnAGE	SEX	β_8SEX	β_9MARR	$\beta_4$lnHSIZE	OCCUP	β_5OCCUP
1(a) Male	-2.13	30	2.9523005	1	-0.971903	0.19023	0.3325214	1	-3.851984
1(b) Female	-2.13	30	2.9523005	0	0	0.19023	0.3325214	1	-3.851984
2. Age	-2.13	53	3.4462848	1	-0.971903	0.19023	0.3325214	1	-3.851984
3(a) No education	-2.13	30	2.9523005	1	-0.971903	0.19023	0.3325214	1	-3.851984
3(b) Primary	-2.13	30	2.9523005	1	-0.971903	0.19023	0.3325214	1	-3.851984
4. Income reduction	-2.13	30	2.9523005	1	-0.971903	0.19023	0.3325214	1	-3.851984
5. Smoking	-2.13	30	2.9523005	1	-0.971903	0.19023	0.3325214	1	-3.851984
6. Formal Occupation	-2.13	30	2.9523005	1	-0.971903	0.19023	0.3325214	0	0

SCENARIO	C	Y	$\beta_2$lnY	$EDUC_1$	β_{13}EDUC1	β_{14}EDUC2	β_{15}EDUC3	SMOK	β_{16}SMOK
1(a) Male	-2.13	100000	11.831304	0	0	0	3.478565	0	0
1(b) Female	-2.13	100000	11.831304	0	0	0	3.478565	0	0
2. Age	-2.13	100000	11.831304	0	0	0	3.478565	0	0
3(a) No education	-2.13	100000	11.831304	0	0	0	0	0	0
3(b) Primary	-2.13	100000	11.831304	1	0.723538	0	0	0	0
4. Income reduction	-2.13	75000	11.535666	0	0	0	3.478565	0	0
5. Smoking	-2.13	100000	11.831304	0	0	0	3.478565	1	-6.872495
6. Formal Occupation	-2.13	100000	11.831304	0	0	0	3.478565	0	0

SCENARIO	C	β_{17}ATT	β_{18}AWARE	β_{19}FEAR	β_{20}HEAC	β_{21}INFO	β_{22}lnDIST	β_{23}PHYSIC	β_{24}RCANCER
1(a) Male	-2.13	0	0.058342	0	0.443298	-7.813597	0.0368831	0.052235	0.536025
1(b) Female	-2.13	0	0.058342	0	0.443298	-7.813597	0.0368831	0.052235	0.536025
2. Age	-2.13	0	0.058342	0	0.443298	-7.813597	0.0368831	0.052235	0.536025
3(a) No education	-2.13	0	0.058342	0	0.443298	-7.813597	0.0368831	0.052235	0.536025
3(b) Primary	-2.13	0	0.058342	0	0.443298	-7.813597	0.0368831	0.052235	0.536025
4. Income reduction	-2.13	0	0.058342	0	0.443298	-7.813597	0.0368831	0.052235	0.536025
5. Smoking	-2.13	0	0.058342	0	0.443298	-7.813597	0.0368831	0.052235	0.536025
6. Formal Occupation	-2.13	0	0.058342	0	0.443298	-7.813597	0.0368831	0.052235	0.536025

SCENARIO	C	β_{25}REL1	β_{26}REL2	β_{27}REL3	β_{28}REL4	lnWTP	WTP
1(a) Male	-2.13	3.034	0	0	0	8.1782199	**3562.51**
1(b) Female	-2.13	3.034	0	0	0	9.1561229	**9415.60**
2. Age	-2.13	3.034	0	0	0	8.6722042	**5838.36**
3(a) No education	-2.13	3.034	0	0	0	4.6986549	**109.91**
3(b) Primary	-2.13	3.034	0	0	0	5.4231929	**226.60**
4. Income reduction	-2.13	3.034	0	0	0	7.8825823	**2650.71**
5. Smoking	-2.13	3.034	0	0	0	1.3.57249	**3.69**
6. Formal Occupation	-2.13	3.034	0	0	0	12.030204	**167745.74**

Table 16 is one continuous table only that it has been cut into several parts in order to fit in the space available. The predicted values of the WTP based on the above scenarios are shown in the last column. Thus, a female with similar attributes as the male in 1 (a) would be willing to pay 62.2% more than the male. Suppose the male aged 30 years now would live and add 23 years to

become 53 years old, his willingness to pay for screening is predicted to increase by 39% (from Ksh. 3,562.51 to Ksh 5,838.36) suggesting that older people are more likely to pay for screening than younger people.

If we took two men with similar attributes except for educational attainment, the one with primary education is predicted to be willing to pay 51.5% more than the one with no education, that is, the difference between Ksh. 226.60 for primary education and Ksh. 109.91 for no education. Were the income of the male in 1 (a) to be reduced by 25% (from Ksh. 100,000.00 to 75,000.00), the WTP amount for screening that he would be willing to part with would similarly go down by 25.6%(from Ksh. 3,562.51 to 2,650.71).

A man who smokes but shares all the other attributes of the man in 1 (a) would be willing to pay 96435.5% less than the man in 1(a) who does not smoke. Compared to the male in 1 (a) who is in an informal employment, and assuming all other attributes are the same, a male in formal employment would be willing to pay 97.9% more for cancer screening.

The above simulation helps demonstrate the likely implications of policies and programmes that may be targeted at particular groups of the population when implementing cancer control strategies such as early detection through screening of asymptomatic populations.

4.7 Discussion of the Study Findings

Two of three objectives of this study were to estimate the amounts that residents of Dagoretti North Constituency are willing to pay for cancer screening and to explore the factors that drive WTP for cancer screening amongst the said residents. Before we delve into the study findings, there are a few areas to highlight. The sample size was relatively low relative to the number of explanatory variables and this may explain why a number of variables were weakly significant. The limitation of sample size was due to economy reasons. Further research in future should therefore expand the sample size. Second, this being a contingent valuation study, it was prone to a number of biases. For example, bid prices were arranged in descending order in order to minimize chances of starting point bias. MBDC technique, cheap talk script and 'give up' questions were among the measures

put in place to mitigate hypothetical bias. Follow up questions were asked to minimize protest zeros (Kabubo-Mariara *et. al*, 2010).

A number of empirical studies have estimated WTP amounts in terms of mean and median (Pham *et. al*, 2008; Milligan *et. al*, 2010; Wang and He, 2014). In our case, the household's mean WTP amount was Kshs. 9,334.63 whereas the median was Kshs. 3,000.50. Thus, on average, residents of Dagoretti North Constituency are willing to pay Kshs. 9,334.63 (range of 5001 – 15000) for cancer screening. In terms of cumulative frequency, this covers up to 73.2% of the residents. Therefore, a government programme to subsidize the cost of cancer screening would perhaps look at how to assist the remaining 26.8%. A study by Wang and He (2014) of some 3 villages in rural China gave Kshs. 11,840.40 (759 Yuan) and Kshs. 2,683.20 (172 Yuan) for mean and median respectively, which figures are thus not far from what we found out from the Kenyan sample.

The study further confirmed the existence of a relationship between the WTP for cancer screening and the factors earlier hypothesized in this study as potentially influencing WTP for cancer screening. The coefficients of the explanatory variables behaved in the expected direction. Given this was a log-log model, the coefficients reflected the elasticity between the WTP and the various factors.

With a t-statistic of 1.98 and 3.02 respectively, the nature of a household head's occupation (OCCUP) and whether he/she smokes (SMOK) were found to be very significant. They also had the expected signs for their coefficients whereby OCCUP was negative (β_3 = -3.85) and SMOK was also negative (β_{10} = -6.87). OCCUP is a dummy variable describing the nature of occupation of the respondent (household head) such that if the occupation is informal then it is equal to 1, otherwise 0 (formal). Here, we are not so much interested in the magnitude of the coefficient but if we should interpret it then a coefficient of -3.85 means that a respondent in an informal occupation is predicted to be willing to pay 97.9% less than one in a formal occupation whilst holding other factors fixed (i.e. 100 [exp (-3.85) - 1]). A possible reason for this is that formal occupation, as compared to informal occupation, bears some level of certainty with respect to future income and so a respondent employed in the formal sector can be more willing to pay for

screening since he is sure about income tomorrow. This finding is similar to the one made by Murithi (2013).

'SMOK' was also a dummy variable describing whether the respondent smokes cigarette (equals to 1) or not (equals to 0). It returned the expected negative sign with a coefficient of -6.87. This would be interpreted to mean that a respondent who smokes is predicted to be willing to pay 96194.9% less than one who does not smoke. Cigarette smoking has been associated with risky behavior whereby despite knowing the harmful effects of cigarette smoking, the smokers smoke nonetheless; they do not care whether or not they develop lung cancer and related problems. Such people would therefore not care about cancer screening. A similar finding was made by Hakes and Viscusi (2007) who found cigarette smokers having low likelihood of putting on seatbelts.

Possession of secondary education ($EDUC_2$), having information about cancer (INFO) and respondent's income (lnY) were marginally significant with a calculated t-statistic of 1.91, 1.82 and 1.54 respectively against the required 1.96 at 5% significance level. Education level of the respondent was a categorical variable whereby the base variable was 'no education'. Possession of primary education ($EDUC_1$), secondary education ($EDUC_2$) and higher education ($EDUC_3$) were the other categories. They all had the expected positive sign relative to the base variable. The coefficients for ($EDUC_1$), ($EDUC_2$) and ($EDUC_3$) were 0.72, 5.68 and 3.48 respectively. This would mean that a respondent with primary education would be willing to pay 105.4% more than one with no education; one with secondary education would pay 29194.9% higher than one with no education whereas the WTP amount for cancer screening would be more by 3146% in a respondent with higher education than for one with no education. The existence of positive correlation between WTP and the level of education has been affirmed in other studies (Hakes and Viscusi, 2007; Wang and He, 2014; Fonta and Ichoku, 2005; Abala, 1987; Murithi , 2013). But the finding is a departure from Mwabu *et. al* (2003) and Prosser *et. al* (2004) who found out low demand for medical care among educated farmers and low WTP for a vaccine among people with higher educational attainment respectively. Overall, the positive correlation seems not to be an uncommon finding and it suggests that people with higher education attainment are perhaps more informed about the need to maintain good health and the goodness of taking preventive measures.

A dummy variable, INFO, was used to denote whether a respondent had heard about the disease called cancer (equals to 1 if answer is negative or zero if affirmative). It had the expected negative sign with a coefficient of -7.81. It was; however, only marginally significant at 5% level with a t-statistic of 1.82. The coefficient magnitude suggested that respondents who had no information about cancer would be willing to pay nearly 99.96% less than those who were informed. Being informed about cancer could come from a number of sources such as media campaigns or having seen someone suffer from cancer, which reasons would create eagerness for knowing cancer status, hence more willingness to pay for screening.

Income was a continuous variable, lnY. There was a positive correlation between lnWTP and lnY. With a calculated t-statistic of 1.54, income was thus only marginally significant at 5% level. It returned a coefficient of 1.03. In a log-log model, the coefficient of the continuous explanatory variable denotes elasticity between the dependent and the explanatory variable. Thus a coefficient of 1.03 can be interpreted as suggesting that as income increases by 1%, the amount the respondents are willing to pay for screening of cancer also increases by 1.03%. This finding is in agreement with a number of studies that have found a positive correlation between WTP and income (Wang and He, 2014; Fonta and Ichoku,2005; Kabubo – Mariana *et. al.* 2010; Abala, 1987; Henderson, 2005). People with higher levels of income would be more willing to pay for cancer screening than at lower income. This might also suggest that high income people value cancer screening more and that it gives the respondents the ability to pay. Thus we see the income effect (ability to pay) and benefit effect interacting.

The age of the respondent (ln AGE), marital status (MARR: married =1, otherwise 0), household size (ln HSIZE), awareness around cancer screening (AWARE: has heard of cancer screening =1, otherwise 0), type of health facility preferred (HFAC : if formal health facility = 1, if traditional healer =0), physical exercising (PHYSIC: Physical activity in last 7 days =1, otherwise 0) and whether or not the respondent had a relative diagnosed with cancer (RCANCER: has a relative suffering from cancer = 1, otherwise 0) were weakly significant at 5% level. However, they all had the expected positive signs.

The finding with regards to gender (SEX: Male =1, otherwise 0) departed from the a *priori* expectation. The coefficient for gender (SEX) was found to be -0.97 which therefore suggested that the willingness to pay amount in males was 62.1% less than in females. This was contrary to the expectation that males would pay more. Women have been observed to be more likely to visit health facilities than men; a pointer that their demand for medical care is higher than those of men (Muriithi, 2013). Another possibility is that men are known to be more risk takers than women and so not going for cancer screening may not be considered risky by men as would by women. Higher medical care demand in females than in males has also been found by Henderson (2005), Hakes and Viscusi (2007) and Muriithi (2013).

Religion was a categorical variable whereby a belief in traditional religion was the base variable. Being Christian (REL_1), Muslim (REL_2), Hindu (REL_3) and not believing in any of these (REL_4) were the other categories. They were all weak in terms of significance but they differed somewhat ambiguously in the directional signs of their coefficients relative to the base variable. A Christian would be willing to pay 1969.7% more than a traditionalist. A Muslim and a Hindu would be willing to pay 144998.8% and 366.5% respectively less than a traditionalist. Being Muslim (REL_2) was more significant relative to the other religions. Not believing in any of the religions gave a surprise finding in terms of the magnitude of the coefficient (2.33). It suggested that those who do not believe in any of the religions were willing to pay 927.8% more than those who at least believed in something, traditional religion. Religion defines some code by which people live. It spells the dos and don'ts of the community of believers and this may include health care.

Attitude towards cancer screening (ATT: cancer screening is useless = 1, useful = 0), fear of cancer screening procedure (FEAR: fears cancer screening procedure = 1, otherwise 0) and distance to the nearest health facility (ln DIST) were weakly significant at 5% level but all of them had the expected negative direction of the coefficients.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary and Conclusion

Using a contingent investigative approach, this paper has empirically looked into the willingness to pay for cancer screening in a cosmopolitan urban set-up in Kenya. It has attempted to estimate the value in terms of WTP amount that a representative population in Kenya attaches to screening of cancer. The paper has also investigated some socio-economic and environmental factors that are hypothesized to affect willingness to pay for screening of cancer.

The study established a mean and median WTP amount of 9,334.63 and 3,000.50 Kenya Shillings respectively. 73.2% of the respondents were willing to pay up to 15,000.00 Kenya Shillings for cancer screening.

We find that elasticity between WTP and smoking status of a respondent is very significant and negatively related whereby smokers are predicted to be less willing to go for screening of cancer than non-smokers. This is perhaps due to smokers being people who do not mind engaging in risky behaviors: they do not care about whether or not they contract cancer. Those who are formally employed (white-collar) were found to have higher WTP than those in the informal sector ('jua kali' or self-employed). This may be due to the reason that formal occupations tend to assure regular income whilst informal occupations do not. When future income is certain, one can spend today on cancer screening because he is sure to get money tomorrow.

Generally, those with education gave higher WTP amounts than those with no education. Education may determine how someone's access to information on the benefits of healthy behavior such as screening for cancer. Those who had information about cancer were willing to pay more than those who had no information about cancer. Similarly, those who were aware about cancer screening were willing to pay more than those who, prior to the study, were not aware of cancer screening.

WTP and income was found to be positively related. Thus, an increase in income would shift WTP to the right. Income here has double influence; the income effect which indicates that someone can afford the screening and the benefit effect which implies that people think screening is valuable and therefore they should pay for it as long as there is income. The WTP was also positively elastic with age. The older the respondent the higher the WTP for screening. This is perhaps due to the belief that the older one is the higher the risk of contracting cancer. Women were more willing to pay for screening than men. Married people were found to have higher WTP than unmarried people. This may be because married partners can support each other towards healthy behaviors such as screening. Also, where both are gainfully employed, then they have a larger pool of income than singles. The more dependants in a household, the more the WTP. This can be attributed to the fact that a larger household would demand more of health care than a small household hence a bigger family budget could have been set aside. Those who preferred traditional healers to formal health facilities gave less WTP amounts. This is expected given that screening for cancer in the first place requires a formal health facility with proper infrastructure.

Physical exercising and whether or not someone had a relative diagnosed with cancer were found to be positively related to WTP for screening. It is possible that people who do body exercises are keen on living healthy lifestyles and they therefore view screening as part of healthy living. They are eager to screen to confirm that they are indeed keeping well. Having a relative who has been diagnosed of cancer and seeing them in pain or having succumbed and yet sometimes this could have been avoided were it to be discovered early, may propel someone to go for cancer screening in the hope of avoiding the fate of his or her relative.

We also find that those who do not believe in traditional religion or Christianity or Islam or Hindu gave higher WTP amounts than those who believe in any one of them. This is a surprise finding that should not be generalized but it could perhaps be that a religion may prescribe do's and don'ts and this may include such things as cancer screening procedures especially if the procedure requires tissue or blood samples to be taken. Those who have poor attitude (think screening for cancer is useless) gave lower WTPs. The same applied to those who fear cancer screening procedures. Those who think cancer screening is useless were mostly those who have witnessed cancer deaths or believe that it is better not to know cancer status than to know. The fear of

screening is mainly due to the intrusive nature of some procedures. Distance to the nearest health facility had a negative effect on WTP.

In conclusion, we find that the willingness to pay for cancer screening is under the influence of some socio-economic and environmental factors. The implication is that cancer control programmes that place early detection at the center in the fight against cancer must of necessity take these factors into account when promoting screening as a cancer control strategy. A contribution has been made by this study to the CVM literature in showing that the MBDC approach can be improved to mitigate hypothetical bias by not only picking the 'definitely yes' but by also picking the highest 'definitely yes' amounts per respondent and by further asking the respondent what, if any, they would give up in order to afford their highest 'definitely yes' amounts. This would help minimize naïve free riding behavior besides hypothetical and strategic biases.

5.2 Policy Recommendations

The findings of this study portend some policy implications. Whether one smokes cigarettes or not was found to significantly affect his or her willingness to pay for cancer screening. Hazardous consumption activities such as smoking are generally connected to risky behaviors and so it is not uncommon that smokers would act in a foolhardy-don't-care manner to something like cancer screening. Cancer control programmes that promote early detection of cancer should therefore take an integrated approach that combine early detection with measures to reduce hazardous consumption activities such as tobacco smoking and alcohol intake. The government can, for example, create a state monopoly in sale and distribution of cigarettes and alcohol.

Another significant finding was that the nature of occupation has an influence on WTP for screening of cancer whereby people in informal occupations such as 'jua-kali' (blue-collar) have lower WTP than those in formal occupations (white-collar). This can be explained by the fact that informal occupations tend to have uncertainty about future income and so they limit their expenditure on optional and 'luxurious' consumption such as cancer screening. It could also be that people in informal occupations consider cancer to be a disease of the rich or those in white-collar jobs who live sedentary lifestyles. Due to uncertainty of income tomorrow, a person in an

informal occupation must take measures to ensure that today's income is maximized by, for example, not engaging in activities that would consume working time. He therefore does not have extra time to spend in traveling to a health facility for screening. The implication is that screening facilities should therefore be brought closer to the people. Stakeholders should also consider a 'single-visit' or 'screen and treat' approach to ensure that one does not have to make several visits to a health facility. Now that in Kenya, health care has been devolved to county governments, stakeholders such as the central government can work with the counties to create cancer screening centers in every ward.

Educational attainment was found to have a positive relation with WTP for cancer screening. Possession of secondary education was found to have the most significance compared to the other levels (no education, primary education and higher education) but generally those who had some level of education gave higher WTP than those with no education. A possible recommendation is to introduce cancer education into the primary and secondary schools' syllabi with emphasis on cancer control through prevention and early detection.

Subsidy on cancer screening services can also be considered by the government. It can also be a government policy to offer free screening services in public health facilities so as to take care of those who cannot afford.

Some cancer screening procedures are known to be so intrusive as to create fear and apprehension among people who would otherwise wish to be screened. Pap smear procedure (for cervical cancer) and the digital rectal examination (for prostate cancer) were pointed out as being intrusive. There is therefore need for research and adoption of screening procedures that are less intrusive.

It is not uncommon in Kenya to find women coming together and organizing themselves into women groups, locally known as *chama*. In most cases the *chama* members are connected via social media platforms such as 'WhatsApp' and 'Facebook' through which they share information. Some of them are so vocal and popular as to influence behaviour change. An example is that of a WhatsApp group called 'Kilimani Moms Uncensored' in which issues that would otherwise be kept secret are shared and discussed, and in so doing women (and men too) have the opportunity

to share experiences and learn from each other. Such can also act as good fora for creating awareness around cancer and the need to be screened for cancer. In the rural areas where not everyone may have a smartphone, the *chama* meetings can be good fora for creating awareness and mobilizing people to go for cancer screening. Such groups can also be taken through capacity building programmes on cancer screening so that they become social agents in their localities.

We find from the study that WTP was lower for people who had relatively low incomes except for a few cases of extreme demands where people were willing to pay prices that exceeded their income. The implication for policy is that for low resource settings, stakeholders should promote low cost screening methodologies such as the VIA in the case of cancer of the cervix. It was encouraging to discover that one hospital in Nairobi charges between 50 to 100 Kenya Shillings for cervical cancer screening.

Stakeholders need to know and monitor the successes of cancer screening programmes. This can be possible when surveillance and registration systems are put in place with the responsibility of collecting data on screening events, cancer mortality, prevalence etc. Such data can be instrumental when designing cancer control plans. In Nairobi, we already have the Nairobi Cancer Registry. There is need to have satellite registries in the counties and these registries should be properly funded by the ex-chequer to enable them carry out their functions effectively.

5.3 Suggestion for Further Research

Being a mortality-reducing intervention, the value of cancer screening can also be determined beyond the WTP figures by going deeper to determine the Value of a Statistical Life (VSL), that is, the value of cancer screening in terms of life years saved. VSL measures the tradeoff between what one is willing to pay for an initiative that reduces the risk of dying, in this case cancer screening, and the amount of death reduced, usually the number of life years saved. This study proposes further research to determine VSL for cancer screening in Kenya. Available literature suggests that once WTP amount has been established like in this study, VSL can then be determined if cancer mortality and incidence rate reductions are known (Wang and He, 2014).

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APPENDIX

Appendix 1: Questionnaire

INTRODUCTION

My name is Barack Kamire. I am currently pursuing a Master's degree in Economics at the University of Nairobi. This research project is part of the requirement of this degree.

Statistics show that cancer is the number three cause of death in Kenya. Infectious and heart diseases are the leading two. The high number of deaths due to cancer has been partly blamed on the late diagnosis of the disease, whereby, it is estimated that in 80% of cancers that are reported in Kenya, little can be achieved in terms of curative treatment since they are diagnosed at very advanced stages when the cancer cells have spread from one part of the body to the other. Therefore, early detection of cancer through screening (testing)- even when one is not sick or does not show symptoms of sickness- is very important as it helps in discovering the cancer early enough to allow for total treatment. Anyone can get cancer; what varies is our risk levels; some people are at more risk of developing cancer than others.

This survey intends to evaluate your willingness to pay for cancer screening. The interview will take a few minutes and the answers will be treated in confidence and used for this academic purpose only. Please be as honest as possible in your answers.

R/NO.....

DATE.....WARD/AREA OF RESIDENCE.....

A. PERSONAL AND HOUSEHOLD CHARACTERISTICS:

1. How old are you (in years)?.....
2. Gender: Male/Female
3. What is your current marital status?
   - Married or in a partnership
   - Single (never been married)
   - Widowed
   - Divorced
   - Separated
4. Are you the household head? Yes/No
   If not, how are you related to the household head?.....
5. How many are you in this household?.....
   Children (below 18 years old).....
   Adults (18 years and above).....
6. What is your occupation? Formal/Informal
7. How much is your take home pay (net salary) after statutory deductions? Ksh.....
8. Try recall your expenses for last month, approximately, how much did your household spend on the following items:

ITEM	COST (Kes)
Food	
Rent	
Others	
Total	

9. What is your highest educational attainment?
   - No education
   - Primary
   - Secondary
   - Higher education
10. Do you smoke cigarette? Yes/No
11. What religion do you subscribe to, if any?
    - Traditional
    - Christianity
    - Islam

- Hindu
- None of the above

12. If you fell ill, which of the following facilities would you prefer to seek medical attention from?
    - Traditional healer
    - Formal health facility (hospital, clinic, health centre)
13. Try recall your activities in the last 7 days, have you engaged in any physical exercise apart from the usual walk-to-work? Yes/No
    If yes, what activity was it or what did it involve?.....

    How long was it?.....
14. Approximately, how far is the nearest health facility from your household?..... Km.

B. SCREENING WILLINGNESS AND CANCER RELATED INFORMATION:

15. Prior to this survey, had you heard of cancer? Yes /No
16. Had you heard of cancer screening prior to this survey? Yes /No
17. Without first considering what it would cost you, are you willing to be screened for cancer? Yes/No
    If no, any particular reason? .....
18. If not cancer or besides cancer, is there a health problem you would like to be screened for? Which one? (Specify or say 'none').....
19. Have you ever been screened for cancer? Yes /No
20. Are you currently suffering from cancer? Yes /No
21. Do you have any relative who is suffering from cancer or has survived cancer? Yes /No
22. In your view, is cancer screening useful or useless? Useful /Useless
23. Which of the following statements captures your feeling towards cancer screening procedure?
    - I am not scared of how screening for cancer is done
    - I am scared of how screening for cancer is done

C. WTP ELICITATION:

24. WTP Question:

Now, suppose testing for presence of cancer cells in your body every year prevents you from dying of cancer by ensuring that it is discovered early, treated and you become totally cured, and conversely, suppose failing to test for cancer in a year means that in case cancer is discovered in your body it would be too late to totally cure leading to your death. We would like to know the

probability that you would pay for the cancer testing (screening). One annual test may require you to pay a certain amount of charge (which goes towards doctor's fees, cost of equipment to be used, procedures etc). If you were presented with different charges for a complete cancer screening as shown below, what is the possibility that you would pay each charge? Remember that people are at different risk levels of getting cancer and so the motivation for and likelihood of testing for cancer may vary. Also, there is no additional income that you are given for cancer screening; it is from the same income (salary) that you would buy other things like food, pay rent, clothes or even pay for treatment of other diseases. Given the following list of charges for a complete cancer screening, we only want to know the possibility that you would pay for the test. Please tick one likelihood for each charge (price) given below. No answer is right and none is wrong; we just want to know your reaction to the different charges. This research is important in understanding cancer screening as a life-saving intervention and so it is important you be as much realistic and honest as possible.

Charges in Kshs.	**Definitely not**	**Probably not**	**Not sure**	**Probably yes**	**Definitely yes**
25001 - 40000					
15001 - 25000					
5001 - 15000					
1001 - 5000					
50 - 1000					
Free (0 Ksh)					

25. Looking at your highest 'definitely yes' amount, would you have to give up buying anything in order to be able to pay this amount? Yes/No

    If yes, what would you give up?.....

    Suppose it was food that you would give up, would this still be the highest amount you would definitely pay, or would you pay more or less? Same/More/Less

26. If you have answered Definitely Not, Probably Not or Not Sure at the free charge what is your reason for this?.....

    .....

    .....

D. RESPONDENT SUGGESTIONS/COMMENTS:

27. Would you like to make a comment or suggestion regarding cancer screening? Yes/No

    If yes, what is your suggestion/comment? .....

    Thank you for the support and co-operation.