KWAME NKRUMAH UNIVERSITY OF SCIENCE AND

TECHNOLOGY- KUMASI, GHANA

PERCEPTION OF ATTRIBUTES AND HEALTH BENEFITS OF COCOA

BY

BENJAMIN SAVIOUR SEMANHYIA

(PG4370315)

A THESIS SUBMITTED TO THE INSTITUTE OF DISTANCE LEARNING (IDL), KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS OF SCIENCE IN FOOD QUALITY MANAGEMENT

AUGUST, 2017

DECLARATION

I hereby declare that this submission is my own work and contains to the best of my knowledge, no material which has previously been published or submitted to any other university or institution for the award of degree, except where due acknowledgement has been made in the text.

Semanhyia, Benjamin Saviour **……** **……**
(Student) **Signature** **Date**

Certified by:

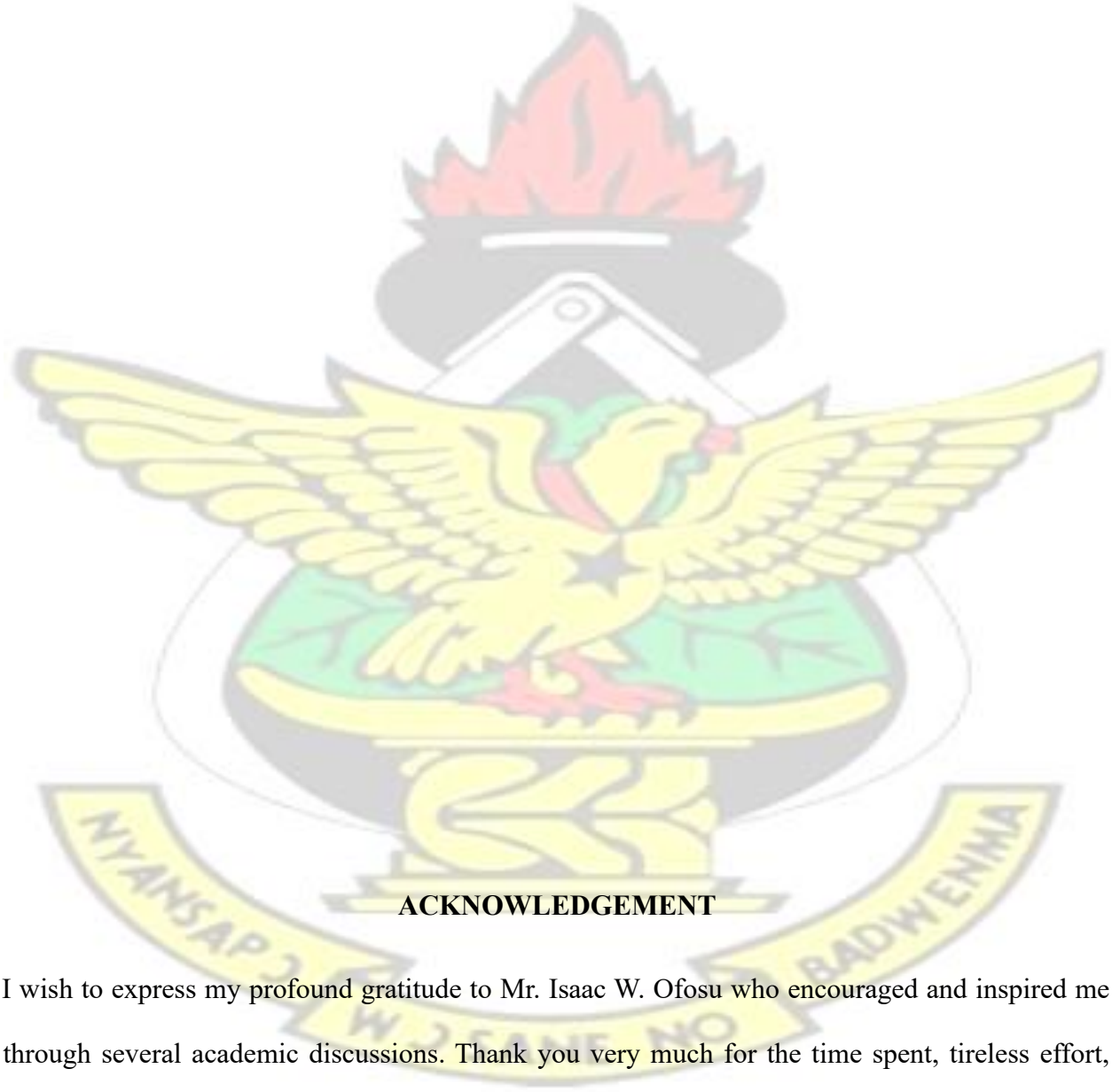
Isaac W. Ofosu **…….** **…….**
(Supervisor) **Signature** **Date**

Certified by:

Dr. F.D. Wireku- Manu **…….....** **…….**
(Head of Department) **Signature** **Date**

DEDICATION

I wish to dedicate this work to my wife and lovely daughters.



ACKNOWLEDGEMENT

I wish to express my profound gratitude to Mr. Isaac W. Ofosu who encouraged and inspired me through several academic discussions. Thank you very much for the time spent, tireless effort, overall support and supervision during this research work.

I wish to also express sincere appreciation to Lecturers of the Food Science Department, KNUST especially Dr. Herman Lutterodt, Mrs. Gloria Ankar Brewoo, Dr. Emmanuel de- Graft Johnson Owusu- Ansah for their diverse support in the research work.

I am indebted to Mr. Michael Frimpon, lecturer at the Ghana Institute of Management and Public Administration (GIMPA), for your support during data gathering. Alfred Avornyo, Cyril Acolatse, Frederick Mensah and the rest of the team, you performed extremely well during questionnaire administration despite the challenges encountered.

I am most grateful to my wife, Beatrice and my lovely girls, Mary, Rita and Tracy for their unconditional love and support. To my colleagues at work thank you very much. Finally, I am most grateful to the Almighty God for the peace, love, guidance and protection throughout this study. Indeed you are my mentor and always there for me.

TABLE OF CONTENT

CHAPTER THREE: MATERIALS AND METHODS

CHAPTER FOUR: RESULTS AND DISCUSSION

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

LIST OF TABLES

ABSTRACT

Studies have shown that cocoa and chocolate have many medicinal properties. Many clinical benefits are derived from cocoa including dietary antioxidants, inhibition of dangerous clot formation and improving blood circulation. The aim of this study was to assess consumer perception of attributes and health benefits of cocoa. A total of 282 respondents were interviewed or questionnaire were given to be completed. Respondents were residents in 4 municipal assemblies in the Greater Accra region of Ghana. In all six attributes that served as input variables were the focus of the investigation to ascertain how consumers perceive these to influence health benefits of cocoa. The regression model was used to analyze the perception attribute and useful deductions were drawn to ascertain the acceptance of attributes and health benefits of cocoa. The results showed that consumers perceive cocoa to have many clinical benefits. Two attributes or input variables namely Cocoa and cancer management and cocoa butter as skin remedy had no significance in the prediction of response variable. It is recommended that Government provide the enabling environment and introduce tax waivers to support local manufacturers of cocoa. This will reduce cost of operations. There is the need for an intensive consumer education, sensitization and awareness creation in order to shift consumer attitudes and perception.

ABBREVIATIONS AND SYMBOLS

ROS- REACTIVE OXYGEN SPECIES

ANOVA- ANALYSIS OF VARIANCE

NCPCC- NATIONAL COMMITTEE FOR PROMOTION OF COCOA CONSUMPTION

LDL- LOW DENSITY LIPOPROTEIN

BP- BLOOD PRESSURE

NO- NITRIC OXIDE

ACE- ANGIOTENSIN CHANGING ENZYME

SS- SUM OF SQUARES

SE- STANDARD ERROR

CHAPTER ONE
INTRODUCTION

1.1 Background to the study

Health attributes and benefit of cocoa consumption have become important as a result of changing lifestyle and food consumption patterns (Hassler, 2002). Consumer health consciousness is increasingly becoming key factor driving the agro food industry (Nestle, 2013). Healthier food products have entered global markets in such an alarming rate and rapidly gaining grounds. Invariably this emergence has resulted in industry responding with growing variety of new cocoa products with corresponding health- related benefits. Cocoa products such as chocolate ensure provision of essential nutrients including vitamins and minerals and additional health benefits when consumed within acceptable levels on regular basis (Watson *et al.,* 2013). In reality not all foods available on market and are tagged as having proven health benefit and reliable data to warrant such claim. There are variety of cocoa products classified in terms of the strength of evidence and recommended intakes. Cocoa products though not magic bullets or regarded as panaceas for poor health habits remain one of the key areas mostly investigated and marketed in food and nutrition sector in recent times. Cocoa products can be described as having health attributes and benefits since it provides taste, aroma as well as nutritive value (Latif, 2013). Knowledge in this area is very necessary for more understanding in consumer choices with respect to cocoa products. Grunert and Aachmann (2016) came out with the three dimensions of quality, as a result of evaluative judgment, drawing relationship between the subject and the object, consumer accepting products in terms of its value. The three properties of consumers are search, experience and credence (Ford *et al.,* 1988). Perceived quality demand subjectivity, the level of value perceived and reported by consumers when it utilizes and derive benefits from product consumption (Wiedmann *et al.,* 2009). Consumer perception of quality is the most valuable

considered factor in product choice (Zeithaml, 1988). Consumer avid drive towards enrichments with proven nutritional effects has resulted in the acceptance of healthier foods. Within a population set up, older adults are likely to benefit tremendously from healthier foods as a result of age-related issues pertaining to food and health. At the time of purchase, the health benefit of food is not readily accessible hence consumers have to rely on nutritional information, health claims as well as intrinsic and extrinsic quality attributes (Padel and Foster, 2005). These attributes include taste, appearance, labeling, wholesomeness, convenience and processing method (when disclosed) which tend to influence consumer judgment. The long-term success of cocoa and cocoa products in the marketplace hinges on consumer attitudes, acceptance and perception with regards to these products. However this cannot be achieved in a vacuum, an effective communication of nutrition and health information is necessary in ensuring long term success in terms of patronage. The bioactive constituents of cocoa products thus offer remedy to the increased risk of chronic disease among older adults (Scapagnini *et al.,* 2014). This is as a result of its antioxidant and anti-inflammatory properties.

1.2 Problem statement and justification

Various attributes and health dimensions of a product affect consumer perception of the product and hence its patronage on the market (Roitner-Schobesberger *et al.,* 2008). Cocoa comes with many health benefits which has been proven scientifically but what consumers think is another matter. The level at which these good attributes of cocoa is appreciated by segment of consumers is not known. As a result of the huge cost of health delivery in the country, there is the need to channel resources to the preventive health care in order to reduce this burden on the economy. The fact still remains that the effect of diseases on individuals and their dependents such as family and employers is huge. Diseases prevention, control and management through natural means as well

as leaving healthy life styles are the necessary key in our quest for improved health delivery. The results of this study would be of immense benefit to consumers and the general public. To the academia, the findings of this research could serve as reference material for further research in the area of assessing consumer perception of health benefits of cocoa which will be addition to knowledge in this field.

1.3 Aims and objective of the study

The main objective was to assess consumer perception of attributes and health benefits of cocoa. In addition, to understand consumer behavior and what influences their choice and acceptance of products derived from cocoa. The specific objective was to investigate the influence of demographic characteristics such as age, gender, education and cultural settings on the perception of attributes and health benefits of cocoa consumption. It was also to determine which of the six input variables play significant role in the determination of consumer perception of attributes and health benefit of cocoa. Finally, the project sought to assess consumer acceptance of health benefits of raw cocoa powder and dark chocolate as against sweetened and other processed cocoa products.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction: Brief history of cocoa

Forastero, Trinitario, and Criollo are the three main varieties of cocoa (Laurent *et al.,* 1993) . The world cocoa production is made up of Criollo 5% and Forastero form 80- 90% (Barry, 2016). Criollo is regarded as delicacy even though it is very rare. Criollo is originated from Central, South America and also Sri Lanka and the Caribbean. The color of Criollo bean is white to pale and taste is usually described as delicacy yet complex owing to its low in classic chocolate. Criollo is considered the prince of cocoa but is more vulnerable to harsh weather conditions (Galleano *et al.,* 2009). Forastero is the most commonly grown cocoa and is less susceptible to diseases, much harder and provide much yield than Criollo. The full- bodied flavor of chocolate is as a result of the purple color of Forastero beans (Bekele *et al.,* 2006). It is often blended with superior cocoa as it is bitter to taste within a short duration and unsupported by secondary flavors. Forasrero has many subspecies including Amelonado, Cundeamor, and Calabacio (N'Goran *et al.,* 1994). However, Amelonado is the most widely cultivated of all (Motamayor *et al.,* 2013). Criollo variety has been around since origination of cocoa and compared to Forastero originating from the Amazonas is seen as a variety that is foreign. Originating from Trinidad, Trinitario which is described as a natural hybrid due to cross pollination, has certain unique attributes such as hardiness, high yield and an improved taste attribute of Criollo. Its demand on market is high due to its excellent flavor and yield (Galleano *et al.,* 2009). Another variety, Nacional is well recognized for having unique characteristics of splendid aroma despite its weaknesses of being easily attacked by diseases and its peculiar cultivation. Cocoa has a characteristic flavor that is independent on soil type, temperature, sunshine, rainfall and the variety (Ahmed *et al.,* 2012). The flavor of cacao beans is independent on the variety, soil, temperature, sunshine and rainfall.

Perception and attitude

Perception is the means by which a consumer assesses a sensory situation and be able to provide meaning to the environment (Ashford and Cummings, 1983). In psychology, perception is the means of identifying and offering meaning to information on sensory. Perception includes how consumers respond to sensory information. Perception defines how information is picked by an individual from the environment and reacts to it within that same set up (Lombard and Ditton, 1997). In philosophy, perception entails how individuals relate to beliefs concerning something or how they see the world around them. The study of perception, this is seen as what an individual subconsciously give in or out from the sensory perspective which forms an image of an object, in this case a product (Puth *et al.,* 1999). Angell (1912) defined perception as consciousness in reference to a particular item available to the sense. This may originate in an organs' stimulation and depends on how our past influences the present outcome. In marketing, perception is important as consumers either act or react as a result of perception and not what they objectively realize (Schiffman, 1991). An attitude is the correlation between what impression consumers have about a product and what they actually purchase during shopping (Foxall, 1994). Attitude towards a brand is derived from perception of a consumer of the attributes associated with that brand. An attitude is defined as a learned ability to respond to something in a particular way (Evans, 2006). An attitude is a lasting overall assessment of an individual or object (Solomon *et al.,* 2008). Consumers consider health as an important characteristic just like taste. They develop choices for particular food attribute which is usually enhanced by personal quest for a long lasting and extreme living standard (Huang, 1996).

2.1 Health benefits of cocoa

Consumers consider the health dimension of food at par with taste and these two are top most criteria in assessing and choosing suitable food product according to research previously

conducted. Consumer preference for improved health dimension is driven by their quest for long life and also meeting the high standard of expectation (Padel and Foster, 2005). Cocoa and chocolate is known through research to have medicinal properties. Consumers prefer healthy eating habits so they continue to have better life (Dima *et al.,* 2012). Well documented research reaffirms characteristics of chocolate as stimulant, aphrodisiac, antidepressant etc. Cocoa has lot of health benefits including supply of high dietary antioxidants, influence blood pressure positively, prevents physical signs due to aging, reduces menstrual pain, enhances energy, improves blood circulation, shows resistance to tooth decay, boosts fertility in both sexes, inhibits dangerous clot formation within blood vessels, affords anti- cancer and cancer prevention properties, promotes cleansing and detoxification of the body, rich dietary iron which helps to fight anemia, improves memory and general brain functions, supply important dietary minerals ,offers healthy levels of dietary fiber, protects blood vessels, boosts sense of well- being (NCPCC- COCOBOD). Research show that diet rich in flavonoids is able to reduce remarkably the effect of arterial thrombosis (Arts and Hollman, 2005) and moderate intake of cocoa and allied products such as natural cocoa powder substantially increases platelet performance (Flammer *et al.,* 2007).

Castell *et al* (2013) indicated that cocoa intake is linked with resistance to oxidative stress.

Research shows that cocoa and chocolate intake contributes to retardation of cancer growth (Kanadaswami *et al.,* 2005) and performance immune system including the inflammatory outlook. In addition cocoa other is effective in minimizing effects of high blood pressure, cholesterol, constipation, obesity, cancer, bronchial asthma, sugar disease, all aspect of neurodegenerative diseases. Cocoa also provides quick cardiovascular health and brain health (Katz *et al.,* 2011). Cocoa is also beneficial in the treatment of copper deficiency. The cocoa bean exhibit mood enhancing and exerts protective effects against neurotoxicity. Cocoa provides anti- carcinogenic, anti- inflammatory, antioxidant properties and presents enormous health benefits (Sarriá *et al.,*

2014). Research conducted on pregnant women show that high cocoa proportion in chocolate consumed in moderation resulted considerable reduction in blood pressure, glycemic as well as improved liver function with effect on weight gain (Di Renzo *et al.,* 2012). Cocoa bean is the fruit of the *Theobroma cacao* tree and the extracts from cocoa beans is cocoa. Cocoa has high levels of flavanol most especially, epicatechin, catechin and also procyanidins known for its blood pressure lowering effect (Latif, 2013).

2.1.1 Evidence of antioxidant properties of cocoa

Evidence show that cocoa provide higher antioxidant activity that enable it neutralize the oxygen based free radicals resident in the body. Cocoa retards LDL oxidation within the human system (Vinson *et al.,* 1999), it enhances antioxidant effects of plasma (Osakabe *et al.,* 2001) and causes reduction in development of reactive agents (Rein *et al.,* 2000). Also cocoa contain a high level phenolic phytochemicals and flavonoids. The phenolic content in cocoa reduces during processing (Rusconi and Conti, 2010). Many of the beneficial effects of cocoa and chocolate are associated with the antioxidant effects of the polyphenols found in cocoa. Flavanols such as catechin, epicatechin, and procyanidins which are polyphenols is responsible for chocolate antioxidant activity (Latif, 2013). Within the cardiovascular system cocoa consumption play key role in preventing disease condition (Keen *et al.,* 2005). When colonic fermentation is over, condensed tannins which are proanthocyanidins sometimes become bioactive antioxidants. However there is disagreement of the antioxidant effectiveness of cocoa when consumed with milk, some research indicate reduction in antioxidant activity whereas other study shows that the inclusion of milk solely reduce the removal of metabolites from urine. Cocoa flavanol antioxidant function is due to the ability to minimize effects of free radicals, retard the activity of enzymes that provide reactive oxygen species (ROS), metallic chelate and reduce antioxidant resistance (Watson *et al.,* 2013).

2.1.2 Cardiovascular health and cocoa

Studies undertaken recently show that products derived from cocoa have the potency of minimizing certain conditions that lead to the development of heart disease. These conditions include high blood pressure (BP), intense platelet agitation, high LDL concentration and oxidation etc. The antioxidant property of flavonoid such as epicatechin and gallic acid in cocoa ensures cardiovascular protection of cell damage and strengthening of the heart ((Katz *et al.,* 2011). The development of endothelial nitric oxide (NO) in cocoa leads to the lowering of blood pressure when there is vasodilation. Cocoa flavanol content is known for inhibiting angiotensin changing enzyme (ACE) function that cause reduction in blood pressure. Previous study confirm the existence of strong antioxidants found in the cardiovascular unit works by regulating NO-synthesize process to reduce blood pressure. Cocoa prevents blood clotting and ensures prevention of diseased condition such as atherosclerosis (Katz *et al.,* 2011). Stearic acid though saturated fatty acid in cocoa doesn't elevate cholesterol levels but contribute in reduction of heart attacks. Sugar free cocoa powder is reported to be more clinically beneficial than that with sugar content. With the latter there is decrease in both micro and macro circulation with the arteries due to moderate hyperglycemia (Grassi *et al.,* 2015).

2.1.3 Cocoa and blood pressure management

The flavonoid- rich cocoa helps in reducing blood pressure (BP) and enhancing the elasticity of blood vessels (Watson *et al.,* 2013). There has been in depth study in this aspect of which results

shown positive effect on the heartbeat and relaxation as a result of the antioxidants present in cocoa which enable stimulation of nitric oxide that assist in keeping blood vessels in relaxed state. The overall effect is an improvement in the circulatory system. During blood circulation, blood is pushed toward the arterial walls and the extent of force it exerts determines the blood pressure. Another contributory factor to high blood pressure is the size of the arteries. When the heart relaxes to fill the arteries blood pressure is low but it is high when the heart beats to move blood into the arteries (Gaciong *et al.,* 2013). When the artery gets narrower or constricts the pressure of blood circulating is higher and when the muscular walls of artery dilates or relaxes blood pressure lowers. Long duration of continuous consumption play significant role in blood pressure reduction, the longer the duration of continuous consumption, the better even with smaller dose. Heavy dose within period leads to weight gain and significant reduction found in younger population than adults (Watson *et al.,* 2013). The reduction of elastin and rise in collagen and glycosaminoglycan's causes stiffening of arteries. When it is consumed in acceptable proportions arterial stiffness and vascular resistance reduces thereby improving vascular performance. Effect of cocoa consumption on consumers is more pronounced in young persons as a result of reduced vascular reactivity due to physiological stimuli. Hypertension is not recorded when there is temporal rise in blood due to an intense physical activity which reduces when the stress is over (Joyner and Casey, 2015). Heart disease, arteries hardening (atherosclerosis), kidney disease are some of the complications of hypertension. Cocoa has an effect on blood cholesterol. Extensive research on cocoa reveals both hypoglycemic as well as hypocholesterolemic influence on glucose and cholesterol levels. The outcome indicates reduction in triglycerides, LDL cholesterol and glucose.

2.1.4 Cocoa and the nervous system

Cocoa has neuroprotective effect on learning as well as memory function (Nehlig, 2013). Previous works attest to the fact that the consumption of cocoa and cocoa based products improves blood flow to the brain and exhibit therapeutic potential for treating vascular disorders. Clinical benefits of cocoa and chocolate consumption include mood enhancement, safeguarding the nerves from damage and swollen up, boosting general alertness and cognitive performance (Barnes *et al.,* 2013). Previous research conducted indicate flavanol in cocoa is quiet beneficial in boosting brain function especially where the consumer is cognitively impaired and is undergoing sleep deprivation, fatigue or aging (Bayard, 2007). Further investigation is required to clearly ascertain the exact process by which cocoa, chocolate and allied products exhibit the neuroprotective, neuroenhancing as well as neurostimulating attributes. Chocolate intake protects nerves from injury and inflammation.

2.1.5 Brain function and cocoa

Cocoa contributes in developing healthy brain which positively influences learning and memory function. It improves blood flow to the brain and evidence has confirmed its ability to contribute in curing vascular disorders. Nurk *et al.* (2009) investigated the capacity of flavonoid rich cocoa to protect the brain and for that matter the damaging effects of neurotoxins on neurons safeguarding against inflammation of neurons. Research reveals the overall direct effect of cocoa when consumed in enhancing memory, learning and also cognitive performance. It must be noted that despite the positive attributes of cocoa and chocolate on brain performance it has negative effects on cravings for food which ends up retarding cognitive function. Chocolate is undoubtedly among the highly acceptable and most preferred foods on the market owing to its attributes of taste as well

as creamy texture. Further in depth study is needed to confirm the effects of flavanol rich cocoa when consumed regularly over certain time frame in improving cognitive performance among the aged. Chocolate contain vitamin C and antioxidant flavonoids that has main components polyphenols like catechin, epicatechin and procyanidins that protect the brain and nervous system from getting dull with age and from free radical damage (Ahmed *et al.,* 2012). In addition it keeps the brain and nervous system active even in old age. Chocolate contain vitamin C and antioxidant flavonoids that has main components polyphenols like catechin, epicatechin and procyanidins that protect the brain and nervous system from getting dull with age and from free radical damage. It improves brain efficiency by keeping it active and sharp as a result of increased serotonin levels. It is useful in treating nervous disorders for example Alzheimer's disease.

2.1.6 Cocoa as mood enhancer

Cocoa consumption provides antidepressant form of influence on physiological condition (Parker, 2013). It enhances feeling of contentment and aphrodisiac consequences. The caffeine content, theobromine, phenylethylamine found in cocoa are all stimulant in nature. They are effective mood elevators and antidepressants. Cocoa contain Tryptophan, an amino acid having relaxing properties and during tension and stress provide soothing and refreshing effects. Consumption of cocoa provides antidepressant form of influence on some physiological conditions. Flavonoids support in enhancing and tackling depression and develop cognitive processes when there is continuous mental exertion (Kidd, 2008). Consumption of cocoa also contributes in enhancing feelings of contentment and enhancing aphrodisiac consequences due to presence of neurochemical phenylethylamine. The extent of emotions can influence an individual appetite for food and hence the response to chocolate consumption (Macht, 2008). Recent research show that eating chocolate

reduces negative mood, whereas there is no or slight marginal effects when exposed to neutral and positive mood. The state of depression may be as a result of lack of phenylethylamine. Consumers of chocolate feel less depressed, anxious and irritated and the persistent call for chocolate is an indication of depressed condition. These minerals for instance zinc, potassium, calcium, copper, magnesium are found in higher amount in chocolate and its positive impact on cardiovascular condition cannot be overemphasized.

2.1.7 Cocoa and diabetes management

There is improved insulin resistance and also glucose metabolism upon consumption of cocoa which in turn helps in regulating sugar levels in the body. The body gain proanthocyanidins which support in the inhibition of cataract formation sometimes induced by diabetes (Varsha *et al.,* 2014). Cocoa enables exertion of protective antioxidant activity useful for remedying conditions such as diabetic nephrotoxicity which is long- term complications of diabetes condition. This nephrotoxicity plays a significant role in diabetic mellitus and is mainly responsible for the severe renal disease. Oxidative stress is reached when free radicals worsen these diabetic complications resulting cell as well as tissue damage (Giacco and Brownlee, 2010). Cocoa thus provides a remedy to this free radical damaging condition by employing therapeutic aspect aimed at treating and preventing cellular injury. Evidence suggests that without polyphenols, products rich in fat including chocolate may hugely influence metabolism (Goya *et al.,* 2016). This caused the commercially made cocoa and its allied products having lower levels of polyphenols and this could have negative impact on health as a result of its energy density and capacity to increase insulin and amount of cortisol. Chocolate due to its substantially increase caloric levels and fat content is not suitable to be recommended in preventing and management of diabetes- related complications.

Individuals suffering from type 2 diabetes are usually fat hence consuming chocolate may result in increased weight which will counteract beneficial effect of polyphenols (Farhat, 2014). Dark and sugar free chocolate or cocoa contain alkaloids such as caffeine which makes it bitter (Wirtz *et al.,* 2014). The bitterness eventually neutralized sugar in the blood. Also these are stimulants that stimulate secretion of bile and insulin which contribute in breakdown of sugar thereby reducing sugar levels in blood. Cocoa consumption is effective in improving insulin resistance and glucose metabolism. The proanthocyanidins constitute contribute in inhibiting cataract formation in occasionally induced diabetes. Cocoa free radical scavenging properties exhibit therapeutic effect in preventing and controlling cellular injury. Thus insulin performance is enhanced when high quality products of cocoa have enough bioactive flavanol is consumed (Rostami *et al.,* 2015). Finally, previous research shows that consumption of moderate amount of dark chocolate has the capacity of preventing the advancement of type 2 diabetes. A few components have been proposed to clarify the positive impact of dark chocolate on the improvement of type 2 diabetes as well as on insulin affectability, endothelial vascular capacity.

2.1.8 Cocoa and cancer prevention

The key health benefits of cocoa include suppressing of cancerous growth while enhancing growth of normal healthy cells. Flavonoids and procyanidins found in cocoa provide chemical prevention and anti-proliferative properties that does not only exhibit healing but also adds value in the treatment of cancer such as colon and prostate cancer. Cocoa suppresses cancerous growth while enhancing growth of normal healthy cells (Kanadaswami *et al.,* 2005). Flavonoids in cocoa are good anti- carcinogen, thus prevent growth of cancerous cells (Yang *et al.,* 2001). It is also help neutralize carcinogenic effects on free radicals.

2.1.9 Cocoa butter as skin remedy

Cocoa butter is very effective for keeping good skin due to the presence of flavanol-rich cocoa when consumed assist in reducing the impact of UV- induced erythema (Katz *et al.,* 2011). The overall effect is that there is a reduction of skin roughness and skin scaling, supports the elasticity of skin, also its hydration as well as density. Further study suggests that cocoa contains epicatechin which influences the elevation of oxygen saturation of hemoglobin and enhances effective blood flow through the dermal tissues. Cocoa butter is effective for keeping good skin due to presence of flavanol (Scapagnini *et al.,* 2014). Cocoa butter ensures reduction of skin toughness and skin scaling, supports elasticity of skin. It influences elevation of oxygen saturation of hemoglobin and thus enhances effective flow of blood through the dermal tissues.

The role of cocoa butter

Among the valuable products derived from cocoa beans is a vegetable fat called cocoa butter or Theobroma oil. Clinical benefits include effective skin care, immune system booster, hair quality enhancement, prevents sign of ageing. It is applicable in various areas including cosmetics, chocolate, ointment and some pharmaceuticals. Cocoa butter bears the strong aroma of cocoa beans hence has similar taste and smell characteristics. Other equally important attributes include high stability when compared to other fats. It has antioxidant properties which prevent rancidity and has a shelf life of 2 to 5 years. The presence of fatty acid and antioxidants make it suitable for reducing inflammation of the skin. Cocoa butter improves the general appearance and strength of the hair. It provides moisturizing hair and contributes in the reduction of scars on skin. It supports hair growth and slows down development of male baldness. Cocoa butter acts as a barrier to protect the skin from environmental factors as well as skin damage and irritation. Cocoa butter fatty acid component which is an antioxidant agent make it suitable for reducing inflammation of the skin.

Cocoa butter is an effective remedy for eczema, rashes, psoriasis as well as other type of inflammation on the body. Evidence show that considerable amount of cocoa butter when applied brings relief to the inflammation condition of the heart.

2.1.10 Effectiveness of dark chocolate

Dark chocolate intake has strong correlation with lowering of blood pressure (Wirtz *et al.,* 2014) even though some trials have reported conflicting results. Previous research has demonstrated that there is considerable reduction in platelet aggregation after consumption of dark chocolate continuously for a certain period of time (Rein *et al.,* 2000). Other research works however indicate that upon consumption of cocoa or chocolate there is neutral effects. Cocoa consumption has overall effect such as protection on cardiovascular condition through reduced platelet aggregation, blood pressure and enhancing endothelial performance. Blood lipid profile is less affected by the saturated fat content in dark chocolate (Katz *et al.,* 2011).

2.2 Other benefits of cocoa

Consumption of cocoa and cocoa products aids in treating copper deficient victims. Cocoa is quite effective in copper substitution therapy and enhances hemoglobin. Evidence available indicates that cocoa and for that matter, cocoa products are beneficial to individual suffering from chronic fatigue by exerting a calming effect (Watson *et al.,* 2013). This is attributable to the release of neurotransmitters such as serotonin, phenylethylamine found in the brain that able to provide protective effects owing to oxidative stress on the neuronal cells and provide remedy for chronic fatigue syndrome (Castell *et al.,* 2013).

In-depth research show potential benefits derived from consumption of cocoa and cocoa products in preventing high-fat diet induced obesity. When cocoa and cocoa products are consumed, it aids not only in regulating lipid metabolism but enhances reduction in synthesis and transport of fatty acids. Cocoa and cocoa products from research show an improvement in thermogenesis as well as have an effect on heat production in adipose tissue and in the liver (Yang *et al.,* 2004). In addition, cocoa exert stimulating characteristics (aphrodisiac effects) due to its theobromine and phenethylamine content (Afoakwa, 2008).

Extracts from cocoa have demonstrated therapeutic and wound healing attributes during processing of medicinal products that are natural. When extracts used in producing medication is applied appropriately, it retards the development of infectious diseases in the human system. Cocoa rich phenolic content provide anti- inflammatory effect on consumer (Gu and Lambert, 2013).

Studies show that consumption of cocoa husk enhances therapeutic effects in controlling chronic constipation as well as diseased bowel function conditions. Previous study indicate that cocoa improve bowel function, frequency of bowel movement and provide regular stool that is softer with no related side issues including pain in abdomen as well as gastrointestinal discomfort.

The xanthine and theophylline content in cocoa beans play a dual role in supporting relaxing bronchial spasm and also the opening of bronchial tubes to provide easy flow of air which is necessary for overcoming allergies such as asthma and shortness of breath. The overall beneficial effects of cocoa are due to the presence of flavonoids which has the anti-platelet aggregating effect and also contribute in regulating basic hemostasis which is an indication of the duration of a blood clot. The beneficial effects of cocoa in the general well- being of the consumer is the prevention of disease conditions including atherosclerosis and thrombosis.

Epicatechin and catechin are the two major flavanol that are used treating neurodegenerative condition such as Alzheimer (Mandel *et al.,* 2008). Flavanol contribute in minimizing oxidative stress in the mind. This results in the prevention of neuronal cell destruction and protects the cellular membrane from cytotoxicity. Previous study reveals that the flavonoid component in cocoa has pain relieving properties in certain parts of the body most especially the cranial nerve (Nehlig, 2013). As a result of its pain relieving attribute, cocoa butter is recommended for Asthmatic, heart, abdominal pain patients. During period of pain, chocolate acts to improve insulin sensitivity despite the pain resistance experienced at the time.

2.3 Consumer segments

Quality measurements vary significantly among consumers. Despite the fact that there are singular contrasts, individuals can be fragmented by particular qualities that clarify the way individuals relate sustenance to the achievement of qualities. These characteristics called nourishment is related to way of life (Grunert, 2002), are not item specific which can be referred to as obtaining thought processes from quality view point. Buyers are motivated by the means of nourishment or obtaining ready to eat foods, eating conditions, means of assessing quality attributes and purchase decisions (Verbeke *et al.,* 2013), which we characterize as the expectation. The various categories of food consumers include the careless, conservative, uninvolved, rational and the adventurous food consumers. Consumers found in groups are inspired by social environment rather than the economic aspect (Goodwin *et al.,* 2008).

2.3.1 Careless food consumer

This group of consumers show most of the attributes of uninvolved food consumer since food is not considered as important in their day to day activities. They are very young and usually found in big cities but are well educated lying in the upper income bracket. One striking difference between the careless and uninvolved food consumer is that the careless food consumer are keen in seeking novelty products and react spontaneous in their purchase. They only value convenience and their interest in food quality is low.

2.3.2 Uninvolved food consumer

They consider other challenges in life more important than food related issues hence are not keen on shopping. They rather fancy the convenience aspect of food and hence show less interest in shopping. Their food purchase motive is not strong, and the interest in food quality is with respect to the convenience aspect. They show no interest in shopping, do not appreciate brand quality and unable to differentiate various products and do not prioritize in price at the time of purchase. Generally the uninvolved food consumer is young, single, reside in big cities however fall within the lower income bracket.

2.3.3 Conservative food consumer

The conservative food consumer reacts positively to taste and health related issues in relation to food stuffs but are less interested in the convenience dimension of food. Their household income levels are relatively lower when compared with other category of workers. They are mostly found in rural areas and for them inconvenience aspect is not important. It is very difficult to convince to accept new products because they have strong preference for food and shopping. They are least educated, prefer settling in rural communities and their disposable income is simply low. These

buyers are stability and security conscious and they hardly deviate from traditionally accepted meal patterns.

2.3.4 Adventurous food consumer

The adventurous food consumers look for new recipe and are not interested in the convenience dimension. They demand and expect good taste of food products. This category of consumer consider fall within the younger population group having slightly above household. Self-fulfillment in food related issues is considered an important purchase motive. They are usually located in urban communities. As a result of their splendid educational background they earn higher incomes compared to other segment of consumers.

2.3.5 Rational food consumer

These consumers look for more information on products during shopping. Product price is a priority and very often adopt use of shopping list as a guide when shopping. Attaining desired goals in life, rewards and protection are considered during shopping. Majority of this category of consumers are women whose income and educational level vary from region to region. They usually reside in medium- sized towns and are mostly unemployed. They exhibit functional attributes including naturalness, freshness and healthiness. They are always striving for information during shopping hence very easy to inform about new product development. They are however very difficult to convince in accepting new products. Self- fulfillment, security and recognition are major purchasing motives for the rational food consumer.

The significance of the four quality measurements that were recently portrayed contrast among shoppers (Yang *et al.,* 2004). That is, the procedure of nourishment quality observation and subsequently, the decision of sustenance they make are separately characterized. Despite the fact

that there are singular contrasts, individuals can be fragmented by particular qualities that clarify the way individuals relate sustenance to the achievement of qualities. These characteristics, called nourishment related way of life (Grunert, 2002), are non-item specific and may be described as possessing thought processes, high standard ideas, purchasing propensities as well as utilization circumstances.

In summary, the outcome of previous research confirm that there are many clinical benefits derived from cocoa and chocolate consumption. The advantages of consuming chocolate include prevention of physical signs of aging, provision of energy, efficient blood circulation, supply of high dietary antioxidants etc. Natural cocoa products are characteristically noted for increased platelet performance and resistance to oxidative stress. Cocoa is effective in managing high blood pressure, high cholesterol, obesity, cancer, diabetes, learning memory function etc. Constituent of cocoa function effectively as anti- carcinogen, anti- inflammatory, antioxidant which is attained as a result of high levels of flavonols such as epicatechin, catechin and procyanidins. The antioxidant properties enable neutralization of oxygen based free radicals and regulate NO synthesized process. The flavonoid content reduces blood pressure and improves elasticity of blood vessels thereby improving blood circulation. Catechin, epicatechin and procyanidins protect the brain and nerves from free radical damage. Cocoa acts effectively as mood enhancer. Physiological condition of consumers of cocoa products improve due to the antidepressant properties of cocoa.
Caffeine, theobromine and phenylethylamine content of cocoa are responsible for these. The neurochemical content of cocoa (phenylethylamine) provides a feeling of contentment as well as aphrodisiac stimulating effects. Regulation of blood sugar levels is attained upon regular consumption of cocoa since there is improved insulin resistance and glucose metabolism. Consumers of cocoa gain protective antioxidant activity which inhibit diabetic neuphrotoxicity and

eventually retards cellular injury due to free radical damaging effects. Xanthine and theophylline found in cocoa are useful for asthmatic and conditions of shortness of breath by aiding bronchial spasm and opening of bronchial tubes.

Dark and sugar free chocolate or cocoa has caffeine constituent which makes it bitter and neutralizes sugar in the blood. The dark chocolate has high level of flavanol which reduces along the production chain. Cocoa enhances growth of normal healthy cells and at the same time retards cancerous cell growth. Flavonoid and procyanidins exhibit chemical prevention and anti-proliferative effects hence is a source of cancer management. Cocoa butter functions effectively for correcting skin deformities.

CHAPTER THREE
MATERIALS AND METHODS

3.1 Questionnaire design

Questionnaires and interview schedule were used in this study to obtain data. The questionnaire used to collect data was similar to that used by Cater (1996) which is inexpensive and easier to

gather information from a large section of population within short period of time. The questionnaire was designed to have both closed and opened ended questions and then tested to ascertain its reliability and validity (Brace, 2008). The questionnaire design offered respondents the option to select based on the score "I agree", "I disagree" and "I neither agree nor disagree". In addition, an assessment of respondent degree of disagreement on the perception of attributes and health benefits of cocoa was conducted. Respondents were given the option to answer questions by selecting "true", "false" or "I don't know".

Interviews were carried out for these reasons; to briefly introduce the objectives of the research, to assist respondents who could neither read nor write and also to explain key words to them. In depth interviews adopted served useful purpose as it minimized the "distance' between the interviewer and the interviewee (Rubin and Rubin, 2011) and offer clear meanings (Bryman and Bell, 2015).

The research was structured using existing literature on the attributes and health benefits of cocoa and the factors influencing them. The questions were separated into eight sections to assess the influence of these attributes on the perception of health benefits of cocoa. The first section tackled socio- demographic information, specifically respondent age, gender and education. The remaining sections indicate series of questions with assigned marks and depending on the response marks were awarded and summed up to represent the score for that attribute or input variable. Each assigned marks per attribute were totaled to 10. From the second section to the seventh these attributes were assessed, cocoa/ chocolate and pre- hypertension, cocoa as mood enhancer, cocoa and diabetes management, cocoa and cancer prevention, cocoa butter as skin remedy, cocoa in the brain and nervous system. The last section, section 8 aimed at predicting the response variable Y. The questions were designed to gauge their level of affirmation of attributes and health benefits of

cocoa. This demanded an answer on a 6- point Likert scale similar to (Chen *et al.,* 2011) . A score of 0 implies "I completely disagree" and 5 implies "I totally agree". The questionnaire designed was similar to that conducted by (Fotopoulos and Krystallis, 2002). Higgins and Llanos (2015) also adopted same approach during a survey of American wine consumers. The questionnaire design ensures that data collected can be quantified, analyzed objectively and scientifically just as recommended (Wilson *et al.,* 1994).

3.2 Data collection

The study was conducted between March and April, 2017. The primary data was collected through an in depth semi conducted interviews and questionnaire administration. In order for the research outcome to be representative, respondents were selected across all geographic areas within the municipality or assembly. Data collection was done using a structured face- to - face interview and questionnaire administration. Persons engaged in administering questionnaire were carefully selected based on their previous research experience. These personnel numbering six were trained in order to obtain reliable data. Consultation with persons having solid background in local dialects such as Akan and Ga were done in order to understand and communicate true meaning of words in questionnaire to respondents. This approach was adopted in order to reduce human error and negative tendencies of poor communication. In this study, respondents were selected by simple random sampling technique from all areas including densely populated areas such as markets, schools, at church, home and along the streets within an assembly or municipality. The estimated population of the study area is about 567,000 inhabitants referring to the outcome of 2010 population and housing census (Ghana Statistical Service, 2010). The respondents were selected from the following localities South Municipal areas and the break down is shown in table 1 below.

Table 1: Study areas and number of respondents selected per zoned area

Study Area	Sample size	Percentage
Tema Municipal	81	28.7
Ashaiman Municipal	63	22.3
Ga West Municipal	67	23.8
Ga South Municipal	**71**	25.2
Total	**282**	100.0

Before questionnaire distribution, a pilot survey was conducted on a section of the population to ascertain the effectiveness of questionnaire as against the research objective (Simmons, 2001). This paved way for the final version of questionnaire to be used during face- to- face interviews with each section lasting almost 15 min. Questionnaires were administered through random sampling according to from cross section of the population including markets, schools, churches, academicians and the general public. Respondents were picked randomly (Montanari and Cicchitelli, 2014) to assess the perception of attributes and health benefits of cocoa. Hasher and Zacks (1984) described prior knowledge of respondents as fundamental factor when considering the individual ability to process information. The questionnaire supervisors went through the completed questionnaires thoroughly to ensure no gaps were left and where questionnaires were not adequately filled the forms were rejected.

3.3 Data analysis

The raw data contain demographic characteristics and scores for all the six attributes per respondent and is presented in Appendix 1. Analyzing section one, respondents demographics were grouped into three categories namely age, gender and education. The data was filtered for all categories of age, gender as well as level of education and keyed into the Microsoft excel. This was attained by selecting data then followed by data analysis and regression model. The data for

input variables in x- range was first keyed in followed by the corresponding y- range values. New work sheet was created and all steps enumerated earlier were confirmed and this resulted in the generation of summary output results. Series of summary output results were generated depending on the categorization (Appendix 13 to 17). The same approach was followed to obtain descriptive statistics for all input variables. From this data, the various variables including percentile, maximum, minimum, mean, median, mode, standard deviation etc. were obtained. The data was evaluated using one way analysis of variance (ANOVA) to ascertain the significant difference of p- value at 95% confidence interval ($p < 0.05$), linear regression and descriptive statistics.

3.3.1 The overall summary output data

The raw data analyzed gave the overall summary output results which is presented in Table 2 made up of the regression statistics as well as the analysis of variance (ANOVA). In Table 2, attribute X_1 represent cocoa and pre- hypertension, attribute X_2 represent cocoa as mood enhancer, attribute X_3 represent cocoa and diabetes management, X_4 represent cocoa and cancer prevention, X_5 represent cocoa as skin remedy, X_6 usefulness of cocoa in brain and the nervous system. The regression results indicate details of regression statistics (Table 3).

Table 2: Regression results of perceived attributes

Regression Statistics	
Multiple R	0.70267
R Square	0.49375
Adjusted R Square	0.48271
Standard Error	1.25889
Observations	282

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	425.0645	70.8441	44.7019	5.35139E-38
Residual	275	435.8232	1.5848		
Total	281	860.8877			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	1.7532	0.2507	6.9938	0.0000	1.2597	2.2467
X Variable 1	0.1394	0.0362	3.8466	0.0001	0.0681	0.2107
X Variable 2	0.1360	0.0363	3.7469	0.0002	0.0646	0.2075
X Variable 3	0.1001	0.0406	2.4643	0.0143	0.0201	0.1801
X Variable 4	0.0134	0.0320	0.4181	0.6762	-0.0497	0.0764
X Variable 5	0.0646	0.0349	1.8523	0.0651	-0.0041	0.1333
X Variable 6	0.1538	0.0343	4.4767	0.0000	0.0861	0.2214

3.4 Estimating response variable Y

Equation 1 was derived from the results presented in the overall summary output (Table 2). The intercept and the respective coefficients of the 6 attributes (X_1, X_2, X_3, X_4, X_5 and X_6) were summed up to obtain multiple regression Equation 1

$$\mathbf{Y = 1.753 + 0.139X_1 + 0.36X_2 + 0.1X_3 + 0.0134X_4 + 0.0646X_5 + 0.154X_6} \text{ ..... } \mathbf{equation\ 1}$$

where **1.753** is the constant derived from the coefficient of intercept shown in Table 2 above.

The results (Table 3) was inserted into equation 1 to obtain the corresponding estimates for mean, median and mode shown in Table 4.

Table 3: Results from statistical test of perceived attributes

Attributes	Mean	Median	Mode
X1	5.90	6.50	9.00
X2	5.58	6.00	4.00
X3	5.30	5.00	4.00
X4	4.52	4.00	2.00
X5	7.42	8.00	10.00
X6	5.04	5.00	3.00

The estimated results for Y variable using the three central tendencies is shown below.

Table 4: Estimates of perceived attributes of response variable

Prediction	Mean	mode	median
Response variable Y	6.43	5.98	6.66

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Background information of respondents

The study looked at the social demographic characteristics of the respondents selected in the study area. This was aimed at establishing whether their social demographic characteristics have any correlation with the perception of attributes and health benefits of cocoa. The outcome of data analysis is shown in Table 5.

Table 5: Social- demographic characteristics of respondents

Demographic characteristics	Categories	Frequency	Percentage
Respondents gender	Male	144	51.1
	Female	138	48.9
Respondents age (in years)	1 - 20	57	20.2
	21- 40	139	49.3
	41- 60	60	21.3
	60 and above	26	9.2
Respondents education	No Education	44	15.6
	Basic Education	85	30.2
	Secondary Education	81	28.7
	Tertiary Education	72	25.5

In predicting response variable Y, median provided the highest prediction of 6.66 followed by mean 6.43 and mode scored the least 5.98. Referring to the overall summary output, the measure of the strength of regression (R Square) is 0.49375 implying the observation is averagely close to the fitted regression line. In other words the model explains close to 50% of the variability of response and there might be other explanatory variables that are absent in this model. An average figure of

R Square value obtained is nearly the same for all aspect of demographic characteristics ranging between 49% and 50%. In reference to Table 6, input variable cocoa and pre- hypertension was significant ($p< 0.05$); cocoa as mood enhancer had $p< 0.05$ which is significant. In addition, cocoa and diabetes management cocoa as well as cocoa for brain and nervous system had p- value from ANOVA as shown in Table 6 were all significant in the overall prediction of the perception of attributes and health benefits of cocoa. Thus changes in these predictor variables are related to changes in the response variable.

Table 6: Summary output data for perceived attributes

Attribute	Standard error	T - statistics	p- value
Intercept	0.251	6.977	0.0000
X Variable 1	0.036	3.833	0.0002
X Variable 2	0.036	3.738	0.0002
X Variable 3	0.041	2.441	0.0153
X Variable 4	0.032	0.413	0.6786
X Variable 5	0.035	1.846	0.0660
X Variable 6	0.035	4.456	0.0000

Results obtained for the overall summary output for 282 observations and presented in Table 6 show that input variable 4 and 5, cocoa in cancer prevention and cocoa butter as skin remedy were insignificant since p value from ANOVA > 0.05 and hence had minimum influence in the prediction of response variable Y. Thus changes in these two predictors are not associated with changes in the response variable. The outcome of study also reveals that respondents with personal health challenges or those that have had personal encounter with cocoa products previously were

more willing and expressed confidence in their response during interviewing and questionnaire completion. They reaffirm their confidence in the potency and effectiveness of attributes and health benefits of cocoa and its allied products. Those working or have relatives working directly or indirectly on cocoa also showed similar expression. Respondents view on perception of attributes and health benefits of cocoa though subjective was clear and emphatic. Their conviction of the effectiveness of cocoa and chocolate in the management and control of these conditions presented in this study as attributes was never in doubt. In a similar study on soy products, Hammond (2014) showed that the perceived health benefit index had some significant influence on consumption of soy products. The conclusion was that consumer perception of health benefits in soy products are influenced by their knowledge and nutritional awareness and that the health dimension motivational factor is very necessary. This is not different from the view expressed on the correlation existing between the impact of health information and food choices (Rimal *et al.,* 2008). In the study, personal factors such as individual motivation in relation to health condition, diet related challenge or the background of consumer also played a role in the perceived attributes and health benefits of cocoa and cocoa products. This finding is consistent with the study which showed that consumer interest and high expectation on healthiness of food products influences more positively their attitude and choices (William, 2005). Consumer choice of health dimension is often driven by their quest for long life and meeting high standards of life (Roininen *et al.,* 2001). Other investigations also revealed the personal factor with regards to the importance of health information and motivation in the individual perception and attitude towards foods products with claim of clinical benefits (Kanadaswami *et al.,* 2005). Van Kleef *et al.,* 2005 and Verbeke (2005) came out with the same assertion that an individual encounter with health condition may boost his responsiveness to food product owing to the improved knowledge and personal attachment involved. Bhaskaran and Hardley (2002) came out with the research findings that consumers

experiencing high cholesterol levels in blood may invariably have affinity for foods that are cholesterol free. Consumers having diet- related challenge either themselves or close relative may go in for products with little negative effect on them (Lähteenmäki *et al.,* 2010). Even though consumer health knowledge motivates them to patronize functional foods, the individual perception of health benefits of the product is a key factor that cannot be ignored (Hammond, 2014). Consumer perception of health benefits of soy consumption is enhanced when they attach personal fulfillment to it (Wansink *et al.,* 2005). Study shows that previous experience with an ingredients and the associated claimed clinical benefit influences consumer perception.

Affordability is a factor that is very essential to consumers (Ross and Harradine, 2010).

4.3 The demographic characteristics and the perception of health benefits of cocoa

The demographic characteristics have varying level of influence on the perception of attributes and health benefits of cocoa and this is assessed under three factors namely the age factor, the gender factor and the educational factor.

4.3.1 Influence of age on the perception of health benefits of cocoa

There is no significant difference between multiple R values for all the age categories which ranged between 0.6999 and 0.7079. R Square and Adjusted R also showed no significant difference among the various age categories (R Square ranges from 0.4914 to 0. 5011 and Adjusted R from 0.4786 to 0.4898). In all the age categories, the influence of predictor variable; cocoa and pre-hypertension, cocoa as mood enhancer, cocoa and diabetes management and effectiveness of cocoa on the brain and the nervous system, are significant in the overall prediction of the response variable Y since p- value from ANOVA is less than 0.05 (5%).

Table 7: Respondent age and corresponding variables

	Age (years			
	(1-20)	(21-40)	(41-60)	(> 60)
Multiple R	0.7079	0.7010	0.7011	0.6999
R Square	0.5011	0.4914	0.4916	0.4899
Adjusted R	0.4898	0.4802	0.4804	0.4786
X_1 p- value	0.0001	0.0002	0.0003	0.0003
X_2 p- value	0.0002	0.0002	0.0003	0.0003
X_3 p- value	0.0143	0.0169	0.0130	0.0168
X_4 p- value	0.6762	0.6410	0.6827	0.6249
X_5 p- value	0.0651	0.6410	0.0585	0.0587
X_6 p- value	0.0000	1.9 E-05	1.2 E-05	0.0000
p-intercept	0.0000	3.9 E-11	2.5 E-11	2.8 E-11

Changes in the predictor variables; cocoa and pre- hypertension, cocoa as mood enhancer, cocoa and diabetes management and usefulness of cocoa in brain and the nervous system performance are related to changes in the response variable. However, the influence of cocoa and cancer prevention and cocoa butter as skin remedy in predicting the response variable are insignificant since p- value from ANOVA is greater than 0.05 and can therefore be ignored. Referring to table 7, p- value for cocoa and cancer management at the various age categories is greater than 0.05 and that for cocoa butter also greater than 0.05. Thus changes in these two predictors are not associated with changes in the perception of attributes and health benefits of cocoa. From this study, the correlation between age of consumers and the perception of attributes and health benefit of cocoa is weak. This assertion is similar to findings by (Shafie and Rennie, 2012) that demographic variables including age, education may define organic consumers however the correlation between these is weak. The outcome of the study on organic food consumption indicated that age and income levels of consumers had very little influence on the amount of organic food consumption (Lockie *et al.,* 2002). In reference to Hammond (2014), respondents in the upper age bracket

appreciated greater health benefits of soy product consumption much better than the younger ones. This is similar to the view that older consumers were more careful of how safe the food consume are (Vermeir and Verbeke, 2006). Likewise Kovalainen and ÖsterbergHögstedt (2013) and Roberfroid (2000) revealed that older consumers are more attracted to food with health related benefits than the consumers that are relatively young. The elderly were more careful conscious of their condition of health usually than the younger persons hence found it risky consuming chocolate due its high sugar content (Okraku, 2012). This is similar to older adults are more interested in their present and future health state (Pollow *et al.,* 1994). Health consciousness increases with age (Macias and McMillan, 2008). The level of awareness and perception of healthier foods within the older adult population will greatly impact on the other age groups in the population.

4.3.2 Influence of gender on the perception and health benefits of cocoa

In reference to Table 8 for the male category of respondents, cocoa and cancer prevention had p-value of 0.6786 for male and cocoa butter as skin remedy had p- value of 0.0660 which are all greater than 0.05 implying these attributes are of no significant effect on the prediction of response variable Y. On the other hand female respondents scored p- value of 0.5804 for cocoa and cancer prevention (> 0.05) but recorded 0.0479 as p- value for cocoa butter as skin remedy (<0.05). This is a clear departure from earlier findings.

Table 8: Respondents gender and the corresponding variables

Descriptive statistics	Male	Gender	Female
Multiple R	0.7017		0.7033
R Square	0.4924		0.4947
Adjusted R	0.4813		0.4835
X_1 p- value	0.0002		0.0003
X_2 p- value	0.0002		0.0002
X_3 p- value	0.0153		0.0220
X_4 p- value	0.6786		0.5804
X_5 p- value	0.0660		0.0479
X_6 p- value	0.0000		0.0000
p-intercept	0.0000		0.0000

Thus female respondents considered cocoa butter as skin remedy very significant and a predictor for output results. This is a clear difference from the male respondents. Cocoa and pre-hypertension, cocoa as mood enhancer, cocoa and diabetes management and usefulness s of cocoa in brain and the nervous system performance are considered significant in this study. Implying these attributes are meaningful addition to the regression model and changes in these predictors are positively correlated to changes in the response variable. This outcome of study is consistent with studies that showed women to be affected by nutrition and health related issues than men as they are more focused on healthy way of living (Urala and Lähteenmäki, 2003); (Bogue *et al.,* 2005); (Niva and Skär, 2006). Women are more eager in seeking issues related to their health (Chang *et al.,* 2016). Other studies did not demonstrate the influence of gender. There was no significant difference between willingness of both male and female in the consumption of apple-pear beverage with health claim (Lyly *et al.,* 2007) which is similar to study on cholesterol lowering effect of margarine between Dutch male and female (De Jong *et al.,* 2003). Also Mialon *et al* (2002) and (Peng *et al.,* 2006) indicated gender had no correlation to consumer acceptance of

bakery products. Some research suggests genders' influence with perception of food depends on the carrier, the enrichment and beneficial claim associated with the food product (Ares *et al.,* 2013; Mandell *et al.,* 2007).

Consumers of organic foods are older with tertiary educational background (Padel and Foster, 2005); (Roitner-Schobesberger *et al.,* 2008). There was however no significant difference between male and female category of respondent when comparing Multiple R and R Squared figures. Multiple R for male is 0.7017 and that for female is 0.7033. Multiple is the coefficient of multiple correlation and R Square is the percentage of variance within the dependent variable that the predictors can explain. Grunert *et al.* (2014) indicated that demographic variables including age and education may influence the consumer perception of health benefits of organic products even though the level of influence is insignificant.

4.3.3 Influence of level of education on the perception and health benefits of cocoa

Considering the educational background of respondents, attributes cocoa and pre- hypertension, cocoa as mood enhancer, cocoa and diabetes management and usefulness of cocoa in brain and the nervous system performance play significant role in predicting the response variable. This shows that consumers perceive these attributes of cocoa to be potent in providing remedy to these conditions and the level of perception is extremely high which cannot be ignored. The level of influence was respondent educational background was assessed. The correlation between educational level of respondents and the perception of health benefit of cocoa consumption was weak as R Square was averagely recorded (0.49) at all levels. In other words variation in educational level of respondents does not result in appreciable change of output results. Multiple

R range from 0.7007 to 0.7038 and R Square range from 0.4910 to 0.4948 showing the difference are negligible. Thus all six attributes accounted for almost half of the cause prediction of output variable and that there are equal amount of other factors which are external responsible for the output results.

Table 9: Educational level of respondents and corresponding variables

Descriptive Statistics	No Education	Basic Education	Secondary Education	Tertiary Education
Multiple R	0.7028	0.7007	0.7034	0.7017
R Square	0.4940	0.4910	0.4948	0.4924
Adjusted R	0.4826	0.4797	0.4831	0.4813
X_1 p- value	0.0002	0.0002	0.0004	0.0002
X_2 p- value	0.0002	0.0002	0.0001	0.0002
X_3 p- value	0.0184	0.0184	0.0394	0.0153
X_4 p- value	0.6075	0.6075	0.4417	0.6786
X_5 p- value	0.0574	0.0574	0.0784	0.0660
X_6 p- value	0.0000	0.0000	0.0000	0.0660
p-intercept	0.0000	0.0000	0.0000	0.0000

Respondents having had no educational background, basic education, secondary and tertiary education had p- value from ANOVA to be greater than 0.05 for attribute X_4 representing cocoa and cancer prevention and X_5 Cocoa butter as skin remedy, implying these attributes are of no significant effect on response variable Y. This is in contrast with the study on soy which concluded that consumer perception of health benefits of a product vary significantly in reference to the socio-demographic characteristics such as education. Well educated respondents are likely to appreciate health attributes of soy foods (Hammond, 2014). Similarly findings by Grossman and Kaestner (1997) showed positive correlation between level of education and health benefits. The more educated a respondent is the more exposed he or she is to nutritional and health information and

hence aid in their food choices. Consumer level of education play a key role in the processing of information hence the lower the level of education, the lesser the level of information processed resulting negative effect during decision making (Capon and Burke, 1980).

In the study on consumer attitudes, the research findings show that some respondents with higher educational background portray that they do understand the process. It's expected that the level of awareness and perception of healthier foods within the older adult population will impact positively on the younger ones. The level of consumer trust and belief in the source of nutrition information are also core factors that influence acceptance of cocoa products as healthier foods.

CHAPTER FIVE

CONCLUSION AND RECOMENDATION

5.1 Conclusion

The outcome of the study provided useful information with regards to the perception of attributes and health benefits of cocoa. The outcome of study show that, with the exception of cocoa and cancer prevention, cocoa butter as skin remedy that have insignicant influence on the prediction of response variable, the other attributes namely; cocoa and pre- hypertension, cocoa as mood enhancer, cocoa and diabetes management, cocoa usefulness in brain and the nervous system indicated otherwise. Thus, these four attributes were found to have significant influence on the perception of attributes and health benefits of cocoa. Female respondents considered cocoa butter as skin remedy significant even though their male respondents considered otherwise. The research findings show that level of education had insignificant influence on the perception of attributes and health benefits of cocoa but rather the consumer knowledge on nutrition and health information that influence perception. The results affirm demographic variables such as age, gender, level of education may define cocoa consumption however the correlation is considerably weak. Consumers generally perceive cocoa and chocolate to have tremendous health benefits with minimum negative effects owing to the antioxidant properties, nutritional provision, blood pressure lowering effects. With the exception of few reported cases of overweight and the negative effect on diabetics due the sugar addition, cocoa generally has splendid, unique and vital constituents which impact positively on the well- being of the consumer. Dark chocolate and natural cocoa powder contains the highest amount of flavonoid rich constituents which is very good for the body comparable to the sweetened product and should be the preferred choice. It is suggested that consumers patronize the dark and natural cocoa powder and consider its bitterness as pre- requisite for improving their health status. It is recommended that consumers especially those that fall within

the upper age brackets reduce consumption of sweetened cocoa products. Increase consumer education and sensitization, stakeholder support, re- engineering and repackaging of products, consideration of environmental impact on product quality are recommended in order to attract more consumers in accepting cocoa as a healthy commodity.

5.2 Recommendation

Consumer education, sensitization and awareness

There is the need for more education, sensitization and awareness creation of the general public on the attributes and health benefits of cocoa. Ghana's Chocolate day acknowleged in February for showcasing benefits of cocoa is not enough, the awareness creation should be an all year round event. Cocoa's strong antioxidant properties as well as other useful attributes should be communicated effectively to the general public. An effective sensitization and awareness creation will go a long way to improve the level of consumer knowledge on cocoa to help shift consumer behavior. Attitudinal and behavioral change will invariably influence positively on consumer choice and acceptance of various products made from cocoa. In addition, media education through advertisement should be inculcated in the entire sensitization process. The sensitization should come from perceived reliable sources such as health professionals, physicians, dieticians, friends and relatives since they are known to be trusted sources of nutrition and health information.

Govermental and stake holder support

Most industries especially those in the private sector should be supported by Government with an introduction of tax exemptions in key areas including raw materials importation. Alternatively, government can introduce special tax waivers to cocoa manufacturing organizations. This will attract more companies and subsequently reduce the monopoly of Cocoa Processing Company

Limited. Considerable flexibility in taxes would go a long way in reducing operational cost which will at the end of the day impact positively on the cost of the products on market. With the reduction in operational cost and improvement in product quality, consumers will definitely patronize these products on the market. Cocoa products of high quality and affordable coupled with improved accessibility will result in increased consumption and associated benefits. Once consumer patronage increase, the health status of beneficiaries will improve and lead to reduction of high cost of health delivery in the country.

Marketing Strategy and Promotion

Producers of cocoa and cocoa products should aim at re- designing and re- packaging products to attract targeted consumers. They must adopt consumer based approach to be responsive to changes in the dynamics at the market. The sugar content in some of the products derived from cocoa should be redesign as consumer health consciousness is increasing.The dark chocolate known to have high levels of flavanols and hence more potent should be re- packed to attract more consumers. Producers and manufacturers must be responsive to changes in dynamics of the markets.This can be accelerated by adopting well integrated communication strategies via the print and electronic media. The key local dialects can be used during this exercise to offer better understanding to consumers.

Environmental factor

The aspect of prevailing environmental factors should be carefully tackled since it has impact on consumer segments. The enviroment and prevailing conditions of consumer significantly influence consumer behavior and acceptance of products with health related claims.

5.3 Sugestions for future research

There is the need to encourage more research in this field as the dynamics of consumer segments call for more hollistic approach if we are to chalk some success in wooing more consumers to appreciate the benefts of cocoa. In addition, sample size in future study should be increased to at least 600 respondents. Enough time for data gathering is to be provided. This is very essential to ensure better interaction between questionnaire administers and respondents and to ensure questionnaires are not completed under duress. Further in depth study on consumer attitude to food products with key focus on cocoa is needed, issues based on trust, social factor and income levels of consumers should form the central theme. Also ethnocentric evaluation in relation to consumer perception of attributes and health benefits should be considered in future study. Future study should be extended to other health conditions such as prostate cancer. In depth study should be done to ascertain other potential benefits of flavanoid rich cocoa. The study outcome should be compared to the consumers health status to ascertain the relationship between the previous health status and the perception of attributes and health benefits of cocoa.

REFERENCES

Afoakwa, E. O. (2008). Cocoa and chocolate consumption-are there aphrodisiac and other benefits for human health?: invited review. *South African Journal of Clinical Nutrition*, *21*(3), 107–113.

Ahmed, S., Tabassum, S., Shakeel, F., and Khan, A. Y. (2012). A facile electrochemical analysis to determine antioxidant activity of flavonoids against DPPH radical. *Journal of The Electrochemical Society*, *159*(5), F103–F109.

Ajzen, I., and Fishbein, M. (1980). Understanding attitudes and predicting social behaviour.

Allport, G. W. (1935). Attitudes (Murchison, C. ed. Handbook of social psychology Vol. 2 Clark University Press, Worcester, Mass).

Almeida, A.-A. F. de, and Valle, R. R. (2007). Ecophysiology of the cacao tree. *Brazilian Journal of Plant Physiology*, *19*(4), 425–448.

Ashford, S. J., and Cummings, L. L. (1983). Feedback as an individual resource: Personal strategies of creating information. *Organizational Behavior and Human Performance*, *32*(3), 370–398.

Ares, G., Giménez, A., Bruzzone, F., Vidal, L., Antúnez, L., and Maiche, A. (2013). Consumer visual processing of food labels: results from an eye‐tracking study. *Journal of Sensory Studies*, *28*(2), 138–153.

Arts, I. C. W., and Hollman, P. C. H. (2005). Polyphenols and disease risk in epidemiologic studies. *The American Journal of Clinical Nutrition*, *81*(1), 317S–325S.

Awua, P. K. (2002). The success story of cocoa processing and chocolate manufacturing in Ghana—The success story that demolished a myth. *Saffron Walden, Essex: David Jamieson* and *Associates Ltd*.

Barnes, J. N., Taylor, J. L., Kluck, B. N., Johnson, C. P., and Joyner, M. J. (2013). Cerebrovascular reactivity is associated with maximal aerobic capacity in healthy older adults. *Journal of Applied Physiology*, *114*(10), 1383–1387.

Barnett, C. F., and De Marco, T. (2011). A chocolate a day keeps the doctor away? *The Journal of Physiology*, *589*(24), 5921–5922.

Bearden, M. M., Pearson, D. A., Rein, D., Chevaux, K. A., Carpenter, D. R., Keen, C. L., and Schmitz, H. (2000). Potential cardiovascular health benefits of procyanidins present in chocolate and cocoa. ACS Publications.

Bekele, F. L., Bekele, I., Butler, D. R., and Bidaisee, G. G. (2006). Patterns of morphological variation in a sample of cacao (Theobroma cacao L.) germplasm from the International Cocoa Genebank, Trinidad. *Genetic Resources and Crop Evolution*, *53*(5), 933–948.

Bhaskaran, S., and Hardley, F. (2002). Buyer beliefs, attitudes and behaviour: foods with therapeutic claims. *Journal of Consumer Marketing*, *19*(7), 591–606.

Bogue, J., Coleman, T., and Sorenson, D. (2005). Determinants of consumers' dietary behaviour for health-enhancing foods. *British Food Journal*, *107*(1), 4–16.

Bower, J. A., Saadat, M. A., and Whitten, C. (2003). Effect of liking, information and consumer characteristics on purchase intention and willingness to pay more for a fat spread with a proven health benefit. *Food Quality and Preference*, *14*(1), 65–74.

Brace, I. (2008). *Questionnaire design: How to plan, structure and write survey material for effective market research*. Kogan Page Publishers.

Brown, D. J., and Schrader, L. F. (1990). Cholesterol information and shell egg consumption. *American Journal of Agricultural Economics*, *72*(3), 548–555.

Brunsø, K., and Grunert, K. G. (1998). Cross-cultural similarities and differences in shopping for food. *Journal of Business Research*, *42*(2), 145–150.

Bryman, A., and Bell, E. (2015). *Business research methods*. Oxford University Press, USA.

Capon, N., and Burke, M. (1980). Individual, product class, and task-related factors in consumer information processing. *Journal of Consumer Research*, *7*(3), 314–326.

Capps Jr, O., and Schmitz, J. D. (1991). A recognition of health and nutrition factors in food demand analysis. *Western Journal of Agricultural Economics*, 21–35.

Castell, M., Pérez-Cano, F. J., and Bisson, J.-F. (2013). Clinical benefits of cocoa: An overview. In *Chocolate in Health and Nutrition* (pp. 265–275). Springer.

Carter, W. P. L. (1996). Condensed atmospheric photooxidation mechanisms for isoprene. *Atmospheric Environment*, *30*(24), 4275–4290.

Chang, K. J., Thach, M. W. L., and Olsen, J. (2016). Wine and health perceptions: exploring the impact of gender, age and ethnicity on consumer perceptions of wine and health. *Wine Economics and Policy*, *5*(2), 105–113.

Chen, M., Gonzalez, S., Vasilakos, A., Cao, H., and Leung, V. C. M. (2011). Body area networks: A survey. *Mobile Networks and Applications*, *16*(2), 171–193.

Codron, J.-M., Siriex, L., and Reardon, T. (2006). Social and environmental attributes of food products in an emerging mass market: Challenges of signaling and consumer perception, with European illustrations. *Agriculture and Human Values*, *23*(3), 283–297.

Corti, R., Flammer, A. J., Hollenberg, N. K., and Lüscher, T. F. (2009). Cocoa and cardiovascular health. *Circulation*, *119*(10), 1433–1441.

De Jong, N., Ocke, M. C., Branderhorst, H. A. C., and Friele, R. (2003). Demographic and lifestyle characteristics of functional food consumers and dietary supplement users. *British Journal of Nutrition*, *89*(2), 273–281.

Di Renzo, G. C., Brillo, E., Romanelli, M., Porcaro, G., Capanna, F., Kanninen, T. T., Clerici, G. (2012). Potential effects of chocolate on human pregnancy: a randomized controlled trial. *The Journal of Maternal-Fetal* and *Neonatal Medicine*, *25*(10), 1860–1867.

Dima, L., Grecu, A., Dimienescu, O., Hajdu, A., Banuta, A., and Badea, M. (2012). Healthy eating habits for a better life. *Series VI: Medical Sciences*, *5*(54), 97–106.

Etxeberria, U., de la Garza, A. L., Campión, J., Martinez, J. A., and Milagro, F. I. (2012). Antidiabetic effects of natural plant extracts via inhibition of carbohydrate hydrolysis enzymes with emphasis on pancreatic alpha amylase. *Expert Opinion on Therapeutic Targets*, *16*(3), 269–297.

Evans, V. (2006). *Cognitive linguistics*. Edinburgh University Press.

F Nabavi, S., Sureda, A., Daglia, M., Rezaei, P., and M Nabavi, S. (2015). Anti-oxidative polyphenolic compounds of cocoa. *Current Pharmaceutical Biotechnology*, *16*(10), 891–901.

Farhat, G. (2014). Dark chocolate rich in polyphenols improves insulin sensitivity in the adult nondiabetic population.

Farhat, G., Al-Dujaili, E., Drummond, S., and Fyfe, L. (2014). Dark chocolate low in polyphenols increases BMI in normal weight and overweight adults (121.3). *The FASEB Journal*, *28*(1 Supplement), 121–123.

Flammer, A. J., Hermann, F., Sudano, I., Spieker, L., Hermann, M., Cooper, K. A., … Noll, G. (2007). Dark chocolate improves coronary vasomotion and reduces platelet reactivity. *Circulation*, *116*(21), 2376–2382.

Ford, G. T., Smith, D. B., and Swasy, J. L. (1988). An empirical test of the search, experience and credence attributes framework. *ACR North American Advances*.

Foxall, G. R. (1994). Behavior analysis and consumer psychology. *Journal of Economic Psychology*, *15*(1), 5–91.

Gaciong, Z., Siński, M., and Lewandowski, J. (2013). Blood pressure control and primary prevention of stroke: summary of the recent clinical trial data and meta-analyses. *Current Hypertension Reports*, *15*(6), 559–574.

Galleano, M., Oteiza, P. I., and Fraga, C. G. (2009). Cocoa, chocolate and cardiovascular disease. *Journal of Cardiovascular Pharmacology*, *54*(6), 483.

Giacco, F., and Brownlee, M. (2010). Oxidative stress and diabetic complications. *Circulation Research*, *107*(9), 1058–10

Goya, L., Martín, M. Á., Sarriá, B., Ramos, S., Mateos, R., and Bravo, L. (2016). Effect of cocoa and its flavonoids on biomarkers of inflammation: studies of cell culture, animals and humans. *Nutrients*, *8*(4), 212.

Grassi, D., Desideri, G., Mai, F., Martella, L., De Feo, M., Soddu, D., … Ferri, C. (2015). Cocoa, glucose tolerance, and insulin signaling: cardiometabolic protection. *Journal of Agricultural and Food Chemistry*, *63*(45), 9919–9926.

Greenberg, J. A. (2015). Chocolate intake and diabetes risk. *Clinical Nutrition*, *34*(1), 129–133.

Grossman, M., and Kaestner, R. (1997). EIfects oI Education on Health. *The Social Benefits of Education*, *12*, 69.

Gu, Y., and Lambert, J. D. (2013). Modulation of metabolic syndrome‐related inflammation by cocoa. *Molecular Nutrition* and *Food Research*, *57*(6), 948–961.

Gu, Y., Yu, S., Park, J. Y., Harvatine, K., and Lambert, J. D. (2014). Dietary cocoa reduces metabolic endotoxemia and adipose tissue inflammation in high-fat fed mice. *The Journal of Nutritional Biochemistry*, *25*(4), 439–445.

Hailu, G., Boecker, A., Henson, S., and Cranfield, J. (2009). Consumer valuation of functional foods and nutraceuticals in Canada. A conjoint study using probiotics. *Appetite*, *52*(2), 257–265.

Hannum, S. M., and Erdman Jr, J. W. (2000). Emerging health benefits from cocoa and chocolate. Mary Ann Liebert, Inc.

Hasher, L., and Zacks, R. T. (1984). Automatic processing of fundamental information: The case of frequency of occurrence. *American Psychologist*, *39*(12), 1372.

Hasler, C. M. (2002). Functional foods: benefits, concerns and challenges—a position paper from the American Council on Science and Health. *The Journal of Nutrition*, *132*(12), 3772–3781.

Higgins, L. M., and Llanos, E. (2015). A healthy indulgence? Wine consumers and the health benefits of wine. *Wine Economics and Policy*, *4*(1), 3–11.

Hollenberg, N. K., Fisher, N. D. L., and McCullough, M. L. (2009). Flavanols, the Kuna, cocoa consumption, and nitric oxide. *Journal of the American Society of Hypertension*, *3*(2), 105–112.

Huang, C. L. (1996). Consumer preferences and attitudes towards organically grown produce. *European Review of Agricultural Economics*, *23*(3), 331–342.

Ippolito, P. M., and Mathios, A. D. (1991). Information, advertising, and health choices: a study of the cereal market. In *Economics of Food Safety* (pp. 211–246). Springer.

Jahn, T. R., Parker, M. J., Homans, S. W., and Radford, S. E. (2006). Amyloid formation under physiological conditions proceeds via a native-like folding intermediate. *Nature Structural* and *Molecular Biology*, *13*(3), 195.

Jensen, K. (1995). Fluid milk purchase patterns in the South: Effects of use of nutrition information and household characteristics. *Journal of Agricultural and Applied Economics*, *27*(2), 644–657.

Joyner, M. J., and Casey, D. P. (2015). Regulation of increased blood flow (hyperemia) to muscles during exercise: a hierarchy of competing physiological needs. *Physiological Reviews*, *95*(2), 549–601.

Kanadaswami, C., Lee, L.-T., Lee, P.-P. H., Hwang, J.-J., Ke, F.-C., Huang, Y.-T., and Lee, M.T. (2005). The antitumor activities of flavonoids. *In Vivo*, *19*(5), 895–909.

Katz, D. L., Doughty, K., and Ali, A. (2011). Cocoa and chocolate in human health and disease. *Antioxidants* and *Redox Signaling*, *15*(10), 2779–2811.

Keen, C. L., Holt, R. R., Oteiza, P. I., Fraga, C. G., and Schmitz, H. H. (2005). Cocoa antioxidants and cardiovascular health. *The American Journal of Clinical Nutrition*, *81*(1), 298S–303S.

Kidd, P. M. (2008). Alzheimer's disease, amnestic mild cognitive impairment, and age-associated memory impairment: current understanding and progress toward integrative prevention. *Alternative Medicine Review*, *13*(2), 85.

Kim, J. B., Sebastiano, V., Wu, G., Araúzo-Bravo, M. J., Sasse, P., Gentile, L., … van den Boom, D. (2009). Oct4-induced pluripotency in adult neural stem cells. *Cell*, *136*(3), 411–419.

Kovalainen, A., and Österberg-Högstedt, J. (2013). Entrepreneurship within social and health care: a question of identity, gender and professionalism. *International Journal of Gender and Entrepreneurship*, *5*(1), 17–35.

Kuebler, U., Arpagaus, A., Meister, R. E., von Känel, R., Huber, S., Ehlert, U., and Wirtz, P. H. (2016). Dark chocolate attenuates intracellular pro-inflammatory reactivity to acute psychosocial stress in men: A randomized controlled trial. *Brain, Behavior, and Immunity*, *57*, 200–208.

Lampila, P., van Lieshout, M., Gremmen, B., and Lähteenmäki, L. (2009). Consumer attitudes towards enhanced flavonoid content in fruit. *Food Research International*, *42*(1), 122–129.

Lähteenmäki, L., Lampila, P., Grunert, K., Boztug, Y., Ueland, Ø., Åström, A., and Martinsdóttir, E. (2010). Impact of health-related claims on the perception of other product attributes. *Food Policy*, *35*(3), 230–239.

Latif, R. (2013). Health benefits of cocoa. *Current Opinion in Clinical Nutrition* and *Metabolic Care*, *16*(6), 669–674.

Laurent, V., Risterucci, A.-M., and Lanaud, C. (1993). Variability for nuclear ribosomal genes within Theobroma cacao. *HEREDITY-LONDON-*, *71*, 96.

Lim, T. K. (2012). Theobroma cacao. In *Edible Medicinal And Non Medicinal Plants* (pp. 208–251). Springer.

Lockie, S., Lyons, K., Lawrence, G., and Mummery, K. (2002). Eating "green": motivations behind organic food consumption in Australia. *Sociologia Ruralis*, *42*(1), 23–40.

Lollo, P. C. B., Cruz, A. G., Morato, P. N., Moura, C. S., Carvalho-Silva, L. B., Oliveira, C. A. F., Amaya-Farfan, J. (2012). Probiotic cheese attenuates exercise-induced immune suppression in Wistar rats. *Journal of Dairy Science*, *95*(7), 3549–3558.

Lombard, M., and Ditton, T. (1997). At the heart of it all: The concept of presence. *Journal of Computer‐Mediated Communication*, *3*(2), 0.

Lyly, M., Roininen, K., Honkapää, K., Poutanen, K., and Lähteenmäki, L. (2007). Factors influencing consumers' willingness to use beverages and ready-to-eat frozen soups containing oat β-glucan in Finland, France and Sweden. *Food Quality and Preference*, *18*(2), 242–255.

Macht, M. (2008). How emotions affect eating: a five-way model. *Appetite*, *50*(1), 1–11.

Macias, W., and McMillan, S. (2008). The return of the house call: The role of Internet-based interactivity in bringing health information home to older adults. *Health Communication*, *23*(1), 34–44.

Mandel, C. R., Bai, Y., and Tong, L. (2008). Protein factors in pre-mRNA 3′-end processing. *Cellular and Molecular Life Sciences*, *65*(7), 1099–1122.

Meldrum, D. R., Gambone, J. C., Morris, M. A., Esposito, K., Giugliano, D., and Ignarro, L. J. (2012). Lifestyle and metabolic approaches to maximizing erectile and vascular health. *International Journal of Impotence Research*, *24*(2), 61.

Mialon, V. S., Clark, M. R., Leppard, P. I., and Cox, D. N. (2002). The effect of dietary fibre information on consumer responses to breads and "English" muffins: a cross-cultural study. *Food Quality and Preference*, *13*(1), 1–12.

Montanari, G. E., and Cicchitelli, G. (2014). Sampling Theory and Geostatistics: A Way of Reconciliation. In *Contributions to Sampling Statistics* (pp. 151–165). Springer.

Mostofsky, E., Johansen, M. B., Tjønneland, A., Chahal, H. S., Mittleman, M. A., and Overvad, K. (2017). Chocolate intake and risk of clinically apparent atrial fibrillation: the Danish Diet, Cancer, and Health Study. *Heart*, heartjnl-2016.

Motamayor, J. C., Mockaitis, K., Schmutz, J., Haiminen, N., Livingstone III, D., Cornejo, O., Royaert, S. (2013). The genome sequence of the most widely cultivated cacao type and its use to identify candidate genes regulating pod color. *Genome Biology*, *14*(6), r53.

Nehlig, A. (2013). The neuroprotective effects of cocoa flavanol and its influence on cognitive performance. *British Journal of Clinical Pharmacology*, *75*(3), 716–727.

Nestle, M. (2013). *Food politics: How the food industry influences nutrition and health* (Vol. 3). Univ of California Press.

N'Goran, J. A. K., Laurent, V., Risterucci, A.-M., and Lanaud, C. (1994). Comparative genetic diversity studies of Theobroma cacao L. using RFLP and RAPD markers. *Heredity*, *73*(6), 589–597.

Niva, B., and Skär, L. (2006). A pilot study of the activity patterns of five elderly persons after a housing adaptation. *Occupational Therapy International*, *13*(1), 21–34.

Nurk, E., Refsum, H., Drevon, C. A., Tell, G. S., Nygaard, H. A., Engedal, K., and Smith, A. D. (2009). Intake of flavonoid-rich wine, tea, and chocolate by elderly men and women is associated with better cognitive test performance. *The Journal of Nutrition*, *139*(1), 120–127.

Osakabe, N., Baba, S., Yasuda, A., Iwamoto, T., Kamiyama, M., Takizawa, T., Kondo, K. (2001). Daily cocoa intake reduces the susceptibility of low-density lipoprotein to oxidation as demonstrated in healthy human volunteers. *Free Radical Research*, *34*(1), 93–99.

Padel, S., and Foster, C. (2005). Exploring the gap between attitudes and behaviour: Understanding why consumers buy or do not buy organic food. *British Food Journal*, *107*(8), 606–625.

Peng, Y., West, G. E., and Wang, C. (2006). Consumer Attitudes and Acceptance of CLA ‐Enriched Dairy Products. *Canadian Journal of Agricultural Economics/Revue Canadienne D'agroeconomie*, *54*(4), 663–684.

Peter, J. P., and Olson, J. C. (1994). Understanding Consumer Behaviour, Richard D. Irwin. *Inc., USA*.

Pollow, R. L., Stoller, E. P., Forster, L. E., and Duniho, T. S. (1994). Drug combinations and potential for risk of adverse drug reaction among community-dwelling elderly. *Nursing Research*, *43*(1), 44–49.

Puth, G., Mostert, P., and Ewing, M. (1999). Consumer perceptions of mentioned product and brand attributes in magazine advertising. *Journal of Product* and *Brand Management*, *8*(1), 38–50.

Rein, D., Paglieroni, T. G., Wun, T., Pearson, D. A., Schmitz, H. H., Gosselin, R., and Keen, C. L. (2000). Cocoa inhibits platelet activation and function. *The American Journal of Clinical Nutrition*, *72*(1), 30–35.

Rimal, A., Moon, W., and Balasubramanian, S. K. (2008). Soyfood consumption: Effects of perceived product attributes and the food and drug administration allowed health claims. *British Food Journal*, *110*(6), 607–621.

Rodriguez-Mateos, A., Oruna-Concha, M. J., Kwik-Uribe, C., Vidal, A., and Spencer, J. P. E. (2012). Influence of sugar type on the bioavailability of cocoa flavanols. *British Journal of Nutrition*, *108*(12), 2243–2250.

Roininen, K., Tuorila, H., Zandstra, E. H., De Graaf, C., Vehkalahti, K., Stubenitsky, K., and Mela, D. J. (2001). Differences in health and taste attitudes and reported behaviour among Finnish, Dutch and British consumers: a cross-national validation of the Health and Taste Attitude Scales (HTAS). *Appetite*, *37*(1), 33–45.

Roitner-Schobesberger, B., Darnhofer, I., Somsook, S., and Vogl, C. R. (2008). Consumer perceptions of organic foods in Bangkok, Thailand. *Food Policy*, *33*(2), 112–121.

Roscoe, A. M., Lang, D., and Sheth, J. N. (1975). Follow-up methods, questionnaire length, and market differences in mail surveys. *The Journal of Marketing*, 20–27.

Rostami, A., Khalili, M., Haghighat, N., Eghtesadi, S., Shidfar, F., Heidari, I., Eghtesadi, M. (2015). High-cocoa polyphenol-rich chocolate improves blood pressure in patients with diabetes and hypertension. *ARYA Atherosclerosis*, *11*(1), 21.

Ross, J., and Harradine, R. (2010). Value brands: cheap or trendy? An investigation into young consumers and supermarket clothing. *Journal of Fashion Marketing and Management: An International Journal*, *14*(3), 350–366.

Rubin, H. J., and Rubin, I. S. (2011). *Qualitative interviewing: The art of hearing data*. Sage.

Rusconi, M., and Conti, A. (2010). Theobroma cacao L., the Food of the Gods: a scientific approach beyond myths and claims. *Pharmacological Research*, *61*(1), 5–13.

Sarriá, B., Martínez-López, S., Sierra-Cinos, J. L., García-Diz, L., Mateos, R., and Bravo, L. (2014). Regular consumption of a cocoa product improves the cardiometabolic profile in healthy and moderately hypercholesterolaemic adults. *British Journal of Nutrition*, *111*(1), 122–134.

Scapagnini, G., Davinelli, S., Di Renzo, L., De Lorenzo, A., Olarte, H. H., Micali, G., Gonzalez, S. (2014). Cocoa bioactive compounds: significance and potential for the maintenance of skin health. *Nutrients*, *6*(8), 3202–3213.

Schifani, G., Romeo, P., Guccione, G. D., Schimmenti, E., Columba, P., and Migliore, G. (2016). Conventions of Quality in Consumer Preference toward Local Honey in Southern Italy. *Calitatea*, *17*(153), 92.

Shafie, F. A., and Rennie, D. (2012). Consumer perceptions towards organic food. *Procedia-Social and Behavioral Sciences*, *49*, 360–367.

Schiffman, L. G. (1991). Kanuk. *LL, Consumer Behavior, Englewood Cliffs, PrenticeHall Inc*.

Siegrist, M., Stampfli, N., and Kastenholz, H. (2008). Consumers' willingness to buy functional foods. The influence of carrier, benefit and trust. *Appetite*, *51*(3), 526–529.

Simmons, R. (2001). Questionnaires. *Researching Social Life*, *2*, 85–104.

Sokolov, A. N., Pavlova, M. A., Klosterhalfen, S., and Enck, P. (2013). Chocolate and the brain: neurobiological impact of cocoa flavanols on cognition and behavior. *Neuroscience* and *Biobehavioral Reviews*, *37*(10), 2445–2453.

Steinberg, F. M., Bearden, M. M., and Keen, C. L. (2003). Cocoa and chocolate flavonoids: implications for cardiovascular health. *Journal of the American Dietetic Association*, *103*(2), 215–223.

Tirmizi, M. A., Rehman, K. U., and Saif, M. I. (2009). An empirical study of consumer impulse buying behavior in local markets. *European Journal of Scientific Research*, *28*(4), 522–532.

Underwood, R. L., Klein, N. M., and Burke, R. R. (2001). Packaging communication: attentional effects of product imagery. *Journal of Product* and *Brand Management*, *10*(7), 403–422.

Urala, N., and Lähteenmäki, L. (2003). Reasons behind consumers' functional food choices. *Nutrition* and *Food Science*, *33*(4), 148–158.

Valussi, M., and Minto, C. (2016). Cacao as a Globalised Functional Food: Review on Cardiovascular Effects of Chocolate Consumption. *The Open Agriculture Journal*, *10*(1).

Van Duynhoven, J., Vaughan, E. E., Jacobs, D. M., Kemperman, R. A., Van Velzen, E. J. J., Gross, G., Doré, J. (2011). Metabolic fate of polyphenols in the human superorganism. *Proceedings of the National Academy of Sciences*, *108*(Supplement 1), 4531–4538.

Van Kleef, E., van Trijp, H. C. M., and Luning, P. (2005). Functional foods: health claim-food product compatibility and the impact of health claim framing on consumer evaluation. *Appetite*, *44*(3), 299–308.

Varsha, M. K. N. S., Raman, T., and Manikandan, R. (2014). Inhibition of diabetic-cataract by vitamin K1 involves modulation of hyperglycemia-induced alterations to lens calcium homeostasis. *Experimental Eye Research*, *128*, 73–82.

Verbeke, W. (2005). Consumer acceptance of functional foods: socio-demographic, cognitive and attitudinal determinants. *Food Quality and Preference*, *16*(1), 45–57.

Verbeke, W. (2006). Functional foods: Consumer willingness to compromise on taste for health? *Food Quality and Preference*, *17*(1), 126–131.

Verbeke, W. (2008). Impact of communication on consumers' food choices: Plenary Lecture. *Proceedings of the Nutrition Society*, *67*(3), 281–288.

Verbeke, W., Scholderer, J., and Lähteenmäki, L. (2009). Consumer appeal of nutrition and health claims in three existing product concepts. *Appetite*, *52*(3), 684–692.

Vermeir, I., and Verbeke, W. (2006). Sustainable food consumption: Exploring the consumer "attitude–behavioral intention" gap. *Journal of Agricultural and Environmental Ethics*, *19*(2), 169–194.

Vinson, J. A., Proch, J., and Zubik, L. (1999). Phenol antioxidant quantity and quality in foods: cocoa, dark chocolate, and milk chocolate. *Journal of Agricultural and Food Chemistry*, *47*(12), 4821–4824.

Wansink, B. (2015). Change their choice! Changing behavior using the CAN approach and activism research. *Psychology* and *Marketing*, *32*(5), 486–500.

Wansink, B., Westgren, R. E., and Cheney, M. M. (2005). Hierarchy of nutritional knowledge that relates to the consumption of a functional food. *Nutrition*, *21*(2), 264–268.

Watson, R. R., Preedy, V. R., and Zibadi, S. (2013). *Chocolate in health and nutrition*. Springer.

Wiedmann, K.-P., Hennigs, N., and Siebels, A. (2007). Measuring consumers' luxury value perception: a cross-cultural framework. *Academy of Marketing Science Review*, *2007*, 1.

Wiedmann, K., Hennigs, N., and Siebels, A. (2009). Value‐based segmentation of luxury consumption behavior. *Psychology* and *Marketing*, *26*(7), 625–651.

Williams, D. L. (2006). Oxidation, antioxidants and cataract formation: a literature review. *Veterinary Ophthalmology*, *9*(5), 292–298.

Wilson, M. A., and McNaughton, B. L. (1994). Reactivation of hippocampal ensemble memories during sleep. *Science*, *265*(5172), 676–679.

Wirtz, P. H., von Känel, R., Meister, R. E., Arpagaus, A., Treichler, S., Kuebler, U., Ehlert, U. (2014). Dark chocolate intake buffers stress reactivity in humans. *Journal of the American College of Cardiology*, *63*(21), 2297–2299.

Yang, C. S., Landau, J. M., Huang, M.-T., and Newmark, H. L. (2001). Inhibition of carcinogenesis by dietary polyphenolic compounds. *Annual Review of Nutrition*, *21*(1), 381– 406.

Yang, Z., Jun, M., and Peterson, R. T. (2004). Measuring customer perceived online service quality: scale development and managerial implications. *International Journal of Operations* and *Production Management*, *24*(11), 1149–1174.

Yoon, H.-S., Kim, J. R., Park, G. Y., Kim, J.-E., Lee, D. H., Lee, K. W., and Chung, J. H. (2016). Cocoa flavanol supplementation influences skin conditions of photo-aged women: A 24-week double-blind, randomized, controlled trial. *The Journal of Nutrition*, *146*(1), 46–50.

Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: a means-end model and synthesis of evidence. *The Journal of Marketing*, 2–22.

Zomer, E., Owen, A., Magliano, D. J., Liew, D., and Reid, C. M. (2012). The effectiveness and cost effectiveness of dark chocolate consumption as prevention therapy in people at high risk of cardiovascular disease: best case scenario analysis using a Markov model. *Bmj*, *344*, e3657.

APPENDICES

APPENDIX 1

	DATA			ATTRIBUTES						
Order	Age	Sex	Education	X1	X2	X3	X4	X5	X6	Y
1	1	2	2	10	8	4	6	6	6	7.00
2	1	2	3	8	9	4	10	10	7	5.67
3	1	1	3	4	8	3	8	10	7	4.33
4	1	2	2	4	7	4	2	6	3	6.00
5	1	1	2	8	6	4	2	10	5	6.33
6	1	2	3	7	5	7	0	8	2	5.67
7	1	2	2	7	9	6	0	10	2	6.00
8	1	1	3	2	6	5	1	8	2	6.00
9	1	1	2	3	6	7	2	10	3	5.00
10	1	1	3	5	8	5	1	8	2	5.33
11	1	1	2	7	3	6	3	10	3	5.67
12	1	1	2	10	10	10	10	10	10	7.67
13	1	2	2	9	6	5	4	10	10	6.33
14	1	1	2	8	10	8	10	10	6	9.00
15	1	1	3	9	5	7	4	6	5	6.00
16	1	1	4	7	4	5	2	6	3	3.00
17	1	1	2	10	10	8	2	10	3	7.00
18	1	1	4	8	10	8	2	8	10	6.67
19	1	2	2	3	6	6	1	8	5	5.67
20	1	1	3	9	10	6	2	10	5	7.00
21	1	1	3	7	5	4	2	8	2	4.67
22	1	2	2	10	5	4	1	8	3	5.33
23	1	2	1	9	10	10	10	10	10	8.33
24	1	2	1	9	6	10	10	10	10	10.00

25	1	1	3	6	3	4	4	6	3	5.67
26	1	2	2	7	7	7	8	10	8	6.67
27	1	2	1	3	4	4	2	10	3	3.00
28	1	2	2	8	4	8	10	10	10	4.67
29	1	2	3	5	6	4	3	8	6	2.00
30	1	2	3	5	3	7	2	8	1	3.33
31	1	2	3	9	6	6	10	10	6	7.00
32	1	2	1	6	2	2	2	10	3	4.00
33	1	2	4	9	7	8	10	10	10	6.67
34	1	2	1	9	5	7	2	8	2	5.00
35	1	1	2	9	0	5	2	10	5	6.00
36	1	1	2	7	4	8	10	10	10	4.67
37	1	1	3	8	7	9	10	8	10	7.00
38	1	2	2	8	7	9	10	8	10	7.33
39	1	2	3	10	8	8	10	8	10	7.33
40	1	1	4	8	2	5	2	8	5	3.00
41	1	2	1	9	8	8	4	10	3	6.33
42	1	2	2	5	8	6	8	10	10	5.00
43	1	2	2	7	7	7	2	10	4	8.00
44	1	2	2	9	6	10	10	10	10	9.33
45	1	2	1	6	8	4	10	10	0	2.00
63	1	1	3	1	4	4	1	4	1	3.67
47	1	2	3	9	4	4	0	6	3	7.33
48	1	2	3	8	9	3	6	10	8	6.00
49	1	2	2	7	9	7	10	10	6	6.33
50	1	2	2	8	10	6	8	10	8	5.33

51	1	2	2	1	8	4	4	10	6	4.67
52	1	2	3	3	8	3	2	8	4	5.00
53	1	1	3	1	4	4	1	4	1	2.67
54	1	2	2	10	9	8	10	10	10	8.00
55	1	2	3	9	10	10	10	10	10	10.00
56	1	1	1	3	4	2	0	8	3	5.33
57	1	2	3	9	9	3	7	10	6	7.67
58	2	1	4	9	7	9	2	10	10	9.00
59	2	2	2	9	10	10	10	10	6	8.00
60	2	1	2	1	4	4	1	4	1	3.67
61	2	2	2	2	5	5	0	6	5	4.00
62	2	2	1	1	9	4	4	10	3	3.67
63	2	1	2	5	6	3	2	6	3	2.67
64	2	1	4	7	9	6	2	4	8	5.67
65	2	1	4	10	10	10	10	10	10	7.33
66	2	1	4	6	8	4	10	10	0	2.00
67	2	1	4	7	6	6	6	8	3	8.00
68	2	2	3	9	10	5	6	6	8	7.67
69	2	1	4	4	7	2	4	10	4	6.67
70	2	1	3	8	4	8	7	10	10	6.33
71	2	1	4	3	4	5	2	10	3	3.00
72	2	1	3	7	6	6	10	10	10	8.33
73	2	2	3	4	2	7	6	7	4	5.00
74	2	2	2	6	8	4	10	10	0	2.67
75	2	2	3	7	6	6	6	8	3	6.67

76	2	1	4	9	8	9	8	8	3	5.33
77	2	1	3	9	8	8	6	10	10	9.00
78	2	1	4	7	4	6	5	9	6	5.33
79	2	2	4	4	3	5	6	8	4	4.67
80	2	1	4	9	8	9	8	8	3	5.33
81	2	2	3	3	5	4	3	6	6	4.00
82	2	1	4	8	8	7	6	6	3	5.33
83	2	2	4	4	6	5	2	6	3	4.33
84	2	1	3	8	6	2	6	4	3	5.00
85	2	2	3	5	9	6	4	10	6	5.67
86	2	1	4	4	5	5	6	4	5	4.00
87	2	1	4	3	5	4	3	8	6	4.67
88	2	1	4	6	8	9	7	9	4	6.00
89	2	1	4	8	7	7	6	10	6	7.33
90	2	1	4	3	5	5	4	3	6	5.00
91	2	1	4	9	7	8	10	10	6	8.67
92	2	2	4	5	3	3	4	2	5	3.67
93	2	1	4	7	6	9	6	8	7	6.00
94	2	1	4	1	5	3	3	4	6	5.67
95	2	1	4	9	7	8	8	10	6	8.00
96	2	1	3	4	0	2	1	4	6	2.33
97	2	2	2	8	9	10	7	5	10	7.33
98	2	1	4	7	4	5	3	9	9	9.00
99	2	2	3	8	7	4	6	10	7	6.67
100	2	2	3	7	6	3	4	5	3	4.00

101	2	2	3	10	10	10	10	10	10	7.33
102	2	2	3	7	9	6	2	4	8	5.67
103	2	2	3	6	10	9	9	6	10	1.33
104	2	1	4	1	9	4	4	10	3	3.67
105	2	2	3	2	5	5	0	6	5	4.00
104	2	1	4	3	6	5	2	4	1	5.67
107	2	2	4	9	10	10	10	10	6	8.00
108	2	2	4	9	7	9	2	10	10	7.33
109	2	1	2	9	9	3	7	10	6	8.67
110	2	1	4	5	8	3	6	6	6	4.00
111	2	1	3	6	3	5	4	6	8	4.00
112	2	1	4	9	9	7	10	10	8	7.33
113	2	2	4	2	7	2	4	8	3	4.00
114	2	1	1	6	5	4	6	4	5	5.67
115	2	1	3	4	4	6	5	7	5	5.33
116	2	1	3	8	6	5	3	5	4	4.67
117	2	1	1	3	8	5	2	4	3	5.33
118	2	1	2	8	5	4	4	8	7	5.33
119	2	2	1	2	4	3	1	5	3	3.67
120	2	1	2	3	1	1	2	3	4	2.67
121	2	2	2	6	7	9	5	10	5	6.00
122	2	1	4	4	4	3	2	4	2	3.67
123	2	1	2	8	7	10	6	9	7	7.33
124	2	1	4	3	4	6	2	7	5	5.33
125	2	2	3	3	2	4	1	2	6	2.67

126	2	1	4	10	8	9	7	10	10	8.00
127	2	1	3	1	2	1	3	6	4	4.67
128	2	1	4	6	3	7	6	10	6	5.00
129	2	2	4	2	3	0	1	2	3	2.00
130	2	1	1	4	9	8	5	8	5	6.00
131	2	1	3	10	10	10	10	10	10	7.33
132	2	1	3	7	9	6	2	4	8	5.67
133	2	1	1	3	4	5	2	10	3	3.00
134	2	1	2	1	9	4	4	10	3	3.67
135	2	2	1	2	5	5	0	6	5	4.00
136	2	1	2	1	8	7	3	6	3	4.00
137	2	2	1	9	10	10	10	10	6	8.00
138	2	2	2	9	7	9	2	10	10	9.00
139	2	2	1	9	9	3	7	10	6	7.67
140	2	1	2	5	8	3	6	6	6	4.67
141	2	1	4	6	3	5	4	6	8	4.67
142	2	1	3	9	9	7	10	10	8	7.33
143	2	1	3	2	7	2	4	8	3	4.00
144	2	2	1	6	5	4	6	4	5	5.00
145	2	1	4	4	4	6	5	7	5	5.33
146	2	2	3	8	6	5	3	5	4	4.67
147	2	1	2	1	5	7	3	1	5	3.00
148	2	1	4	8	5	4	4	8	7	5.33
149	2	1	2	2	4	3	1	5	3	3.67
150	2	2	3	3	1	1	2	3	4	2.67

151	2	1	2	6	7	9	5	10	5	6.00
106	2	2	3	4	4	3	2	4	2	3.67
153	2	2	3	8	7	10	6	9	7	7.33
154	2	1	4	3	4	6	2	7	5	5.33
155	2	2	4	3	2	4	1	2	6	2.67
156	2	1	4	10	8	9	7	10	10	8.00
157	2	2	2	1	2	1	3	6	4	4.67
158	2	2	2	6	3	7	6	10	6	5.00
159	2	2	2	2	3	0	1	2	3	2.00
160	2	2	3	4	9	8	5	8	5	6.00
161	2	1	2	7	5	7	0	8	2	5.67
162	2	1	1	9	7	6	1	10	2	5.33
163	2	2	2	2	6	5	1	8	2	6.00
164	2	1	4	4	6	7	2	8	3	4.33
165	2	2	3	5	8	5	1	8	2	5.33
166	2	1	4	7	3	6	3	10	3	5.67
167	2	2	3	10	10	10	10	10	10	7.67
168	2	2	4	9	6	5	4	7	9	6.33
169	2	1	2	8	6	8	8	10	7	9.00
170	2	2	1	5	7	6	5	8	7	6.33
171	2	1	4	0	3	1	7	3	5	5.33
172	2	1	3	7	6	7	8	10	5	8.00
173	2	2	3	1	4	3	2	5	4	3.67
174	2	1	4	2	4	5	2	4	8	3.33
175	2	2	3	6	7	4	6	7	2	5.33

176	2	2	2	3	5	0	3	8	5	5.33
177	2	2	1	7	5	4	6	9	5	5.33
178	2	1	4	9	1	10	10	10	5	5.00
179	2	1	3	7	8	4	7	8	8	4.67
180	2	2	2	9	2	8	10	10	0	4.00
181	2	2	3	4	2	0	3	5	2	2.00
182	2	2	3	10	5	7	2	10	6	4.00
183	2	2	2	9	4	5	1	5	4	3.67
184	2	2	2	6	3	1	5	4	2	4.67
185	2	2	4	6	8	4	7	8	0	4.67
186	2	2	2	8	0	2	4	10	3	5.33
187	2	1	4	7	5	5	6	10	1	4.00
188	2	1	2	9	4	6	10	10	8	4.67
189	2	1	4	5	2	3	6	4	5	4.33
190	2	1	2	4	4	3	2	4	2	3.67
191	2	2	3	1	4	3	2	5	4	3.67
192	2	1	2	8	1	6	4	10	4	4.33
193	2	2	3	4	5	2	4	7	5	5.33
194	2	2	3	7	3	7	6	2	4	2.67
195	2	1	4	9	0	6	5	1	4	5.00
196	2	2	2	7	7	7	8	6	8	6.67
197	3	1	4	3	5	4	2	10	3	3.00
198	3	1	4	8	4	8	7	9	10	6.33
199	3	1	4	5	6	4	3	8	6	5.00
200	3	2	4	5	3	7	2	8	1	3.33

201	3	2	3	9	6	6	10	8	6	7.00
202	3	2	4	6	2	2	2	10	3	4.00
203	3	2	2	9	7	8	10	10	7	6.67
204	3	2	1	9	5	7	2	8	2	5.00
205	3	1	3	8	5	7	6	10	4	6.00
206	3	2	2	6	4	3	6	7	2	5.33
207	3	2	2	0	1	2	1	2	4	4.33
208	3	2	1	1	1	4	0	4	3	4.00
209	3	2	3	4	3	3	3	4	3	6.00
210	3	1	2	8	6	3	1	4	6	5.33
211	3	2	2	9	6	2	6	2	2	4.00
212	3	1	4	8	10	9	10	10	10	8.00
213	3	1	4	7	5	5	6	10	6	3.67
214	3	1	4	5	4	2	2	5	2	5.33
215	3	1	2	0	1	2	2	4	1	2.00
216	3	1	3	7	3	4	4	8	5	5.00
217	3	2	3	5	1	2	1	4	0	3.33
218	3	1	3	7	4	6	6	10	6	6.00
219	3	2	2	5	8	3	4	10	5	5.67
220	3	2	4	9	2	6	10	10	6	4.33
221	3	1	4	9	4	2	2	8	7	3.67
222	3	2	3	7	5	6	2	8	3	6.00
223	3	1	1	4	5	4	2	4	7	4.67
224	3	1	4	9	7	9	4	10	10	2.33
225	3	1	3	3	4	2	2	6	3	3.67

226	3	1	1	0	2	1	1	2	0	3.33
227	3	2	2	0	3	2	0	8	1	1.67
228	3	2	3	9	10	6	4	4	1	4.67
229	3	1	1	7	7	5	8	8	4	4.00
230	3	1	4	7	3	4	4	4	3	4.33
231	3	1	3	6	4	1	1	10	3	5.00
232	3	1	1	7	8	4	7	8	8	4.67
233	3	1	4	7	8	10	7	10	3	5.33
234	3	1	4	7	10	9	4	10	10	4.33
235	3	2	3	6	2	4	4	4	4	4.33
236	3	2	3	9	8	0	2	10	7	4.00
237	3	2	1	8	7	5	1	7	4	5.00
238	3	2	2	0	2	1	0	2	2	2.33
239	3	1	2	4	6	5	5	4	4	5.00
240	3	2	3	9	6	4	0	8	6	4.67
241	3	1	2	4	5	5	3	10	4	4.67
242	3	1	2	4	0	2	4	5	3	4.33
243	3	2	2	9	6	4	2	6	3	4.00
244	3	2	1	7	6	2	2	10	4	5.00
245	3	1	3	1	2	3	0	4	1	3.67
246	3	2	3	3	1	2	2	6	3	3.33
247	3	1	2	0	3	0	0	4	3	3.33
248	3	2	1	8	4	6	1	6	3	5.67
249	3	2	2	9	7	9	10	10	3	5.33
250	3	2	3	3	2	4	1	4	1	4.67
251	3	1	4	6	5	3	3	10	3	3.00
252	3	2	1	7	4	5	6	5	7	4.33

253	3	1	2	6	1	3	1	7	5	3.00
254	3	2	3	1	3	2	4	4	2	4.00
255	3	1	2	1	2	1	0	8	3	3.67
256	3	1	4	7	5	10	2	10	7	5.33
257	4	1	2	5	7	5	5	1	6	5.67
258	4	1	2	2	5	5	2	10	2	4.33
259	4	1	1	8	8	8	10	10	10	8.00
260	4	1	2	3	7	5	6	2	3	7.33
261	4	1	2	7	8	10	10	6	8	8.33
262	4	1	2	10	10	8	6	10	7	4.33
263	4	1	3	4	8	7	4	10	10	7.67
264	4	1	2	10	9	10	10	9	10	4.67
265	4	1	3	2	4	5	4	6	3	1.33
266	4	2	1	4	2	3	1	6	1	3.33
267	4	2	1	1	2	3	2	4	1	4.00
268	4	2	2	6	4	6	4	8	4	4.67
269	4	2	1	4	5	2	4	7	5	5.33
270	4	2	1	7	3	7	6	2	4	2.67
271	4	2	1	6	4	6	5	2	6	5.00
272	4	2	1	7	7	7	8	6	8	6.00
273	4	2	1	3	5	4	2	10	3	3.00
274	4	2	2	8	4	8	7	9	7	5.33
275	4	2	2	5	6	4	3	8	6	4.00
276	4	2	1	6	3	7	2	8	1	3.33
277	4	2	2	9	6	5	9	8	6	7.00
278	4	2	1	6	2	3	2	4	3	2.67
279	4	2	1	5	5	9	8	6	3	2.00
280	4	2	2	3	2	4	1	5	3	4.67
281	4	2	1	8	6	7	5	9	10	7.33
282	4	2	1	2	3	0	0	8	5	3.67
				5.904	**5.578**	**5.305**	**4.525**	**7.422**	**5.039**	**5.18**

APPENDIX 2

OVERALL SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.70267
R Square	0.49375
Adjusted R Square	0.48271
Standard Error	1.25889
Observations	282

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	425.0645	70.8441	44.7019	5.35139E-38
Residual	275	435.8232	1.5848		
Total	281	860.8877			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	1.7532	0.2507	6.9938	0.0000	1.2597	2.2467
X Variable 1	0.1394	0.0362	3.8466	0.0001	0.0681	0.2107
X Variable 2	0.1360	0.0363	3.7469	0.0002	0.0646	0.2075
X Variable 3	0.1001	0.0406	2.4643	0.0143	0.0201	0.1801
X Variable 4	0.0134	0.0320	0.4181	0.6762	-0.0497	0.0764
X Variable 5	0.0646	0.0349	1.8523	0.0651	-0.0041	0.1333
X Variable 6	0.1538	0.0343	4.4767	0.0000	0.0861	0.2214

APPENDIX 3
SUMMARY OUTPUT FOR RESPONDENTS AGED 1- 20 YEARS

Regression Statistics	
Multiple R	0.7078522
R Square	0.5010547
Adjusted R Square	0.4898424
Standard Error	1.262492
Observations	274

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	427.36674	71.22779	44.688133	1.137E-37
Residual	267	425.56757	1.593886		
Total	273	852.93431			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.7334922	0.2523131	6.8704006	4.498E-11	1.2367158	2.2302687	1.2367158	2.2302687
X Variable 1	0.1342863	0.03706	3.6234856	0.0003479	0.0613193	0.2072532	0.0613193	0.2072532
X Variable 2	0.1291357	0.036994	3.4907201	0.0005634	0.0562986	0.2019728	0.0562986	0.2019728
X Variable 3	0.0913802	0.0418501	2.1835137	0.0298687	0.0089821	0.1737783	0.0089821	0.1737783
X Variable 4	0.0278966	0.0331206	0.8422753	0.4003877	-0.0373141	0.0931074	-0.0373141	0.0931074
X Variable 5	0.0659477	0.0353745	1.8642728	0.0633807	-0.0037007	0.1355962	-0.0037007	0.1355962
X Variable 6	0.1621163	0.0347669	4.662944	4.93E-06	0.093664	0.2305685	0.093664	0.2305685

APPENDIX 4

SUMMARY OUTPUT FOR RESPONDENTS AGED 21-40 YEARS

Regression Statistics	
Multiple R	0.7010249
R Square	0.4914359
Adjusted R Square	0.4802176
Standard Error	1.2633985
Observations	279

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	419.53753	69.922922	43.806531	2.68E-37
Residual	272	434.1598	1.5961757		
Total	278	853.69733			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.7420676	0.2528687	6.8892191	3.892E-11	1.2442391	2.2398962	1.2442391	2.2398962
X Variable 1	0.1398458	0.0364153	3.8403035	0.0001529	0.0681541	0.2115374	0.0681541	0.2115374
X Variable 2	0.1383504	0.0365172	3.7886343	0.0001865	0.0664581	0.2102427	0.0664581	0.2102427
X Variable 3	0.0986458	0.04103	2.4042349	0.0168753	0.017869	0.1794225	0.017869	0.1794225
X Variable 4	0.0150467	0.032227	0.4668955	0.6409484	-0.0483995	0.0784928	-0.0483995	0.0784928
X Variable 5	0.0646992	0.0351579	1.8402469	0.0668214	-0.004517	0.1339153	-0.004517	0.1339153
X Variable 6	0.1515166	0.0348201	4.3514094	1.916E-05	0.0829654	0.2200678	0.0829654	0.2200678

APPENDIX 5

SUMMARY OUTPUT FOR RESPONDENTS AGED 41- 60 YEARS

Regression Statistics	
Multiple R	0.7011299
R Square	0.4915831
Adjusted R Square	0.4804091
Standard Error	1.2620722
Observations	280

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	420.44378	70.073963	43.993479	1.851E-37
Residual	273	434.84154	1.5928261		
Total	279	855.28532			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.7509695	0.2515384	6.9610425	2.512E-11	1.2557679	2.246171	1.2557679	2.246171
X Variable 1	0.135765	0.0366439	3.7049768	0.0002559	0.0636243	0.2079056	0.0636243	0.2079056
X Variable 2	0.1338777	0.0365013	3.6677547	0.0002941	0.062018	0.2057375	0.062018	0.2057375
X Variable 3	0.1029214	0.041141	2.5016721	0.0129465	0.0219274	0.1839154	0.0219274	0.1839154
X Variable 4	0.0131525	0.0321431	0.4091864	0.6827237	-0.0501274	0.0764325	-0.0501274	0.0764325
X Variable 5	0.0669183	0.0352176	1.9001357	0.0584688	-0.0024144	0.136251	-0.0024144	0.136251
X Variable 6	0.1539999	0.0345672	4.455082	1.225E-05	0.0859476	0.2220521	0.0859476	0.2220521

APPENDIX 6

SUMMARY OUTPUT FOR RESPONDENTS AGED >60

Regression Statistics	
Multiple R	0.6999218
R Square	0.4898906
Adjusted R Square	0.4785966
Standard Error	1.2651875
Observations	278

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	416.59572	69.43262	43.376423	5.593E-37
Residual	271	433.78957	1.6006995		
Total	277	850.38529			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.752546	0.2524731	6.9415169	2.862E-11	1.2554881	2.2496039	1.2554881	2.2496039
X Variable 1	0.1358117	0.0367404	3.6965186	0.0002645	0.0634787	0.2081447	0.0634787	0.2081447
X Variable 2	0.1357632	0.0366772	3.7015635	0.0002595	0.0635546	0.2079717	0.0635546	0.2079717
X Variable 3	0.1000823	0.0415826	2.4068294	0.0167609	0.0182162	0.1819484	0.0182162	0.1819484
X Variable 4	0.0158723	0.0324319	0.4894037	0.6249518	-0.0479782	0.0797228	-0.0479782	0.0797228
X Variable 5	0.0670754	0.035331	1.8984864	0.0586943	-0.0024827	0.1366336	-0.0024827	0.1366336
X Variable 6	0.1518012	0.0348711	4.3532154	1.903E-05	0.0831486	0.2204539	0.0831486	0.2204539

APPENDIX 7 SUMMARY OUTPUT FOR MALE

Regression Statistics	
Multiple R	0.7017114
R Square	0.4923989
Adjusted R Square	0.4812836
Standard Error	1.2611829
Observations	281

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	422.76721	70.461202	44.298995	1.07E-37
Residual	274	435.81958	1.5905824		
Total	280	858.58679			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.7536854	0.2513373	6.9774179	2.26E-11	1.2588878	2.2484831	1.2588878	2.2484831
X Variable 1	0.139313	0.0363375	3.8338618	0.0001565	0.0677768	0.2108492	0.0677768	0.2108492
X Variable 2	0.1359736	0.0363775	3.7378507	0.0002259	0.0643587	0.2075885	0.0643587	0.2075885
X Variable 3	0.0998937	0.0409303	2.440579	0.0152975	0.0193158	0.1804716	0.0193158	0.1804716
X Variable 4	0.0133235	0.0321198	0.4148074	0.6786075	-0.0499093	0.0765564	-0.0499093	0.0765564
X Variable 5	0.0647579	0.0350848	1.8457527	0.0660068	-0.0043122	0.133828	-0.0043122	0.133828
X Variable 6	0.1539051	0.0345427	4.4555052	1.221E-05	0.0859023	0.2219078	0.0859023	0.2219078

APPENDIX 8

SUMMARY OUTPUT FOR FEMALE

Regression Statistics	
Multiple R	0.7033344
R Square	0.49467928
Adjusted R Square	0.4835325
Standard Error	1.2615147
Observations	279

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	423.750429	70.6250715	44.37866879	1.13715E-37
Residual	272	432.866059	1.59141933		
Total	278	856.616487			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.74209763	0.25139169	6.92981377	3.05085E-11	1.247176805	2.23701845	1.2471768	2.23701845
X Variable 1	0.13320876	0.03671917	3.62777115	0.000341337	0.060918844	0.20549867	0.06091884	0.20549867
X Variable 2	0.13695588	0.03659136	3.74284777	0.000221996	0.064917601	0.20899415	0.0649176	0.20899415
X Variable 3	0.09563233	0.04150254	2.3042524	0.021962174	0.013925288	0.17733938	0.01392529	0.17733938
X Variable 4	0.0179353	0.03240856	0.55341232	0.580435699	-0.045868215	0.08173881	-0.0458682	0.08173881
X Variable 5	0.06990942	0.0351755	1.9874466	0.047875669	0.000658582	0.13916027	0.00065858	0.13916027
X Variable 6	0.155684	0.03446236	4.51750823	9.33628E-06	0.087837129	0.22353088	0.08783713	0.22353088

APPENDIX 9

SUMMARY OUTPUT FOR RESPONDENTS WITH NO EDUCATION

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.7028283
R Square	0.4939677
Adjusted R Square	0.4825534
Standard Error	1.2691401
Observations	273

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	418.23562	69.705937	43.276354	1.014E-36
Residual	266	428.45058	1.6107165		
Total	272	846.6862			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.7481568	0.253961	6.8835641	4.186E-11	1.2481273	2.2481862	1.2481273	2.2481862
X Variable 1	0.1295872	0.0371754	3.4858342	0.0005737	0.0563918	0.2027827	0.0563918	0.2027827
X Variable 2	0.1320942	0.0371811	3.552724	0.0004509	0.0588875	0.205301	0.0588875	0.205301
X Variable 3	0.0943494	0.0422646	2.2323482	0.0264246	0.0111336	0.1775652	0.0111336	0.1775652
X Variable 4	0.0261668	0.0333133	0.7854766	0.4328732	-0.0394245	0.0917581	-0.0394245	0.0917581
X Variable 5	0.0681558	0.0356784	1.9102815	0.0571722	-0.0020922	0.1384038	-0.0020922	0.1384038
X Variable 6	0.1574859	0.0352652	4.4657535	1.18E-05	0.0880514	0.2269204	0.0880514	0.2269204

APPENDIX 10

SUMMARY OUTPUT FOR RESPONDENTS WITH BASIC EDUCATION

Regression Statistics	
Multiple R	0.70071
R Square	0.49100
Adjusted R Square	0.47969
Standard Error	1.26596
Observations	277

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	417.4130	69.5688	43.4084	0.0000
Residual	270	432.7178	1.6027		
Total	276	850.1308			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.7350	0.2535	6.8430	0.0000	1.2358	2.2341	1.2358	2.2341
X Variable 1	0.1366	0.0368	3.7145	0.0002	0.0642	0.2090	0.0642	0.2090
X Variable 2	0.1375	0.0368	3.7400	0.0002	0.0651	0.2099	0.0651	0.2099
X Variable 3	0.0988	0.0416	2.3724	0.0184	0.0168	0.1808	0.0168	0.1808
X Variable 4	0.0167	0.0325	0.5142	0.6075	-0.0472	0.0806	-0.0472	0.0806
X Variable 5	0.0675	0.0354	1.9084	0.0574	-0.0021	0.1371	-0.0021	0.1371
X Variable 6	0.1518	0.0349	4.3498	0.0000	0.0831	0.2205	0.0831	0.2205

APPENDIX 11

SUMMARY OUTPUT FOR RESPONDENTS WITH SECONDARY EDUCATION

Regression Statistics	
Multiple R	0.7034
R Square	0.4948
Adjusted R Square	0.4831
Standard Error	1.2694
Observations	267

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	410.2872896	68.3812149	42.438468	6.0883E-36
Residual	260	418.9386779	1.61130261		
Total	266	829.2259675			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.7502	0.2552	6.8575	0.0000	1.2477	2.2528	1.2477	2.2528
X Variable 1	0.1346	0.0377	3.5730	0.0004	0.0604	0.2087	0.0604	0.2087
X Variable 2	0.1248	0.0376	3.3150	0.0010	0.0507	0.1989	0.0507	0.1989
X Variable 3	0.0879	0.0425	2.0702	0.0394	0.0043	0.1716	0.0043	0.1716
X Variable 4	0.0260	0.0337	0.7704	0.4417	-0.0404	0.0924	-0.0404	0.0924
X Variable 5	0.0635	0.0360	1.7670	0.0784	-0.0073	0.1343	-0.0073	0.1343
X Variable 6	0.1691	0.0355	4.7665	0.0000	0.0993	0.2390	0.0993	0.2390

APPENDIX 12

SUMMARY OUTPUT FOR RESPONDENTS WITH TERTIARY EDUCATION

Regression Statistics	
Multiple R	0.7017
R Square	0.4924
Adjusted R Square	0.4813
Standard Error	1.2612
Observations	281

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	422.7672	70.4612	44.299	1.0705E-37
Residual	274	435.8196	1.5906		
Total	280	858.5868			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1.7537	0.2513	6.9774	0.0000	1.2589	2.2485	1.2589	2.2485
X Variable 1	0.1393	0.0363	3.8339	0.0002	0.0678	0.2108	0.0678	0.2108
X Variable 2	0.1360	0.0364	3.7379	0.0002	0.0644	0.2076	0.0644	0.2076
X Variable 3	0.0999	0.0409	2.4406	0.0153	0.0193	0.1805	0.0193	0.1805
X Variable 4	0.0133	0.0321	0.4148	0.6786	-0.0499	0.0766	-0.0499	0.0766
X Variable 5	0.0648	0.0351	1.8458	0.0660	-0.0043	0.1338	-0.0043	0.1338
X Variable 6	0.1539	0.0345	4.4555	0.0000	0.0859	0.2219	0.0859	0.2219

APPENDIX 13

DESCRIPTIVE STATISTICS FOR ALL INPUT OR EXPLANATORY VARIABLES

Parameter	X_1	X_2	X_3	X_4	X_5	X_6
Mean	5.90	5.58	5.30	4.52	7.42	5.04
Standard Error	0.17	0.15	0.15	0.19	0.15	0.16
Median	6.50	6.00	5.00	4.00	8.00	5.00
Mode	9.00	4.00	4.00	2.00	10.00	3.00
Standard Deviation	2.79	2.56	2.56	3.11	2.59	2.75
Sample Variance	7.80	6.56	6.55	9.70	6.72	7.55
1%	0.00	0.00	0.00	0.00	1.00	0.00
5%	1.00	1.00	1.00	0.00	2.00	1.00
10%	2.00	2.00	2.00	1.00	4.00	2.00
50%	5.00	6.00	5.00	4.00	8.00	5.00
90%	9.00	9.00	10.00	10.00	10.00	10.00
95%	10.00	10.00	10.00	10.00	10.00	10.00
99%	10.00	10.00	10.00	10.00	10.00	10.00
Range	10.00	10.00	10.00	10.00	9.00	10.00
Minimum	0.00	0.00	0.00	0.00	1.00	0.00
Maximum	10.00	10.00	10.00	10.00	10.00	10.00
Sum	1665.00	1573.00	1496.00	1276.00	2093.00	1421.00
Count	282.00	282.00	282.00	282.00	282.00	282.00

APPENDIX 14

DESCRIPTIVE STATISTICS FOR AGE (1-20 YEARS)

descriptive characteristics	X_1	X_2	X_3	X_4	X_5	X_6	Y
Minimum	0.000	0.000	0.000	0.000	1.000	0.000	1.333
Maximum	10.000	10.000	10.000	10.000	10.000	10.000	10.000
Mean	5.904	5.578	5.305	4.525	7.422	5.039	5.1809
median	6.000	6.000	5.000	4.000	8.000	5.000	5.000
standard deviation	2.792	2.561	2.560	3.115	2.593	2.747	1.7503
1%	0.000	0.000	0.000	0.000	1.000	0.000	1.667
5%	1.000	1.000	1.000	1.000	2.000	1.000	2.667
50%	6.000	6.000	5.000	4.000	8.000	5.000	5.000
90%	9.000	9.000	9.000	10.000	10.000	10.000	7.667
95%	10.000	10.000	10.000	10.000	10.000	10.000	8.000
99%	10.000	10.000	10.000	10.000	10.000	10.000	9.333

DESCRIPTIVE STATISTICS FOR AGE (21-40 YEARS)

descriptive characteristics	X_1	X_2	X_3	X_4	X_5	X_6	Y
Minimum	0.000	0.000	0.000	0.000	1.000	0.000	1.333
Maximum	10.000	10.000	10.000	10.000	10.000	10.000	10.000
Mean	5.921	5.999	5.323	4.552	7.423	5.029	5.1804
median	7.000	6.000	5.000	4.000	8.000	5.000	5.000
standard deviation	2.789	2.561	2.551	3.112	2.601	2.743	1.7524
1%	0.000	0.000	0.000	0.000	1.000	0.000	1.667
5%	1.000	1.000	1.000	1.000	2.000	1.000	2.333
50%	7.000	6.000	5.000	4.000	8.000	5.000	5.000
90%	9.000	9.000	9.000	10.000	10.000	10.000	7.667
95%	10.000	10.000	10.000	10.000	10.000	10.000	8.333
99%	10.000	10.000	10.000	10.000	10.000	10.000	9.333

APPENDIX 15 DESCRIPTIVE STATISTICS FOR AGE (41-60 YEARS)

descriptive characteristics	X_1	X_2	X_3	X_4	X_5	X_6	Y
Minimum	0.000	0.000	0.000	0.000	1.000	0.000	1.333
Maximum	10.000	10.000	10.000	10.000	10.000	10.000	10.000
Mean	5.911	5.586	5.318	4.539	7.414	5.021	5.179
median	6.000	6.000	5.000	4.000	8.000	5.000	5.000
standard deviation	2.789	2.565	2.548	3.114	2.600	2.741	1.750
1%	0.000	0.000	0.000	0.000	1.000	0.000	1.667
5%	1.000	1.000	1.000	0.000	2.000	1.000	2.333
50%	6.000	6.000	5.000	4.000	8.000	5.000	5.000
90%	9.000	9.000	9.000	10.000	10.000	10.000	7.667
95%	10.000	10.000	10.000	10.000	10.000	10.000	8.000
99%	10.000	10.000	10.000	10.000	10.000	10.000	9.333

APPENDIX 16 DESCRIPTIVE STATISTICS FOR AGE (>60 YEARS)

descriptive characteristics	X_1	X_2	X_3	X_4	X_5	X_6	Y
Minimum	0.000	0.000	0.000	0.000	1.000	0.000	1.333
Maximum	10.000	10.000	10.000	10.000	10.000	10.000	10.000
Mean	5.911	5.586	5.318	4.539	7.414	5.021	5.179
median	6.000	6.000	5.000	4.000	8.000	5.000	5.000
standard deviation	2.789	2.565	2.548	3.114	2.600	2.741	1.750
1%	0.000	0.000	0.000	0.000	1.000	0.000	1.667
5%	1.000	1.000	1.000	0.000	2.000	1.000	2.333
50%	6.000	6.000	5.000	4.000	8.000	5.000	5.000
90%	9.000	9.000	9.000	10.000	10.000	10.000	7.667
95%	10.000	10.000	10.000	10.000	10.000	10.000	8.000
99%	10.000	10.000	10.000	10.000	10.000	10.000	9.333

APPENDIX 18 DESCRIPTIVE STATISTICS FOR RESPONDENTS AT ALL LEVELS OF EDUCATION

Respondents with no education

descriptive characteristics	X_1	X_2	X_3	X_4	X_5	X_6	Y
minimum	0.000	0.000	0.000	0.000	1.000	0.000	1.333
maximum	10.000	10.000	10.000	10.000	10.000	10.000	10.000
mean	5.911	5.586	5.337	4.553	7.385	5.033	5.1786
median	6.000	6.000	5.000	4.000	8.000	5.000	5.000
standard deviation	2.789	2.565	2.569	3.096	2.611	2.755	1.7495
1%	0.000	0.000	0.000	0.000	1.000	0.000	1.667
5%	1.000	1.000	1.000	0.000	2.000	1.000	2.333
50%	6.000	5.000	5.000	4.000	8.000	5.000	5.000
90%	9.000	9.000	9.000	10.000	10.000	10.000	7.667
95%	10.000	10.000	10.000	10.000	10.000	10.000	8.000
99%	10.000	10.000	10.000	10.000	10.000	10.000	9.333

Respondents- Junior Secondary education

descriptive characteristics	X_1	X_2	X_3	X_4	X_5	X_6	Y
minimum	0.000	0.000	0.000	0.000	1.000	0.000	1.333
maximum	10.000	10.000	10.000	10.000	10.000	10.000	10.000
mean	5.921	5.999	5.323	4.552	7.423	5.029	5.1804
median	7.000	6.000	5.000	4.000	8.000	5.000	5.000
standard deviation	2.789	2.561	2.551	3.112	2.601	2.743	1.7524
1%	0.000	0.000	0.000	0.000	1.000	0.000	1.667
5%	1.000	1.000	1.000	1.000	2.000	1.000	2.333
50%	7.000	6.000	5.000	4.000	8.000	5.000	5.000
90%	9.000	9.000	9.000	10.000	10.000	10.000	7.667
95%	10.000	10.000	10.000	10.000	10.000	10.000	8.333
99%	10.000	10.000	10.000	10.000	10.000	10.000	9.333

Respondents- Senior Secondary education

descriptive characteristics	X_1	X_2	X_3	X_4	X_5	X_6	Y
minimum	0.000	0.000	0.000	0.000	1.000	0.000	1.333
maximum	10.000	10.000	10.000	10.000	10.000	10.000	10.000
mean	5.904	5.578	5.305	4.525	7.422	5.039	5.186
median	7.000	6.000	5.000	4.000	8.000	5.000	5.000
standard deviation	2.787	2.561	2.545	3.109	2.593	2.747	1.750
1%	0.000	0.000	0.000	0.000	1.000	0.000	1.667
5%	1.000	1.000	1.000	0.000	2.000	1.000	2.667
50%	6.000	6.000	5.000	4.000	8.000	5.000	5.000
90%	9.000	9.000	9.000	10.000	10.000	10.000	7.667
95%	10.000	10.000	10.000	10.000	10.000	10.000	8.000
99%	10.000	10.000	10.000	10.000	10.000	10.000	9.333

Respondents - Tertiary education

descriptive characteristics	X_1	X_2	X_3	X_4	X_5	X_6	Y
minimum	0.000	0.000	0.000	0.000	1.000	0.000	1.333
maximum	10.000	10.000	10.000	10.000	10.000	10.000	10.000
mean	5.918	5.587	5.324	4.541	7.420	5.039	5.321
median	7.000	6.000	5.000	4.000	8.000	5.000	5.181
standard deviation	2.787	2.561	2.545	3.109	2.597	2.752	1.860
1%	0.000	0.000	0.000	0.000	1.000	0.000	1.667
5%	1.000	1.000	1.000	0.000	2.000	1.000	2.667
50%	7.000	6.000	5.000	4.000	8.000	5.000	5.000
90%	9.000	9.000	9.000	10.000	10.000	10.000	7.667
95%	10.000	10.000	10.000	10.000	10.000	10.000	8.000
99%	10.000	10.000	10.000	10.000	10.000	10.000	9.333

QUESTIONNAIRE

As requirement of project work a student is examining Consumer perception of attributes and health benefits of cocoa. As a resident in Accra- Tema metropolis, your genuine contribution to the study is much appreciated. Your views will be treated with the strictest confidentiality and for the purpose of this study only. The questionnaire contains mixed closed-ended and open-ended questions as well as response format.

Section 1 – Demographics

Q1 Age (in years)..... [1] Up to 20 [2] 21-40 [3] 41-60 [4] Above 60 years.

Q2 Gender ..... [1] Male [2] Female.

Q3. Level of Education .....[1] No Education [2]Basic (Up to Junior Secondary) [3] Secondary (SSS/ Technical/Vocational) [4] Tertiary(Diploma, HND, Degree etc.)

Section 2- Cocoa/ chocolate and Pre- hypertension (Attribute X1)

Q4. Cocoa is perceived to improve cardio- vascular condition, do you agree?

[a] Yes [b] No [c] Other, please specify.....

Q5.Which of these statements on consumption of cocoa and chocolate is perceive to be true? Please tick (√)

[a] Cocoa consumption protects and strengthen the heart [b] Cocoa consumption does not protects and strengthen the heart [c] Cocoa consumption negatively affect the heart

Q6. In your opinion cocoa is effective when consumed [a] in raw state or [b] with addition of milk

Q7. Do you agree with the following

(I) Cocoa reduces high blood pressure (BP), [a] True ..... [b] False .....

(II) Cocoa improves free flow of blood. [a] True .....[b] False .....

[a] I and II

Q8. Have you heard that consumption of cocoa improves blood circulation?

[a] Yes [b] No [c] I don't know

Q9. Do you agree to the statement that Cocoa reduce blood pressure in younger consumers than the aged? [a] Yes [b] No [c] I don't know

Section 3- Cocoa as mood enhancer (Attribute X2)

Q10. Cocoa is perceived to regulate mood after regular consumption

[a] I agree [b] I disagree [c] neither agree nor disagree

Q11. It has been reported that the consumption of a cocoa drink boosts blood flow to key areas of the brain which help to increase performance and boost general alertness

[a] True …… [b] False …….

Q12. It is perceive that Cocoa improves fatigue, sleep deprivation and aging. Do you agree?

[a] I agree [b] I disagree [c] neither agree nor disagree

Q13. Have you heard that cocoa is potentially effective in treating depressive patients?

[a] Yes …… [b] No……

Q14.Cravings for chocolate is more profound with people experiencing mood disorders

[a] True …… [b] False ……

Section 4- Cocoa and Diabetes management (Attribute X3)

Q15. Do you agree that natural cocoa consumption control diabetes?

[a] I agree [b] I disagree [c] neither agree nor disagree

Q16. Do you agree that the longer the duration of consumption of cocoa the better the control?

[a] I agree [b] I disagree [c] neither agree nor disagree

Q17. Do you agree that even with smaller dose, control and management of diabetes is effective?

[a] I agree [b] I disagree [c] neither agree nor disagree

Q18. It has been established that regular consumption of cocoa contribute in preventing cataract formation caused by diabetes, do you agree?

[a] I Agree [b] I disagree [c] neither agree nor disagree

Q19. Do you agree that Dark and sugar free chocolate neutralizes sugar in the blood.

[a] I Agree [b] I disagree [c] neither agree nor disagree

Section 5- Cocoa and cancer prevention (Attribute X4)

Q20. It is perceive that cocoa prevent cancer formation, do you agree?

[a] I Agree [b] I disagree [c] neither agree nor disagree

Q21. Have you heard that cocoa control cancer development?

[a] I Agree [b] I disagree [c] neither agree nor disagree

Q22. Have you heard that cocoa consumption is effective in cancer management

[a] True [b] False

Q23.Have you heard that Cocoa suppresses cancerous growth?

[a] Yes [b] No

Section 6- Cocoa as skin remedy (Attribute X5)

Q24. It is widely accepted that some ingredients in cocoa is effective for keeping good skin.

[a] True ..... [b] False .....

Q25. It is reported that cocoa ensures effective flow of blood through the skin and prevent sign of aging. [a] True ..... [b] False .....

Q26. It is perceive that cocoa butter pomade ensures smoothness of skin [a] Yes [b] No [c] I don't know

Q27. Have you heard that cocoa butter pomade reduces appearance of scars and inflammation of skin.

[a] Yes [b] No [c] I don't know

Section 7- Cocoa usefulness in Brain and Nervous system

Q28. Do you perceive that regular consumption of cocoa prevent the brain and nervous system from becoming dull with age?

[a] Yes [b] No [c] I don't know

Q29. Do you perceive that cocoa is beneficial in treating nervous disorders

[a] Yes [b] No [c] I don't know

Q30. Do you agree to the statement that regular consumption of cocoa have favorable effects on learning and memory function? [a] Yes [b] No [c] I don't know

Section 8: Response Variable- Y

In your own estimation on a scale of 0 to 5, rate the performances of natural cocoa powder in improving the following

(Q31). Cocoa and pre- hypertension control [a] 0 [b] 1 [c] 2 [d] 3 [e] 4 [f] 5

(Q32). Cocoa as mood enhancer [a] 0 [b] 1 [c] 2 [d] 3 [e] 4 [f] 5

(Q33). Cocoa and Diabetes management [a] 0 [b] 1 [c] 2 [d] 3 [e] 4 [f] 5

(Q34). Cocoa and cancer prevention [a] 0 [b] 1 [c] 2 [d] 3 [e] 4 [f] 5

(Q35). Cocoa butter as skin remedy [a] 0 [b] 1 [c] 2 [d] 3 [e] 4 [f] 5

(Q36). Usefulness of cocoa and brain power [a] 0 [b] 1 [c] 2 [d] 3 [e] 4 [f] 5