CONSUMERS' PREFERENCES AND DEMAND FOR CULINARY SPICES AND HERBS IN GAUTENG PROVINCE, SOUTH AFRICA

K Mphafi

orcid.org/0000-0003-1864-3170

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Promoter: Prof A. S. Oyekale
Co-promoter: Dr P. Ndou

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Student number: 25840835

DECLARATION

I, Kananelo Mphafi, affirm that the dissertation entitled "**CONSUMERS' PREFERENCES AND DEMAND FOR CULINARY SPICES AND HERBS IN GAUTENG PROVINCE, SOUTH AFRICA**", hereby submitted for the degree of Doctor of Philosophy in Agriculture with Agricultural Economics of the North-West University has not previously been submitted by me for a degree at any other university. I further declare that this is my work in design and execution and that all materials used from other sources have been duly acknowledged and referenced in the thesis.

Student Name: ……

Signature: ...……

Date: ...……day of ……., 2022

DEDICATION

I humbly dedicate this work to “God Almighty my creator, my strong pillar, my source of inspiration, wisdom, knowledge and understanding”. For he has been the source of my strength throughout this programme, and on His wings only have I soared. I also dedicate this work to my parents, ‘Makopano and Khahlanyetso Mokhutsoane for instilling the value of education in me and providing me with the necessary background. To my husband, Sebinane Mphafi, who have encouraged me all the way and whose encouragement has made sure that I give it all it takes to finish that which I have started. To my son Sekoala, who has been affected in every way possible by this quest. My mother-in-law, ‘Masera Mphafi for her support during the journey. My love for you all can never be quantified. God bless you.

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ABSTRACT

Spices and herbs are plant materials or ready-to-use plant products with some medicinal and food flavoring properties. They are primarily used for therapeutic, aromatic and/or culinary purposes, in cosmetics, pharmaceutical, and food industries. Currently, growing knowledge on the health-enhancing properties of some spices and herbs have resulted in increase in their consumption. Therefore, this study sought to achieve the following objectives: to analyze the determinants of consumers' preferences for the sources of spices and herbs, to analyze the determinants of consumption and utility choices for spices and herbs, to identify the socio-economic factors influencing consumers' willingness to purchase culinary spices and herbs, to determine the factors influencing households' demand for selected culinary spices and herbs, and to compute the price and income elasticities of households' demand for culinary spices and herbs.

Primary data were collected from the Gauteng province. A multi-stage sampling technique was used to choose the respondents. Gauteng was purposively selected for being the fastest growing province in terms of population size in South Africa. Data were collected from 385 respondents through administration of questionnaires. Multinomial logit regression model, Principal Component Analysis (PCA), logistic regression model and Quadratic Almost Ideal Demand System (QUAIDS) were utilized for data analyses.

The results showed that most of the consumers (94%) between the ages of 27 and 37 years preferred imported spices, while 90% of the single respondents preferred imported spices. Spices from foreign sources were preferred by 84% of the respondents with tertiary education qualifications. The multinomial logistic regression results showed that compared to indifferent consumers, being married and concern for packaging increased the preference for local spices, while household size, gender, concern for product's labelling and product's attractiveness negatively influenced the preference for local spices. Also, compared indifferent consumers, the preference for imported spices was influenced by being married, household size, gender, concern for product's attractiveness, and product's availability. In addition, age, gender, household size and product's attractiveness negatively influenced the preference for local herbs while concern for product's attractiveness positively influenced the preference for local herbs. Being married, household size and gender negatively influenced the preference for imported herbs, while concern for product's attractiveness showed negative influence.

PCA was used to analyze the determinants of consumption utility choices for spices and herbs and the results showed that majority of the spices and herbs were viewed from their medicinal, aroma, weight management and health benefits. Furthermore, consumer utility from spices

was influenced by age, marital status, education level, gender, ethnicity, employment status as well as food expenditure. Similarly, herbs utility was also influenced by age, marital status, household size, ethnicity, gender, religion, food expenditure and employment status. Consumers' utilization index for spices was influenced by sources of information such as newspapers, friends and family, radio and health awareness campaign influenced utilization for spices. Utilization index for herbs was influenced bysources of information such as radio, health practitioners, newspapers, television, and information from friends and family.

The results further showed that the willingness to pay for spices was significantly influenced by age, household size, personal use of cumin, personal use of turmeric and the use of ginger in cooking meats. Willingness to pay for herbs was significantly influenced by marital status, average monthly income, number of years consuming herbs, the use of paprika in ready to use meals, the use of mint in ready to use meals, the use of vanilla in ready to use meals, the use of basil for meat and the use of origanum for personal use.

The results of the QUAIDS model on the demand for spices and herbs showed that price and expenditure influenced demand for spices and herbs. Hot spices (-0.57) and aromatic spices (-0.19) emerged as price inelastic, while mild spices showed a positive but inelastic parameter (0.10) implying that it is a non-luxury good. Own-price elasticities for all herbs were negative, and cross-price elasticities revealed that all herb groups were complements.

Based on these findings, the study recommends that policies that will improve production of spices and herbs in the country be developed to facilitate issues of consumption and marketing of spices and herbs. There is also a need to improve on educating the populace on the health benefits of spices and herbs to increase consumption.

Keywords: consumer, preference, utility, utilization, spices, herbs, willingness to pay, demand, South Africa.

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List of Abbreviations and Acronyms

ABC	Attitude-Behaviour Context
AIDS	Almost Ideal Demand System
CASP	Comprehensive Agricultural Support ProgrammeD
DAFF	Department of Agriculture, Forestry and Fisheries
DRC	Democratic Republic of Congo
FCQ	Food Choice Questionnaire
FRL	Food Related Lifestyle
LES	Linear Expenditure System
MEC	Means-end Chain
NDP	National Development Plan
NPFNS	National Policy On Food and Nutrition Security
QES	Quadratic Expenditure System
QUAIDS	Quadratic Almost Ideal Demand System
SPSS	Statistical Package for the Social Sciences
UK	United Kingdom
USA	United States of America
WTP	Willingness to Pay

CHAPTER ONE

INTRODUCTION

1.1 The Background

Spices and herbs are plant products that are used as medicines and for food flavouring. They are primarily used for therapeutic, aromatic and/or culinary purposes within the cosmetics, culinary and pharmaceutical industries (Asowata-Ayodele et al., 2016). These plants have been used since ancient times for health purposes to aid healing, cure diseases, and improve human health and general wellbeing. Around the world, culinary spices and herbs turned out to be renowned as sources of "natural antioxidants", as they play some essential roles in the prevention of several illnesses among people (Nakatani, 2000; D'Adamo et al., 2021). These spices and herbs have been historically defined as being nutritionally rich due to their medicinal properties, but they also regarded as condiments that add flavour to many dishes, and enhance food attributes and taste (Kaefer et al., 2008; Afonso et al., 2017). However, consumers' preferences for spices and herbs have been barely studied in the context of South Africa.

Currently, most Asian countries have realized an increase in consumption of food products made from spices and herbs (Vázquez-Fresno et al., 2019; Dougkas et al., 2019). Gottardi et al. (2016) noted that vegetables, together with culinary spices and herbs, have served as medicine in traditional food preparations and the food industry, and have been associated with healthy living among people in developed countries such as The Netherlands, USA, and the United Kingdom (Van Andel et al., 2013). Growth of the food industry has influenced the seasoning and spice market significantly in order to support the health needs of the people by using spices and herbs (Wilczyńska et al., 2017). It is important to note that spices and seasonings account for the aroma and taste of most foods, thus making them an integral part of their cuisines (Opara and Chohan, 2014). On their health contributions, consumption of foreign cuisines and spices have increasingly provided huge therapeutic properties, which have been highly acknowledged by many consumers.

On the same note, in sub-Saharan African regions, the demand for spices and herbs is experiencing a substantive increase as most of the people are realizing their nutritional values. For instance, in South Africa, culinary spices and herbs consumption equates to 1-2% of total

recorded annual world trade (Asowata-Ayodele et al., 2016). Furthermore, the country antiquated a paradigm shift towards a demand for culinary spices and related vegetables, as a majority of the people are becoming more health conscious in their dietary behaviour. This is as a result of high levels of obesity and the emergence of non-communicable diseases, more especially among the elderly (Phaswana-Mafuya et al., 2013). For instance, in the sub-Saharan region, non-communicable diseases have been linked to an increase in death and disability rates, with hypertension prevalence at 48%, obesity at 20%, and diabetes at 5.1% (Mudie et al., 2019). A study by Adinew (2014) highlighted that a majority of consumers are preferring organic spices over regular spices, which are deemed to be high in sodium and preservatives that are harmful to the wellbeing of the consumers, and thus creating a new wave of response to the demand for organic herbs and spices.

Despite the increased pattern of demand for culinary spices in South Africa, little is known about the level of consumers' preferences, willingness to pay, and demand for these products. It is worth noting that in as much as scholars are anticipating to explore the subject matter, there has been inadequate scholarly research carried out. Predictions on future demand for spices and herbs in India only analyzed demand by looking into consumption patterns for major spices (Shinoj and Mathur, 2006). However, the study failed to consider consumer preferences that could possibly influence consumption of these spices, as well as their willingness to pay for these commodities. For instance, Engel (2009) explored the determinants of consumers' willingness to pay for organic food in general. However, his argument did not consider spices and herbs, nor the level of demand for these products in South Africa. Moreover, a study carried out by Asowata-Ayodele et al. (2016) looked at an ethnobotanical survey of culinary herbs and spices that are used in the traditional medicinal system in South Africa, but did not look into consumers' preferences, willingness to pay, and demand for these products. It is therefore in light of these research gaps that this study seeks to contribute to scholarly debate on the consumption of spices and herbs in South Africa.

On one hand, South Africa, like many other countries, has been affected by far-reaching health challenges such as obesity (Phetla and Skaal, 2017). These challenges serve as key contributing issues associated with decreased quality of life in affected individuals, and also raise serious concerns about the potential for future weight-related health problems (Hurt et al., 2010). The associated evolving consumer lifestyles together with demographic changes shape developments in the consumer demand for food, thereby, compelling producers and retailers

to understand and satisfy the fluctuating consumers' requirements and market changing trends (Lorinczi, 2008). Among the greatest significant demographic changes are increases in population size and urbanization. Simultaneously, there is also a continuous trend on awareness of healthy regime and healthy food, within which some groups of consumers have a tendency to replace old-style food products with healthier options (Anders and Schroeter, 2017). To satisfy their physiological needs, consumers have moved up the Maslow's hierarchy by being more cautious of their nutritional intake paying attention to quality of food that improves their health status (Küster and Vila, 2017).

A study by Mitić and Gligorijevic (2015) confirmed that consumers' nutrient intake, and food preferences and choices influence food production systems. This is a complex process as poor choices can result in suboptimal nutrient intake (Tapsell et al., 2016). In spite of this, food preferences are a major component of all purchase decisions made by consumers (Marreiros and Ness, 2009). The selection and consumption of food have always been subject matters that are related to a complex network of cultural and individual attributes. The capability to digest information and evaluation of well-being, as well as household and individual characteristics, are factors that can best explain individual food consumption and selection choices. However, today's consumers' food preferences are more complex than before, as differentiated consumers' demands have been reinforced by changes in the retailing sector, providing both threats and opportunities for the food sector. Of the various identified factors that affect consumer food preference, emphasis has been placed on two, which are consumer related factors and market related issues (Kaya, 2016; Yaktine and Caswell, 2013).

Moreover, food preferences are a major components of all food purchase decisions that are made by consumers (Marreiros and Ness, 2009). The argument that food costs influence diet quality and so contribute to the observed social inequalities in health is not new. Spices and herbs are used for flavour, colour, aroma, and the preservation of food and beverages aimed at killing harmful bacteria or preventing their growth, and can contribute some portions of micronutrients like Vitamin A, magnesium, and calcium (Gottardi et al., 2016). These micronutrients may be derived from different parts of plants including the bark, buds, flowers, fruits, seeds, roots, rhizomes, stigmas, and styles (Dzoyem et al., 2017; Kuete, 2017). In South Africa, the term 'herb' is used as a subset of 'spice' and refers to plants with aromatic leaves (DAFF, 2015). Spices are often dried and used in a processed but complete state (Gottardi et al., 2016). They are fragrant or pungent dried vegetable substances and are primarily used to

season food. They can be differentiated from herbs, which are leafy spices, and some such as dill and coriander can afford both spice seeds and leafy herbs (Paur et al., 2011). A majority of herbs are regarded as having medicinal properties. This has therefore resulted in an overlap between them and medicinal or aromatic plants.

1.2 Export Classification of South Africa's Culinary Herbs and Spices

In South Africa, spice products are classified in trade under HS0904 to HS0910 as presented in Table 1.1 below.

Table 1.1: Classification of Spices in South Africa

Code	HS0904	HS0905	HS0906	HSO907	HS0908	HS0909	HS0910
Spices/Herbs	Pepper of the genus piper Capsicum	Vanilla beans	Cinnamon and cinnamon tree flowers	Cloves	Nutmeg Mace & Cardamoms	Seed of anise Fennel Coriander Cumin etc.	Ginger Saffron Turmeric Thyme Bay leaves Curry leaves

Source: Adeeyo et al. (2021)

South Africa recorded an export increase of $57 million from $23 million in export value over a period of 10 years, starting from 2011 until 2020 (Trend Economy, 2021). A large part of this revenue growth was derived from commodity group HS0910 that comprises ginger, saffron, thyme, turmeric, curry leaves and bay leaves. Moreover, the country was ranked in the top ten among global exporters, after India and Turkey, for supplying 5.6% of total global exports of ginger, turmeric, curry leaves, saffron, thyme and bay leaves. Although the country exports these commodities, it also imports them. The second largest product sub-category that was exported over the 10-year period of 2011–2020 was commodity group HS0904 comprising peppers and capsicum. This was followed by sub-category HS0905 (vanilla), HS 0909 (seed of anise, fennel, coriander, cumin etc.), HS 0906 (cinnamon and cinnamon tree flowers), HS0908 (nutmeg, mace and cardamoms) and lastly cloves, which are classified under HS0907.

Table 1.2 presents the trade data for South Africa in relation to importation and exportation of spices and herbs between 2011 and 2020.

Table 1.2: Import and export values of spices and herbs between 2011 and 2020 in South Africa

Commodity	Country	Trade flow	Indicator	2011	2012	2013	2014	2015
HS0904 Pepper of the genus piper capsicum	South Africa	Exports	Value (US$)	12,095,526,000	12,365,871,00	12,802,083,00	15,544,593,00	15,684,463,00
			Value Growth (%)	22,78	2,23	3,52	21,42	0,89
		Imports	Value (US$)	30,289,319,000	33,030,637,00	34,064,415,00	36,894,292,00	41,236,059,00
			Value Growth (%)	61,39	9,05	3,12	8,3	11,76
HS0905 Vanilla beans	South Africa	Exports	Value (US$)	898,111,00	1,003,254,00	1,186,823,00	1,324,782,00	1,368,207,00
			Value Growth (%)	23,03	11,7	18,29	11,62	3,27
		Imports	Value (US$)	199,800,00	515,993,00	701,435,00	545,082,00	792,838,00
			Value Growth (%)	-37	158,25	35,93	-22,29	45,45
HS0906 Cinnamon and cinnamon tree flowers	South Africa	Exports	Value (US$)	236,051,00	184,675,00	215,658,00	298,797,00	280,518,00
			Value Growth (%)	90,09	-21,76	36,27	18,73	-6,11
		Imports	Value (US$)	1,221,538,00	1,173,741,00	1,135,506,00	1,5330808,00	2,101,696,00
			Value Growth (%)	18,99	-3,91	-3,25	35,07	37,02
HS0907 Cloves	South Africa	Exports	Value (US$)	45,381,00	33,325,00	44,277,00	73,876,00	82,394,00
			Value Growth (%)	59,35	-26,56	32,86	66,84	11,53
		Imports	Value (US$)	2,697,729,00	2,167,972,00	1,601,611,00	2,698,890,00	2,355,509,00
			Value Growth (%)	172,03	-19,63	-26,12	68,51	-12,72
H0908 Nutmeg, mace and cardamoms	South Africa	Exports	Value (US$)	114,464,00	52,093,00	158,936,00	269,415,00	183,248,00
			Value Growth (%)	45,7	-54,48	205,1	69,51	-31,98
		Imports	Value (US$)	7,034,331,00	5,508,551,00	4,096,890,00	3,280,18300	3,280,183,00
			Value Growth (%)	58,81	-21,69	-25,62	-19,93	4,41
	South Africa	Exports	Value (US$)	307,128,00	226,415,00	404,964,00	415,455,00	399,901,00
			Value Growth (%)	-37,23	-26,27	78,85	2,59	-3,74

H0909 Seed of anise, fennel, coriander, cumin etc.		Imports	Value (US$)	6,490,348,00	8,144,274,00	7,981,562,00	11,33,807,00	10,067,130,00
			Value Growth (%)	-12,63	25,48	-1,99	41,99	-11,17
HS0910 Ginger, saffron, turmeric, thyme, bay leaves and other spices	South Africa	Exports	Value (US$)	50,748,152,00	53,787,140,00	54,37,343,00	55,902,536,00	51,108,432,00
			Value Growth (%)	12,04	5,98	1,09	2,8	-8,57
		Imports	Value (US$)	16,698,953,00	13,692,226,00	12,476,566,00	17,238,162,00	16,717,253,00
			Value Growth (%)	-4,69	-26,77	-8,87	38,16	-3,02

Table 1.2 continued…

Commodity	Country	Trade flow	Indicator	2016	2017	2018	2019	2020
HS0904 Pepper of the genus piper capsicum	South Africa	Exports	Value (US$)	18,789,707,00	22,955,486,00	23,589,979,00	22,552,127,00	23,726,414,00
			Value Growth (%)	19,79	22,17	2,76	-4,39	5,2
		Imports	Value (US$)	47,591,303,00	41,488,011,00	32,390,348,00	28,683,703,00	33,307,943,00
			Value Growth (%)	15,41	-12,82	-21,92	-11,44	16,12
HS0905 Vanilla beans	South Africa	Exports	Value (US$)	1,191,334,00	1,801,008,00	1,959,728,00	2,063,233,00	2,424,968,00
			Value Growth (%)	-12,92	51,17	8,81	5,28	8,71
		Imports	Value (US$)	429,816,00	1,172,406,00	2,598,799,00	2,407,944,00	1,567,399,00
			Value Growth (%)	-45,78	172,76	121,66	-7,34	-34,9
HS0906 Cinnamon and cinnamon tree flowers	South Africa	Exports	Value (US$)	272,798,00	407,457,00	279,078,00	163,285,00	178,873,00
			Value Growth (%)	-2,75	49,36	-31,5	-41,49	9,54
		Imports	Value (US$)	2,205,555,00	2,239,476,00	2,671,501,00	3,093,102,00	3,499,968,00
			Value Growth (%)	4,94	5,61	14,68	15,78	13,15
HS0907 Cloves	South Africa	Exports	Value (US$)	44,064,00	46,645,00	54,699,00	26,966,00	47,748,00
			Value Growth (%)	-46,52	5,85	17,26	-50,7	77,06

		Imports	Value (US$)	2,117,829	1,711,998,00	2,143,286,00	1,578,300,00	1,783,389,00
			Value Growth (%)	-10,09	-19,16	25,19	-26,36	12,99
H0908 Nutmeg, mace and cardamoms	South Africa	Exports	Value (US$)	211,400,00	266,299,00	118,328,00	80,006,00	131,619,00
			Value Growth (%)	15,36	25,96	-55,56	-32,38	64,51
		Imports	Value (US$)	2,942,833,00	3,210,993,00	2,831,260,00	3,437,525,00	3,387,479,00
			Value Growth (%)	-14,07	9,11	-11,82	21,41	-1,45
H0909 Seed of anise, fennel, coriander, cumin etc.	South Africa	Exports	Value (US$)	343,624,00	293,138,00	197,521,00	202,586,00	352,748,00
			Value Growth (%)	-14,07	-14,69	-32,61	2,56	74,12
		Imports	Value (US$)	9,831,743,00	9,613,246,00	10,538,527,00	12,179,976,00	14,906,493,00
			Value Growth (%)	-2,33	-2,22	9,62	15,57	22,38
HS0910 Ginger, saffron, turmeric, thyme, bay leaves and other spices	South Africa	Exports	Value (US$)	50,319,575.00	58,651,112.00	65,342,895.00	60,787,794.00	57,339,863.00
			Value Growth (%)	-1.54	16.55	11.40	-6.97	-5.67
		Imports	Value (US$)	19,240,725.00	18,021,738.00	15,958,592.00	17,438,494.00	25,751,721.00
			Value Growth (%)	15.09	-6.33	-11.44	9.27	47.67

Table 1.2 shows that the values of exports for commodity group HS0904 (pepper of the genus piper capsicum) from South Africa totaled $23 million in 2020. An increase of 5.2% in sales of commodity group HS0904 was also recorded in the same year compared to 2019. Furthermore, exports of this commodity group increased by $1.17 million (cumulative of commodity group HS0904 from South Africa amounted to $22 million in 2019). Similarly, the value of imports of commodity HS0904 totaled $33 million in 2020, with an increase of 16.1% in sales for the commodity matched to 2019. Imports of the product went up by $4.61 million; the worth of importations of commodity group HS0904 to South Africa was equivalent to $28 million in 2019. The value of both exports and imports has seen a positive increase of $11 million and $1.3 million respectively over a period of ten years.

The second commodity group that shows a significant growth in exports is HS0910, comprising ginger, saffron, turmeric, thyme, bay leaves, and other spices. The value of exports for the commodity group totaled $57 million in 2020, with a decrease in sales of the commodity by 5.67% in value terms compared to 2019. Exports for the commodity group showed a decrease by $3.44 million (cumulative exports of commodity group HS0910 from South Africa which amounted to $60 million in 2019). On the other hand, the value of imports for the commodity group HS0910 totaled $25 million in 2020, with sales of the commodity group increasing by 47% matched to 2019. Again, importations of the commodity group HS0910 ascended by $8.31 million (the value of imports commodity group HS0910 to South Africa was equivalent to $17.4 million in 2019).

The South African export growth performance has however revealed that the country has increased its export growth on an annual basis between 2011 and 2020 for the majority of the spices and herbs. This has created an opening for South Africa to further increase on its growth and sustainability in growing global sector for some spices such as cinnamon, cloves, nutmeg, seeds of anise, fennel, coriander and cumin. However, the country has managed to gain trade benefits from exports of some spices and herbs through the application of some unique marketing strategies.

South Africa's import growth performance on an annual basis from 2011 to 2020 in relation to annual growth of global exports for spices and herbs for the same period revealed that while exports for commodity groups such as HS09007 (cloves) and HS0908 (nutmeg, mace and cardamoms) increased, the country experienced lower imports of these commodities. This furthermore, creates a good chance for the country's growth in production of the commodities, and again to make a significant improvement on exportation. On the other hand, for HS0904 (pepper of the genus piper capsicum), HS0906 (cinnamon and cinnamon tree flowers), HS0907

(cloves), HS0908 (nutmeg, mace and cardamoms) and HS0909 (seed of anise, fennel, coriander, cumin etc.), the country's imports increased more than the exports. Furthermore, on South Africa's export growth performance on an annual basis from 2011 to 2020, in relation to annual growth of imports, the country lost export growth in spice products such as ginger, saffron, turmeric, thyme, bay leaves, curry leaves and other spices.

The above data form a basis for the country to conduct a thorough analysis that can stimulate production and guide the exploration of marketing opportunities with the aim of enhancing global trade, which will in turn enhance the country's foreign exchange earnings from the agricultural sector. Both existing and potential producers are going to benefit from improvement in spices and herbs value-addition for boosting economic viability at primary level, and for enhancing livelihoods of farming households.

It is worth noting that as the agricultural sector continues to play an important role in the economy of the country, South Africa has introduced and reviewed different programmes aimed at harnessing economic growth through exhaustive use of agricultural produce. Among them are the Comprehensive Agricultural Support Programme (CASP) and the National Policy on Food and Nutrition Security (NPFNS). Besides the policy instruments, which are all in line with the National Development Plan (NDP) Maoba, (2016), there is a strong call for investment in local production of high-value agricultural commodities that may not have been explored by local farmers. However, the emphasis on the production and consumption of spices and herbs in the country has been minimal. This is the case despite the fact that spices and herbs have gradually been considered as part of the traditional condiments among many people and are now grown for their high export potentials (Temu and Temu, 2005) .

A study by Mahomedy (2018) noted that chilli account for 20% of all the spice imports. Approximately 10 000 tons of chilli are being produced in Mpumalanga, Limpopo, KwaZulu-Natal and North West. Turmeric, coriander seeds and whole pepper also form part of other spices that are being imported into the country. However, the marketing levels of these spices in South Africa cannot be determined. Furthermore, it is estimated that world production (with the inclusion of South Africa) and trade of spices and herbs is facing difficulties such as unrecorded domestic production and embedment of export statistics in encryptions that cover a variety of other products (DAFF 2015).

It is therefore, in the interest of this study to analyse consumers' preference willingness to pay, and the demand for culinary spices and herbs in South Africa. This will enhance an understanding of the consumption of spices and herbs for enlightening the promotion of some consumption-related attributes. The expected findings will assist in farming households'

empowerment thereby facilitating economic growth in South Africa. Furthermore, it will contribute to poverty alleviation among different actors within the value addition channels.

1.3 Problem Statement

Culinary spices and herbs are rich sources of bioactive molecules such as vitamins, micro- and macro-elements, glycosides, essential oils, sulphur-containing compounds, tannins, alkaloids, phenolic diterpenes and vitamins, especially flavonoids and polyphenols (Kunnumakkara et al., 2018; Jiang, 2019 and Embuscado, 2019). Spices and herbs such as rosemary, clove, oregano, sage, and cinnamon act as excellent sources of antioxidants, with high contents of phenolic compounds (Yashin et al., 2017). Over the past decade, research has reported that bioactive constituents of spices and herbs possess a wide range of health benefits such as anti-inflammatory, anti-tumorigenic, anti-carcinogenic, and glucose and cholesterol-lowering activities as well as properties that affect mood which are used in preclinical, clinical and therapeutic trials aimed at investigating new treatments of different diseases.

On human health, culinary spices and herbs have been reported to have various beneficial effects. Research showed evidence to suggest that spice and herb consumption is related to a reduction in the mortality associated with cancer and ischemic heart diseases, as well as respiratory diseases (Hashemian et al., 2019). For instance, Pan et al. (2017) conducted an observational study that assessed the consumption of spicy food on a daily basis. The study compared participants who ate spicy food less than once in a week with those who consumed it on 1 to 2 days a week. The results showed that those who ate spicy food more frequently were at 14% reduced risk of death. The study further concluded that frequent consumption of spicy food was linked to a lower risk of death from cancer, ischemic heart diseases, and respiratory diseases. Subsequently, subjects with a high preference for spices consumption showed a lower salt intake as well as lower blood pressure than those with lower preferences.

Spices and herbs are valued for their potential health attributes and are further believed to have positive effects in the treatment of numerous diseases, more especially chronic illnesses such as cancer, diabetes, and cardiovascular diseases (Ghaffari and Roshanravan, 2020). Adequate nutrition and health are intricately linked with consumption of spices and herbs. Numerous authors (Ogbunugafor et al., 2017; Sudhakar et al., 2020) conducted studies that were aimed at providing insights into the mode of actions of these relationships.

The South African culinary industry embraces a wide range of colourful grouping of spices and herbs which makes the country a significant role player in both trade and consumption of the commodities (DAFF, 2015). Spices and herbs found in the country are not only used for

culinary purposes but also form part of the ingredients used in preparation of medicine for their reputed health benefits. In ancient times, spices and herbs were used primarily for their organoleptic and preservative properties. However, various recent studies (for example, by Paswan et al., 2021; Khalaf et al., 2021; Seetaloo et al., 2019; Pereira et al., 2019) on the medicinal and nutritional properties of spices and herbs have opened new landscapes in the fields of functional foods and nutraceuticals. A number of these studies have come up with sensational results such as antioxidants from spices such as curcumin (turmeric), eugenol (clove), and capsaicin (red pepper), which through experimental activities showed some capacity to block the production of oxygen radicals in aerobic metabolism, and interference with signal transduction pathways (Dini and Laneri, 2021).

Although spices and herbs are commonly known components of healthy diets, their consumption level in South Africa seems to be lower than an average of 4.4 grams per day (Vázquez-Fresno et al., 2019). Diet alone is not sufficient, and according to Maggini et al. (2018), low consumption of healthy functional foods is associated with compromised immuno-competence and is risky, as the body is deprived of micronutrients essential for proper body and cell functioning. As mentioned by Lv et al. (2015), lower consumption of spicy food made with culinary spices is normally superseded by a high sodium intake which poses an increase in blood pressure in the majority of consumers. The incorporation of spices and herbs in food may, among others, help to lower the salt, fat and sugar content of food products. A good supplement for salt, such as basil, bay leaves, thyme, rosemary, coriander, and parsley may be used. Moreover, some of the spices and herbs are rich in vitamins A, E, D, K, C, and B (Leja and Czczyk, 2016). Furthermore, spices and herbs can be used in food processing as preservatives to inhibit growth of undesirable microorganisms, which can be a serious problem to consumers and producers as they can cause food spoilage and ultimately poisoning (Shahidi and Hossain, 2018).

For instance, South Africa experienced an increase in deaths due to non-communicable diseases with the highest number recorded in 2016 (Sinyolo et al., 2020). The authors further disclosed that deaths related to non-communicable diseases caused by unhealthy diets involving low intake of fruits and vegetables, and excessive intake of fat, sugar, salt, and others has been on the increase. However, due to various factors such as lack of knowledge, traditional beliefs, cost, unavailability of some of the spices and herbs, lack of proper institutions to dictate the significance of some spices and herbs which people can perceive as important so that they can promote their usability, consumers are unable to benefit from the health benefits of these products. Despite evidence from past research indicating that

consumers may have different motivations for their food preferences, which may be influenced by sensory appeal, convenience, price trend, attitudes, beliefs and knowledge about food, preference for food is still considered a complex process that is influenced by a number of factors that are related to the product itself (Castro et al., 2018). Some studies (Grzybowska et al., 2017; Kaya, 2016), have provided evidence that consumers' food preferences are somehow determined by food attributes which are valued because of different reasons imposed by consumers and their households' needs.

On the other hand, consumers' food preferences are to some extent influenced by health problems which are known to alter body composition, sensory attributes, and functioning of the digestive system, with possible consequences for the metabolism of certain nutrients in older adults (Shlisky et al., 2017). Thus, food choices may change in response to aspects of the aging process and the presence of specific health conditions. These changes include eating less and making different food choices with aging. For example, compared with young counterparts, adults may eat more grain, fruit, vegetables, and spices and herbs which have positive dietary consequences instead of high energy sweets or fast foods (De la Iglesia et al., 2021). Research on older adults has underscored the importance of identifying dietary patterns and specific dietary components that offer protection against chronic disease, and, lately, with possibilities of preventing, slowing and/or reversing the onset of many chronic health conditions by modifying lifestyle factors, including diet. These, however, remain a challenge, as most chronic diseases have long latency and may even begin in young adulthood. It is therefore in the interest of this study to understand some of the key factors influencing consumers' preferences to provide valuable insights into alternative options that can benefit both consumers and the industry.

Low consumption of healthy food is attributed to an increase in various health risks associated with obesity and non-communicable diseases, where, in turn, food is used for management of chronic diseases, weight management and other health benefits (Berthoud and Klein, 2017). This is in line with the presumption that the use of spices and herbs has been incredibly important throughout history and they have been celebrated for their medicinal properties way before being utilized for some culinary purposes (Kumar, 2020). The market has therefore expanded considerably in recent years, and South Africa, like the developed countries, has experienced phenomenal growth in the export markets (Kisaka-Lwayo and Obi, 2014). However, the future of the spice and herb industry will at the end of the day depend on consumer preferences then willingness to purchase these commodities.

Empirical literature on consumer surveys reveal that willingness to pay (WTP) can be influenced by various factors such as affordability, availability, potential benefits, taste, and cleanliness amongst others. With the recent volatility in food prices, food security issues have been brought to the surface. In addition, the sensitivity of agricultural production to weather conditions will result in scarcity of products, and/or low production (Ferguson and Gars, 2016). Consequently, the latter has a negative effect on the wellbeing of consumers as they fail to consume products that could assist with their health by meeting dietary requirements. By exploring consumers' willingness to pay (WTP), the study will be able to advise on how this problem can best be solved.

Moreover, the increased consumption of spices and herbs has been driven by the growing trend in healthier lifestyles, hence their intake is gaining significance because of recognition for their health-promoting benefits (Székács et al., 2018; Siruguri and Bhat, 2015). The estimated intake at an individual level presents several challenges since various spices are consumed in small amounts as an integral part of prepared food compared to other dietary components. Therefore, there is a need to ensure that consumers get enough amounts from various types in order to ensure a balanced intake with adequate requirements. This thus presents an opening for improvement and diversification of various agricultural sectors. Production should target a variety of the spices and herbs in order to afford consumers an opportunity of having access to their different needs. Low production with restricted varieties can be detrimental and possess a health threat, as it limits intake of daily nutrient requirement. Inadequate knowledge of existing varieties poses a threat in the spice and herb industry, as well as the health sector, as this may lead to insufficient supply of these commodities. Subsequently consumers will be forced to purchase what is available in the market despite their own wishes and preferences. It is therefore important to address the above-mentioned issues so as to ensure continuation of consumers' nourishment through the use of spices and herbs.

Conversely, the food-making sector is responding positively to an increased level of consumer interest and demand for products with a wide array of attributes (Piližota, 2012) . Demand for culinary spices and herbs has been increasing rapidly in South Africa and is propelled by income, population growth (number of buyers in the market), and quality of products. Although according to Conradie (2018), 25.2% of the population live below poverty line, there has been a swift change of dietary pattern in the urban areas towards a high-level consumption of high-value agricultural commodities which however was limited amongst eh middle- and high-income population groups.

In the absence of preferred spices and herbs, consumers are likely to buy less of what is desired. Also, due to high costs of conventional drugs and also uncertainty around their side effects, there has been an increase in demand for reasonable yet safe therapeutics for treatment and management of diseases (Lourenço et al., 2019). Demand for spices and herbs is also on the increase due to safety concerns around synthetic antioxidants and therefore consumers prefer natural products with fewer additives in food products. By identifying demand factors for spices and herbs in the country and addressing them, it is presumed that consumers' desire to consume more of these products will increase, hence the need to conduct a survey of this nature to guide informed decisions in the sector.

1.4 Objectives of the Study

The general objective of the study is to examine consumers' preference and demand for culinary spices and herbs in Gauteng.

The specific objectives of the study are to:

i) Analyze the determinants of consumer preference for the sources of spices and herbs;
ii) Analyze the determinants of consumption utility choices for spices and herbs;
iii) Analyze the determinants of consumers' utilization choices for spices and herbs;
iv) Estimate the socio-economic factors influencing consumers' willingness to purchase culinary spices and herbs;
v) Examine the factors influencing households' demand for selected culinary spices and herbs;
vi) Compute the price and income elasticities of households' demand for culinary spices and herbs

1.5 Research Questions

To achieve the aforementioned objectives, the study sets out the following research questions:

i) What are the determinants of consumers' preference for the sources of spices and herbs?
ii) What are factors influence consumption utility for spices and herbs?
iii) What influences consumers' utilization of spices and herbs?
iv) What are the socio-economic factors influencing consumers' willingness to purchase culinary spices and herbs?
v) What are the factors that influence household demand for selected culinary spices and herbs?

vi) What are the price and income elasticities of demand for culinary spices and herbs?

1.6 Study Hypotheses

Therefore, based on the set study objectives and research questions, the following hypotheses for the study were set:

i) There is no significant relationship between respondents' socio-economic characteristic and preference for spices and herbs.
ii) There is no signicant relationship between respondents' socio-economic characteristics and consumption utility for spices and herbs.
iii) There is no significant relationsip between consumers' socio-economic characteristics and utilization choices for spices and herbs.
iv) There is no significant relationship between consumer's socio-economic factors and willingness to purchase culinary spices and herbs.
v) There is no significant relationship between expenditure and demand for spices and herbs

1.7 Significance of the Study

In as much as different scholars have indicated that different spices and herbs are important for promoting human health, the issues of preferences, willingness to pay and demand for these products have not been well articulated. This study seeks to bring out more empirical evidences through its findings in understanding the role of culinary spices and herbs in South African diets. Firstly, the findings will assist in understanding consumers' perceptions on the nutritional values of spices and herbs as medicinal plants in order to improve their usage. With spices and herbs gaining more recognitions as medicinal plants, the outcomes of the study will trigger consumption promotion through creation of nutritional awareness and product development.

Secondly, there is need to establish an understanding about what drives consumers to pay for spices and herbs in the country. As such, the determinants of willingness to pay for spices and herbs would be identified. Therefore, the findings are to provide some addition to literature and scholarly debates. Some studies have investigated the factors that are associated with willingness to pay for different agricultural commodities, in order to assist key stakeholders in resolving some consumption challenges (Senyolo et al., 2014). The results of this study are expected to provide important information to promote production, value addition and

consumption of spices and herbs, and will provide important information about the main factors affecting households' decisions regarding willingness to pay for spices and herbs.

Lastly, spice and herb literature presents debates around the value of spices, their use, nutritional and health benefits (Fasoyiro, 2014; Tapsell et al., 2016; and Egharevba and Gamaniel 2017). Those in favour of their usefulness point at improved health status as well as improved taste of food that brings consumer satisfaction in both the food and pharmaceutical sectors (Siro et al., 2008). The present research will contribute to scholarly debate by analyzing demand for culinary spices and herbs in South Africa. Several studies (Tavernier et al., 2006; Moser et al., 2011) have argued that consumers' demand is influenced by a variety of attributes e.g. environmental and social outcomes. Similarly, Muzzalupo (2013) emphasized that demand for food is best explained by new food products with more added value and higher degrees of differentiation. It is envisaged that both developments in consumer demands and changes in the food industry create opportunities for food producers and food chains to be innovative in filling these demands.

1.8 Definition of Technical Terms

Preference: This is defined as making choices among alternatives or liking of something at the expense of another.

Spices: This refers to a seed, fruit, root, bark or other plant substance primarily used for flavouring or colouring food.

Herbs: This refers to leaves of plants that can be used either fresh or dried to season food.

Willingness to pay: This is the maximum price a customer/consumer is willing to pay for a product or a service

Demand: This is the quantity of goods that a consumer is prepared and eager to pay for at different prices during a given period of time.

Consumer preference: This refers to the type of product an individual customer likes and dislikes

Consumption utility: This refers to the satisfaction a person gets from consuming a good or service

Consumers' utilization: This refers to the level of usage a product is subjected to.

1.9 Thesis Layout

Seven chapters make up this thesis. An outline of the introduction is given in chapter one. Chapter two contains the theoretical framework and literature review on preferences, willingness to pay, and demand for spices and herbs. In chapter three, the methodology for the study was provided. The fourth chapter presents the results on the socioeconomic factors influencing consumers' preferences for the sources of spices and herbs. Chapter five discusses the socioeconomic factors that affect consumers' willingness to pay for spices and herbs, as well as those that determine consumers' utilities. The results of QUAIDS model are presented in chapters six, while the summary, conclusions, and policy recommendations are discussed in chapter seven.

CHAPTER TWO

THEORETICAL/CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 Introduction

Different theories have been formulated to explain and understand the underlying motivation for consumers' preference, willingness to pay, and demand for different commodities. The purpose of this chapter is to comprehensively review these theories. The review is relevant to this study since these theories are also based on drivers of preference, willingness to pay, and demand for spices and herbs. The second section of the chapter presents the theoretical foundation for the analytical framework that was used in the study. The last section of the chapter presents the literature review related to preference and demand for spices and herbs.

2.2 Theoretical Reviews

According to Kivunja (2018), a theory is "a set of interconnected constructs/concepts, definitions, and propositions that present a systematic view of phenomena by specifying relations among variables with the purpose of explaining and predicting phenomena." A framework is "a set of ideas that you use when you are forming your judgements and conclusions" (Evans et al., 2011; Osanloo and Grant, 2016). According to Elragal and Klischewski (2017), a theory can be used to successfully make estimates, and this prognostic power of the theory can help guide researchers to ask appropriate research questions. Conversely, a framework provides structure within which the relationships between variables of a phenomenon are explained.

2.3 Preferences Theory

The following sections depict preference theories that were reviewed for the study. These include economic models for food consumption, as well as conceptual models related to factors influencing food choices. Also, conceptual models relevant to the attitude- behaviour context and food preferences are briefly explained.

2.3.1 Economic models of food consumption

Proposed by Rose (2010), the framework was based on an economic model of food consumption but has been adapted to include neighbourhood effects. Through this model, economists view individuals as attempting to maximize their utility from goods, and will

subject their tastes and preferences to a budget constraint that is determined by their income. Food demands are functions of income and price as well as taste and preferences. Food cost was used as an alternative of price since the actual price paid by consumers is a function of the in-store price and travel costs to the store where the food is purchased. Socio-demographic attributes, including ethnicity, rage, education, age and other variables are useful for capturing unobserved information on consumers' tastes and preferences. Consumers' sense of taste and preferences is based on social food habits within particular cultural groups, that may be based on knowledge and concern of the consumers regarding diet and health outcomes. Availability of food on the shelves has a promotional effect that can influence consumer preferences. The model is thus relevant as it acknowledges income, food prices, and food availability as factors influencing food preferences of consumers.

2.3.2 Conceptual model for understanding factors influencing food choice

The model was developed in 2001 by Krebs-Smith and Kantor (2001), and suggests that there are many points in the sequence of production to consumption that ultimately affect food choice. The model summarizes the methods of assessment pertaining to the food supply, foods acquired and individual food consumption. The model reveals the interplay among agricultural, economic and social forces and the supply, acquisition and consumption of foods. There is much to learn from existing assessment measures such as food supply, and food acquisition, as well as food consumption. However, much more data are required to develop an understanding of the intervening factors and their relationships to the food production/consumption sequence. Therefore, this model is also relevant as it also indicates price as a major determinant of food preference in addition to socio-demographic and food characteristics which are supreme to the evaluation of food preferences of consumers.

2.3.3 Attitude-Behavior-Context (ABC)

Developed by Guagnano et al. (1995), this is a sociological model of environmental behaviour which incorporates contextual factors that may influence or limit one's capability to act on their intentions. These factors include socio-economic and demographic variables which may limit access to food. The ABC theory contains Means-End Chain (MEC) theory and Food-Related Lifestyle (FRL) models. The MEC theory assumes that choice of products by consumers is based on product attributes and values. As a result, consumers' choice and preference for a product is solely based on the products functional and psychological benefits they provide.

The FRL model is therefore an application of the MEC theory. According to the model, consumer intentions that explain food purchases, shopping manners, product attributes, methods of cooking, consumption and purchasing motives mediate between values and product characteristics. The theory is considered relevant to the study, as it indicates how demographic characteristics, income, and access can influence food preferences.

2.4 Willingness to Pay Theory

According to literature, different methods such as revealed preference and stated preference have been classified as the different approaches for estimating consumers' willingness to pay (Hill et al., 2013; Janssen and Hamm, 2012). Revealed preference is referred to as observations, while preference data derived from surveys are also referred to as stated preference. According to Antoniou (2014), studies on willingness to pay have been largely based on stated preference data, mainly because revealed preference/actual choices data are unavailable, or markets do not currently exist. Therefore, this study focuses on the stated preference approach.

According to Hill et al. (2013), surveys/stated preference for estimating willingness to pay can either be direct or indirect. Normally in direct surveys, consumers/respondents are asked to state how much they would be willing to pay for some products, while for indirect surveys, some sort of rating procedure for different products is applied. Conjoint analysis is an indirect survey method. When it comes to stated preference methods, the main categories are the contingent valuation methods, conjoint analysis, and discrete choice experiments (Adamowicz et al., 2018).

2.4.1 Conjoint analysis

Conjoint analysis is used to study the factors influencing consumers' product purchasing preference (Siriguppi et al., 2020). According to Cinelli and LeBoeuf (2020), products possess attributes such as colour, price, ingredients, and predicted reliability. The overall preference evaluations are used to make an inference on the relative contributions of the different attributes of the product (Lembregts and Pandelaere, 2019). According to Peyhardi (2014), the specification of the function depends highly upon the product attributes that can be divided into two classes, which are categorical and quantitative. Categorical attributes can be described using a nominal scale using either the brand names or verbal descriptions such as low, medium or high. On the other hand, a quantitative attribute is measured either on interval or ratio scale of numbers to describe the levels of such attribute. Some researchers, such as Bridges et al.

(2011) and Eggers et al. (2017), argued that conjoint analysis incorporates price into the conjoint design as an additional attribute in order to provide estimates of willingness to pay. The inclusion of price attributes however leads to three types of problems. These include the fact that by treating price as an attribute in a conjoint study, part-worth utilities are estimated for presented price levels. By definition, price does not have any utility; rather it reflects an exchange rate between different utility scales, and this implies that the price of goods does not influence goods' utility.

2.4.2 Choice experiments

The method involves presenting a number of scenarios or profiles about a commodity in terms of its attributes to consumers. Here, the consumers are asked to evaluate all the presented product attributes and to select the ones they prefer (Johnson et al., 2013; Kløjgaard et al., 2012; Murwirapachena and Dikgang, 2021; Speckemeier et al., 2021). When using choice experiments to value products, price is often included as one of the attributes of each alternative so that preferences towards the other attributes can be measured (Hoyos, 2010; Liebe and Meyerhoff, 2021). Choice experiment avoids both part-whole bias and yea-saying problems common with CMV. However, choice experiments do not take into account all the attributes in the experimental design as it also ignores the interaction between the attributes.

2.4.3 Contingent valuation method

This method involves survey data, for which a random sample of respondents are asked to answer a questionnaire with the purpose of understanding their willingness to pay for a product. From an economic point of view, willingness to pay is the variable of interest. The type of data obtained depends on the information the researcher is trying to extract form the respondent. This often consists of presenting the respondent with one or several prices that she can either accept to pay or not (Hofstetter et al., 2021). Contingent valuation method is mostly used because of its ability to estimate willingness to pay for non-market commodities by creating a hypothetical market for that commodity. Estimation method depends on how the information on willingness to pay is elicited. There are different types of elicitation techniques in the contingent and these include: open-ended questions, bidding games, payment cards, close-ended single-bound dichotomous choice questions, and close-ended double-bound dichotomous choice questions (Pinheiro, 2012).

The use of dichotomous choice format in contingent valuation surveys has been recommended by various authors (Florio and Giffoni, 2020; Choi et al., 2016; Sund, 2010) and has thus resulted in the choice format questions gaining popularity in the past few years. This is due to their advantages in avoiding biases known to be inherent in other formats used in the contingent valuation method. By adopting dichotomous choice valuation questions, several types of biases can be minimized (Hofstetter et al., 2021). The closed-ended dichotomous choice techniques have become a credible approach in the contingent valuation studies (Seck, 2016). The coefficient estimated from the double-ended model can yield tighter confidence intervals and are more efficient than those from the single-bounded model (Donfouet et al., 2014).

2.4.4 Consumer behaviour theory

The theory of household consumer behaviour is based on the concept of consumer preference and the assumed existence of consumer utility function. The theoretical assumption posits that when a consumer is faced with alternative bundles or "baskets" of commodities, each of which has some utility content, he/she will prefer a bundle with higher utility to one with lower utility. There are however two key assumptions to this theory, which are; (i) there is perfect competition in the market and (ii) every consumer is a utility maximizer. Utility or satisfaction is a function of a good/commodity or a bundle of goods being consumed. This means that the quantity of commodity is an input in the consumption activity of a household, and the utility derived from its consumption is the output. It is noteworthy that quite a number of assumptions and abstractions are involved in this kind of formulation of the consumption process. The factors that are usually taken into consideration about the standard consumer include income, price, and household demographic variables, etc. (Kim et al., 2018 ; Lautiainen, 2015; Omar et al., 2016 and Mhlanga and Machingambi, 2016).

2.5 Demand Theory

Several demand studies have been characterized by extensive use of single equation specifications when analysing demand, with the centre of these analyses being the measurement of elasticities. However, according to Deaton (1986), some of those studies considered only a fraction of the total budget and therefore failed to meet the requirements that demand systems should satisfy properties such as adding-up. Additionally, according to Shaikh and Larson (2003), these equations do not capture substation effects across goods and this makes them to be appropriate for individual commodities instead of multiple commodities. Due to the inefficiencies of the equation, economists have shifted demand analysis to recent

systems of demand equation models which possess the ability to categorize goods as either gross substitutes or gross complements. The basic demand restrictions of adding up, homogeneity and symmetry are also easily imposed and tested in the case of demand system approaches. The models include;

i. The Linear Expenditure System (LES): This was developed by Stone (1954) and is the only linear demand system in expenditure relative to price (Meyer et al., 2011). The linearity and the small number of independent parameters (commodities) make its application easy but also impose some limiting constraints. The LES is most appropriate when few of the commodities are considered and when one is not interested in differentiating between complements and substitutes among the commodities, because all goods are treated as Hicksian substitutes. Moreover, LES can be used if the study is not intended to categorize commodities as either normal or inferior goods, because all commodities are treated as normal goods.

ii. Quadratic Expenditure System (QES): This is a generalization of the LES and was first introduced by Howe et al. (1979). In its specification, the addition of the squared expenditure terms makes it more Engel-flexible compared to the LES. However, the Engel-flexibility is still limited because of the linearity of marginal expenditure (Howe et al., 1979).

iii. The AIDS Model: This was developed by Deaton and Muellbauer (1980). It is a demand system that can be derived from a second order approximation of any cost function. This implies that it has a flexible functional form. It has enough independent parameters such that all the elasticities can be identified. The Engel-flexibility is limited to linearity in logarithms. The AIDS model is regarded as the most recent major breakthrough in demand system analyses. Alboghdady and Alashry (2010) pointed out that, in the comparatively short time since the AIDS model was introduced, it has been widely adopted by Agricultural Economists to the point that it now appears to be the most popular among all demand systems.

According to Deaton and Muellbauer (1980), the popularity of the AIDS can be ascribed to several reasons which make it the model of choice for this study. These attributes, among others, include the facts that the model is rooted in a well-structured analytical framework allows certain types of aggregation, it is easy to estimate, and it permits empirical testing of the standard restrictions of the classical theory of pldemand (Deaton and Muellbauer, 1980). The model yields elasticity values that are consistent

with consumers' theory and which are more flexible than those obtained from other commonly-used demand systems (Anderson and Blundell, 1984).

2.6 Conceptual Framework

As described in the theories above on preference, willingness to pay and demand theory, the predisposing factors comprise socio-economic characteristics, product attributes, preference

Factors, and economic factors. In addition, the theories demonstrate the usefulness of some enabling factors including availability, and ease of preparation as they relate with the outcome variable such as preference. The conceptual framework illustrated in Figure 2.1 shows the relationship among these factors with the outcome variables. In order to have a comprehensive approach to investigate factors associated with preference, willingness to pay for spices and herbs as well as demand for spice and herbs in South Africa, a conceptual framework adapted from Innocent (2018) was used.

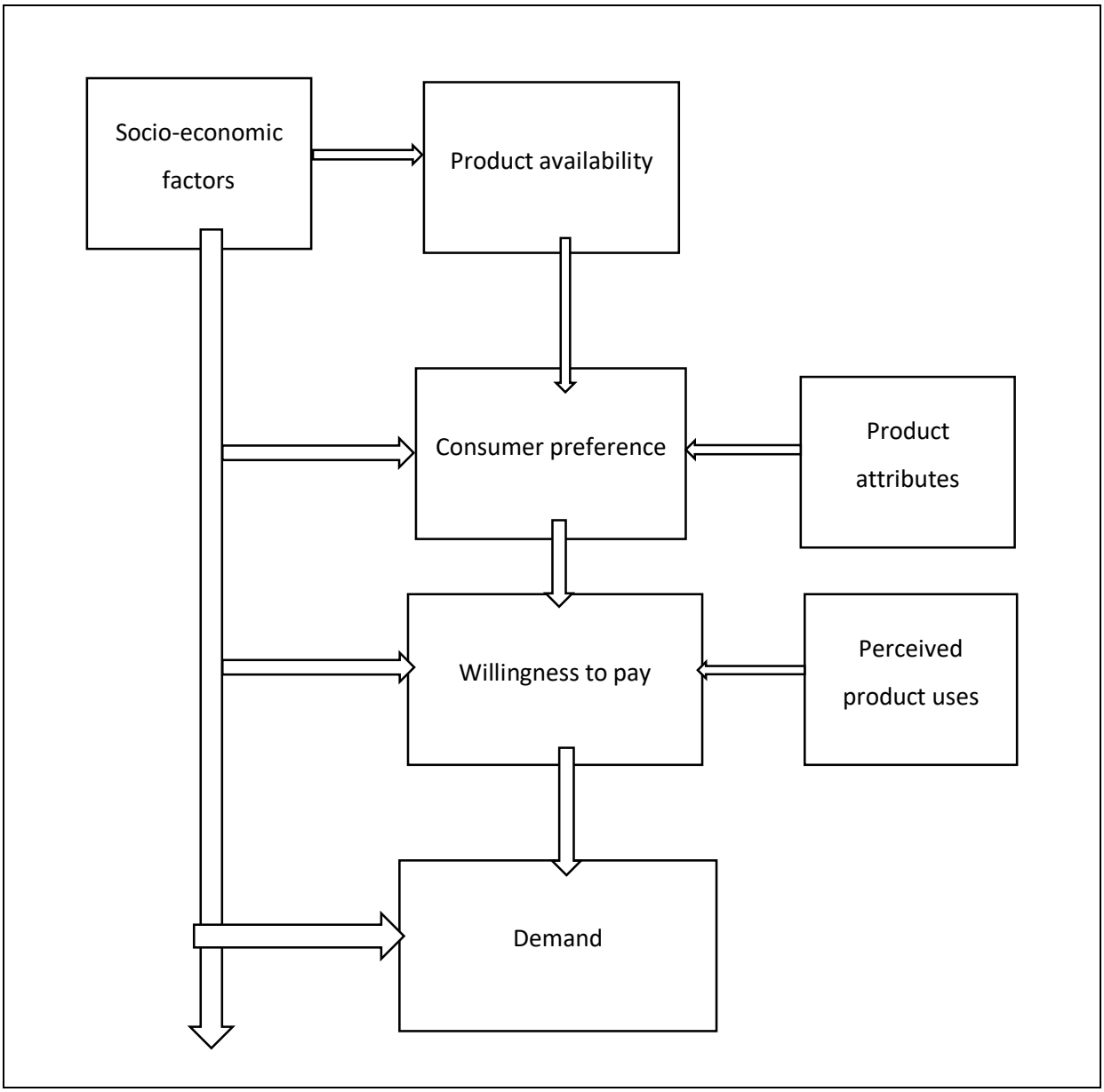

Figure 2.1: Conceptual framework reflecting consumer's preference, willingness to pay and demand for spices and herbs (Adapted from Innocent (2018))

2.7 Linkage Between Preference and Household Utility

2.7.1 Consumer preference for food

For the consumer to experience and gain maximum satisfaction, they have to allocate their limited resources and utilize them among all the available goods they wish to purchase. Affordability of goods is determined by disposable income in within a consumers' tight budget and this depends on income and price of commodities while the choice of the product itself is steered by consumers' preference

According to Peiling and Tingting (2018), preferences are subjective individual's tastes that permit the ranking of various commodity bundles based on their levels of utility. Besides consumers' income and price of goods, preferences determine the relationships between the bundles of commodities that the consumer faces. For example: assuming Y commodities are

accessible for utilization, a commodity bundle is represented by: $Z= (Y_1, Y_2, Y_3, \ldots Y_E)$, where Y_i with i=1,2,3,… E represents respective quantities of goods 1,2,3, E. Furthermore, in the presence of two bundles A and B, if consumers opt for the first bundle (A) in the presence of the second bundle (B), then clearly the consumer prefers bundle A and not bundle B. It is worth mentioning that preferences establish relationship between bundles of different commodities and not among individual commodities. The various notions of preference can be denoted as follows.

2.7.1.1 Weak and strict preference

Weak preference refers to when a consumer considers bundle A to be at least as good as bundle B, then the consumer weakly prefers bundle A over B. Symbolically this is denoted by;

$A \succeq B$ and $B \succeq A$

A state of indifference is a situation where both bundles A and B are regarded as equally good symbolized as

$$A \sim B$$

Strict preference: when bundle A is regarded as superior to B, the relationship is then said to be of strict preference, represented by: $A \succ B$.

This means that, if A ≥ B and neither A~B nor B ≥ A, then in words A ≻B "A is strictly preferred over B".

2.7.2 Consumer utility

Utility concept is synonymous with "satisfaction, well-being as well as pleasure." According to van der Deijl (2018), utility is measurable; it accrues from consumer consumption of a unit of a commodity and can be measured in terms of cardinal number having the unit called "util." However, the challenge in this approach is the unavailability of an appropriate measurement index giving that cardinal number. On the other hand, the ordinal tactic by Hicks (1941) is able to overcome the challenge by way of ranking and preference-ordering bundles. According to this approach, two different bundles (better, worse and/or as good as) could be ordered without saying anything about the strength of the preferences.

2.7.2.1 Utility function and preference

Utility function represented by the symbol (U) defines the level of utility attained by a consumer as a function of the amount of commodities consumed (Gong et al., 2018). The function takes the following form:

$$U_1 = U\ (X_i\ Y) \quad \ldots\ldots 1$$

Where X and Y represent the quantities of commodities consumed and U_1 represents the utility level obtained by consuming the specific commodity bundle.

The utility function can be derived from preference, or alternatively, preferences can be represented by utility functions. The function U assigns values to different bundles that reflect consumer preferences:

U(A)≥if and only if A≥

Here A and B represent bundles of commodities X and Y.

As indicated above, the preference relation among the bundles is preserved by the utility function, and this means that if a consumer weakly prefers bundle A to B, then the utility obtained from consumption of bundle A will not be less than that obtained from consumption of bundle B. For the utility function to represent preference ordering, the preference relation must satisfy all the preference assumptions (completeness, reflexivity, and transitivity).

2.8 Literature Review

2.8.1 General overview of the spice and herb industry

The use of spices and herbs as food and for medicinal purposes dates back to 1550 BC as recorded by Papyrus Ebers (Petrovska, 2012). Various secondary compounds produced by spices and herbs are now used in different fields and industries in the production of food to enhance its taste, preserve food, and provide some essential macro-and micro elements. Furthermore, they are used in medicine for the management of various diseases as well as treatment of infectious diseases, and in the pharmacology and cosmetology industries (Ekor, 2014).

The spice and herb industry, which also forms part of the seasoning industry, is slowly adapting to consumers' choices, food safety, and values. Therefore, increased demand for these commodities in the retail food service division creates market pressures from the global competitors. The spices and herbs sector is now being aided to grow significantly due to the growing demand across the globe. Awareness of health benefits and properties of varied spices and herbs will therefore extensively increase their demand (Wójcik et al., 2021). The spices and herbs market is said to be a competitive ground occupied by a significant presence of global and regional key players. For instance, Europe is the largest market for spices and herbs globally, and despite its low production capacity, it is inclined towards the import of spices and herbs from the developing regions such as the Middle East, Asia, and Africa, with a majority (±90%) of its imports from the developing countries (Vázquez-Fresno et al., 2019; Mahomoodally, 2013). In spite of the region possessing a mature market share in the spice and herb industry, its growth rate is comparatively very slow when compared to other regions.

In Asia, India is a major global power producer of spices and herbs, with a yearly production quantity estimated to be nine million metric tons (Nguyen, Duong and Mentreddy, 2019; Xie and Finley, 2018). Due to its climatic conditions which serves as an enabling factor, the country is able to cultivate a variety of spices and herbs, with an average production land area of around "3.15 million hectares". The country commands a comforting position in world's trade for spices and herbs, and exports these products to countries like USA, which is their major importer, followed by Vietnam, Germany, China, Saudi Arabia, Malaysia, UK, Singapore, to name but a few.

Demand for spices and herbs in South Africa is said to have recently doubled, and in order to cater for the increase, the country is relying mostly on imports from countries like India (Ronquest-Ross et al., 2015; Amanor and Chichava, 2016). The evolving food industry in Africa is gradually experiencing growth in consumer spending on food products owing to

population growth, urbanization trends, and global interest, as well as investments. Furthermore, the consumers' changing food tastes as a result of western influences is aiding the development of food in the region. This has resulted in food companies using more spices and herbs in their products to suit consumers' changing palates. This in turn will enable more role players to enter the market and contribute to the market growth

The importance of spices and herbs in the livelihood of the people has been well-emphasised by several scholars (Jiang 2019; Gajewska et al., 2020). Various studies also showed a linkage between spices and herbs and other food products. For instance, Fritts et al. (2018), in their study on the usage of spices and herbs in the increase of vegetable intake, showed the importance of spices or herbs as food condiments. The results of the study revealed that there was an increase in vegetable consumption after these were seasoned with spices and herbs, which resulted in an increased willingness to consume vegetables. In addition, El-Sayed and Youssef (2019) presented the results on application of herbs and spices and their effects on dairy products. The aim of the study was to develop functional dairy products with nutritional and medicinal values using spices and herbs. However, the issues of preference, willingness to pay and demand for spices and herbs have not been well-studied in South Africa. Therefore, the study will utilize literature on other food products in relation to spices and herbs in order to establish issues of preference, willingness to pay, and demand.

2.8.2 Preferences for spices and herbs

Consumer preference is defined as the subjective tastes of individual consumers, measured by the satisfaction they have with the purchased items. Expressed by the affective compatibility towards a product or service, preferences are a positive motivation which can be triggered by the features related to the material substance of goods (size, shape, taste, colour, package, etc.) elements referring to the label, and product usage instructions, as well as the status granted to the person owning and using that particular product (Valerian et al., 2011).

Preferences are the ultimate result of a long-term relationship between the brand and the consumer, as the consumer learns to associate the brand with a symbol of and perceive it as having high quality (Confos and Davis, 2016; Djerv and Malla, 2012; Lautiainen, 2015). Consumer preferences can be measured by their satisfaction with a specific item and are dictated by personal taste, culture, and many other factors (Ramya and Ali, 2016). Consumers have different learning experiences with food and this causes different food preferences. There are several different factors affecting consumers' food choices and preferences. One of them is

biological reaction towards food. According to Vabø and Hansen (2014), such reactions are related to the perception of sensory modalities and physiological post-digestive efforts.

Several authors (Ushiama et al., 2021; Chen, Liu and Binkley, 2012; Chen, Wang and Hou, 2020; Deleon (2015) summarized food preference as the selection of one food item over another. Bartkiene et al. (2019) argued that food preferences can be regarded as an individual's choice towards a set of objects that reflects an explicit decision-making process. From the different definitions, food preference refers to the act of making choices among alternatives, or liking of one thing at the expense of another. Also, food preference may come as a result of taste, presentation, flavour, health and environmental influences which an individual has during their first encounter with certain food. Any failure to convert these choices into preference would make them remain just accepting what is available. With all the various definitions by various researchers, the definition for preference seems to be the same, with the only difference being what is responsible for these preferences.

For the survival of any entity, it is vital to understand various activities that are carried out during its structural level so as to have a rich knowledge of what is preferred by consumers. In the food industry, service providers need to take into consideration competitive prices, proper packaging, stable supply of products, and good quality products etc. Subsequent to determining consumer preferences towards a product, the producer may then change the product's form, or attract attention towards neglected features, with the view of increasing consumers' preference (Horvat et al., 201).

2.8.3 Socio-economic factors and preference for spices and herbs

The effect of age and food preferences among consumers has been vastly researched. According to Guiné et al. (2020), consumers' nutritional needs change throughout life, and the relevance of age on consumption of functional foods should be continuously researched by scholars. Various scholars (Ares and Gámbaro, 2007; Umberson and Karas Montez, 2010) have argued that lifestyle habits tend to become healthier as age increases, though the relationship only lasts until late midlife.

For instance, a study on association of demographic characteristics and food choice motives conducted by Vorage et al. (2020) adopted binomial logistic regression analysis to establish the association between socio-economic and demographic characteristics and food choices from 370 respondents. The findings showed that both age and gender had a positive and

statistically significant effect on preference for functional foods. Similarly, Asakura et al. (2017) reported an association between age and higher preference levels for nutritious food.

By contrast, results from Fritts et al. (2018) indicated that predicted value of preference and consumption of spices and herbs decreased slightly with age. The results were in agreement with those of Batyk (2014), who indicated that due to lack of knowledge about priorities of functional and healthy foods, older consumers had a worse opinion on the quality of functional foods, and showed less preference when compared to younger consumers. Therefore, the study emphasized the need for nutritional education for consumers, as well as its impact on health.

In the USA, preference and consumption of spices and herbs were found to increase with age for both male and female consumers (Nikolaus et al., 2017). In the same way, Drewnowski and Shultz (2001) and Borkent et al.(2020) reported that as people get older, they tend to make different food choices. The study revealed that older adults tend to prefer more functional foods due to some physiological changes that are associated with age.

Differences in food preferences between males and females have been reported by numerous studies. A study conducted by Marino et al. (2011) aimed at identifying food preferences with respect to gender. It was revealed that females made healthier food choices than their male counterparts. Moreover, a study by Salleh and Noor (2018) described preference for functional foods as a reflection of the concept of sustainable diets that are aimed at contributing to the improvement of a sustainable livelihood, good health, and general well-being, as well as economic and environmental sustainability as a whole. The study gathered evidence showing that female consumers preferred functional foods more so than their male counterparts. Similar results were reported by Opara and Chohan (2014) and Ali and Rahut (2019), who argued that male consumers showed lower preference for food, as they believed that woman are better able to pick out some subtle nuances of flavour.

On the other hand, Manippa et al. (2017) conducted a study on gender differences in food choices, and reported that male consumers preferred lower calorie meals compared to their female counterparts. However, a study on consumers' changing attitudes and preferences towards functional foods, that was conducted by Bigliardi and Galati (2013), reported that male and female consumers did not show any difference in their approaches towards functional foods as the functional foods status was changed to conventionally healthy foods. Similarly, a dietary survey conducted by Shastun et al. (2017) found no significant difference between gender and consumption of functional foods.

Marital status has progressively become an important topic in academic and policy research. Past research submits that marital status has an extensive range of benefits including

improvements of one's economic well-being, and mental and physical health. According to Gebhardt-Kram (2016), married people are generally healthier than unmarried people, as measured by numerous health outcomes. This is because being married may result in an increased income as well as economies of scale. Thus, having more income could, in turn, improve health outcomes by enhancing access to healthy food options. In addition, a spouse may play an important role in monitoring and encouraging healthy behaviours such as a good diet. Several authors (Eng et al., 2005; Vinther et al., 2016) in their studies reported similar results by concluding that unhealthy changes in diet accompanied divorce and separation.

Moreover, Haapala et al. (2012) also reported that married women showed a lower dietary risk level compared to those who were not married. Marital status was again found to have a positive influence on preference for food in a study by Tuncil et al. (2018). Similarly, a study on preference and consumption of functional food in Malaysia by Hassan (2011) reported that married couples displayed a preference for functional foods more than the other categories. The results of the study were not applicable to all cultures in Malaysia, and this necessitates the need for further analysis on marital status and food preference.

Household's preferences and available resources play an important role when consumers choose foods within the context of their own household. A household with many members is more likely to comprise both educated high-income earners and married couples. Codjoe et al. (2016) argued that food preference decreases with household size. Ngongi and Urassa (2014) revealed that household size is likely to broadly increase preference for food. However, Olayemi (2012) reported a negative correlation between household size and food security. Thus an increase in the number of household members is likely to decrease consumption.

Also, additional members in the household generally reduces income per head, expenditure per head, as well as per capita food consumption (Aidoo et al., 2013). Inactive individuals in the household have been reported to put a financial pressure on active members and thus affect provision for food (Ndobo, 2013). Moreover, households with older adults over minors, tend to spend a greater share of their income on functional foods (<0.0001) (Ricciuto et al., 2006). Lastly, some recent studies by Wyma et al. (2012) and Phalatsi and Chipunza (2019) showed that among the demographic variables, age, gender, family size, and education level had a significant effect on consumers' food choices and preferences. Also, increase in consumers' age changed preferences for choosing food products, while those with higher levels of education preferred healthier food.

Several explanations have been used to justify the disparities in the consumption of spices and herbs by socio-economic differences. There is evidence showing that those with low income

and little education are less likely to consume a high level of healthy diets (Laraia et al., 2017). It is typical of people with higher education to be more conscious about food choices and therefore tend to opt for healthier foods. Some studies have also shown that socio–economic factors such as educational attainment and monthly income are associated with an increase in preferences for functional foods (Jappelli and Pistaferri, 2010).

A study by Worsley et al. (2004) looked at the association between education and food consumption in Australia. The results from the study reported that education and age positively influenced healthy food consumption among both men and women. The authors argued that as people improved their education attainments, they gained new knowledge that improved their food choices, as opposed to those who have little or no education.

Another factor affecting choice and selection of food by consumers is ethnicity. Ethnicity refers to a social group which shares certain distinctive features such as language, culture, values and customs, among others (Dindyal and Dindyal 2003). Different ethnic groups will in most cases select different foods for different reasons. In a study that was aimed at examining the relationships between demographics and socio-economic status of parents and use of functional foods in feeding children, ethnicity was found to be associated with the use and preference for functional food. It was found that being Black showed greater significance than the other ethnicities. Past research also found that ethnic groups showed different dietary practices (Kirkpatrick et al., 2012).

In another investigation conducted in Malaysia by Abdullah et al. (2016) on the effect of ethnic differences on food intake patterns and its associated factors was carried out among two ethnic groups (Malay and Chinese adolescents). A validated food frequency questionnaire was used to assess dietary patterns from the two groups. Multivariate analyses showed that Chinese adolescents scored higher for healthy food patterns. Similarly, Yang and Panjaitan. (2021) carried out research on ethnicity plus food choices. In the results, the authors also reported a statistical significance between ethnicity and food choices for Asians.

Moreover, Rashid et al. (2018) conducted a study on how ethnicity and socio-economic status relates to dietary patterns in Amsterdam. From the study, the results revealed that ethnicity was associated with dietary pattern scores for the Turkish group, while the Dutch group had notably lower scores compared to other ethnic clusters. The study therefore recommended that in order to evade health inequalities, more specific nutritional education should be provided to specific ethnic groups and those with low socio-economic status. Similarly, Bahr (2007) used bivariate and random coefficient logistic regression to identify significant racial differences in each of the index component variables. In comparing Blacks and Whites, the findings indicated that

health-related nutritional behaviors differed significantly in a direction that is consistent with the well-documented differentials in health outcomes between the two groups.

The determination of the effect of income and food preference using Quadratic Almost Ideal Demand System (QUAIDS) has shown that a change in the distribution of consumers' income is expected to have a considerable effect on the preference and demand for individual food (Sakyiamah and Asuming-Brempong, 2018; Zheng and Henneberry, 2010). Furthermore, Lin and Guthrie (2007) reported that low-income households are more likely to demand less food compared to those with high income.

Moreover, research conducted by Felix et al. (2017) reported that income allocation on spices and herbs was high in low-income groups, and decreased continuously across different income groups. This was in line with the theory that states that income or expenditure elasticity of necessary goods would be positive but inelastic in nature (Nghiem et al., 2013). Gale and Huang (2007) established that as consumers' incomes rise, they change their diets and prefer quality safe and convenient food.

According to Seligman and Berkowitz (2019) and Dammann and Smith (2009), as financial resources decline, food security is also likely to decline as low-income populations tend to focus on quantity instead of preference and quality of food. In their study on understanding consumer's preferences for nutritious foods, Weatherspoon et al. (2014) using logistic analysis revealed that among other variables, there was a positive correlation between increased consumption of nutritious food and income.

Some socio-economic variables have been found to influence functional food preference. In their study on consumer valuations and preference heterogeneity for a novel functional food, Teratanavat and Hooker (2006) analysed data that were collected through email survey from 1704 households. Results from the survey indicated that health benefits were positively valued by respondents, but such preferences depended mostly on, among others, education and monthly income. The study further divulged that naturally-occurring nutrients were preferred over fortified ones.

Today's consumers are price conscious. Using factorial analysis to confirm dimensions of consumer preference and multiple regression for their order of importance, Abdullah et al. (2011) reported that price and quantity were positively associated with consumer preference in the food industry. Another study conducted in the Netherlands by Steenhuis et al. (2011) used purposive sampling to obtain data from the respondents. The study included both low- and high-income earning consumers. The influence of price on food preference and choice, along with other food choice factors, was examined using the food choice questionnaire. The results

of the study highlighted price as an important factor in food choice, especially for low-income consumers, who seem to be more conscious of value and price than high income consumers.

A recent study conducted by Kaliji et al. (2019) in Iran applied the nested Logit model to investigate the factors affecting consumers' dairy products preferences. Several studies have agreed that price does play an important role in consumer preference for healthy food choices (Waterlander et al., 2010; Hoek et al., 2017; Darmon et al., 2014; Gittelsohn et al., 2017). Again, Griffith et al. (2015) conducted a study on relative prices, consumer preferences and demand for food. The study reported that changes in prices resulted in households altering their food purchasing behaviour and thus this has a negative impact on preferences. The changes appeared to have slightly worsened the average nutritional quality of households' shopping baskets.

In a study conducted by Shirai (2015), empirical results revealed that consumers with higher incomes placed less importance on product price and more importance on product quality and brand name. This was also the case with highly educated consumers, who placed more importance on the brand name attribute than anything else. The study recommended that marketing strategies to be considered should place more emphasis on developing brand name, and attractive packaging, as well as ensuring that the food product is easy to cook.

Using the Food Choice Questionnaire (FCQ), that was originally applied by Steptoe et al. (1995) and Szakály et al. (2018) revealed that food choices and preference are influenced by various attributes such as health, natural content of the food product, ease of preparation, convenience, taste, and presentation, as well as price. Apart from the mentioned factors, some authors (Burger et al., 2011; Mccrickerd and Forde, 2016; Pohjanheimo, 2010) debated that sensory appeal plays an important role in consumers' food choices. In the questionnaire (FCQ), sensory appeals refer to the smell of food, pleasant texture, looking nice and tasting good (Szakály et al., 2018). It is quite thought-provoking to learn that not only does sensory appeal or food preferences guide food choice, but there are a great variety of other factors that contribute to the final choice of food.

Packaging and labelling plays an important role in the marketing mix as it differentiates a company's product from its competitors and it is also a way of communicating with consumers. Consumers make purchasing decisions on the basis of product packaging and information that is provided, which builds a perception in the consumers' mind (Gelici-Zeko et al., 2013). Therefore, it is very important that packaging works hard to secure sale of a product which may be in the form of brand image. According to Kašková and Chromý (2014), product labelling tells consumers about different ingredients, usage of product, some possible side effects as well

as precautions. These do not only communicate with the consumers but also safeguard the product itself. It thus promotes the product and plays an important role in marketing. Effective packaging and labelling is likely to absorb a lot of consumers and increase their intentions to buy the product (Annunziata et al., 2019).

A study that was conducted by Mazhar et al. (2015) investigated the influence of product packaging and labelling on consumer's purchasing behaviour. The study collected data from 300 respondents using a questionnaire. The findings of the study revealed that packaging played an important factor in the buying decision. Another study in New York by Pareeratanasomporn (2018) analysed consumer's preferences on food interactively with a sample of 80 respondents using descriptive statistics. The results of the study revealed that consumers preferred brand products that provide basic information. Thus, information that describes or presents necessary principles of the product is vital in promoting demand. The study however only focused on respondents that were 18-24 years of age and excluded all other age groups.

Relationship between food taste and demand preference has been poorly researched. Several studies have either been inconclusive, with a few that are available arguing that taste is an acquired sensation that develops from early childhood, while others postulate that food taste is a combination of several sensations of aroma, taste and texture. A study by Muça et al. (2016), using a sample of 700 respondents, was conducted to study the factors influencing Albanian consumers' preferences for standardized olive oil. The result of the study found important dimensions such as taste and place of origin playing an important role when it comes to consumers' preferences.

Taste is a key sensation that informs both food preference and selection. Taste for food was reported by Bawajeeh et al. (2020) as an imperative attribute in food choice and showed some positive effect on preference for food. The study further argued that taste is acquired over time and therefore repeated exposure should be ensured during early childhood in order for it to play a significant role in food preference and subsequent food choices. However, the study recommended that more studies should be conducted in order to understand adolescents' taste perceptions and dietary patterns. Conversely, a study by Liem and Russell (2019) highlighted that taste has a negative effect on preference for healthy food, as consumers tend to neglect the health aspect of food and focus more on taste. Similarly, Veček et al. (2020) reported that there is a link between taste and food preferences, and this may impact consumers' diet choices in a negative way.

Convenience food plays a noticeable role in the food preferences of consumers, with food products that offers less convenience being less preferred by consumers. It is therefore important to increase preference and consumption of food products by adding convenience features to certain products thought to be healthy and/or beneficial to consumers. Some authors have argued that convenience can be a barrier to achieving adequate nutrition (Jaeger and Cardello, 2007). Srinivasan and Shende (2015) reported a positive relationship between convenience food and preference, citing attributes such as time saving, labour saving and also easy to prepare, as most of the consumers lacked enough time to prepare proper meals for their households. Similar results were reported by other authors like Okrent and Kumcu (2014) and Harris and Shiptsova (2007).

Freshness is an important attribute of the consumers' perceived quality of food. Previous research has identified freshness as an attribute that consumers pay attention to when making food choices and purchases, and thus influences preference for certain food products. However, consumer's opinions on freshness have different perspectives, and highly depend on the type of food. Results from a study conducted by Saba et al. *(*2018) and George (2010) showed that freshness plays an important role in consumers' preferences for certain fruits and vegetables, and it is associated with increased consumption.

Italian researchers Massaglia et al. (2019) who looked at customer preferences for fruits and vegetables came to similar conclusions. The study reported that there was an association between freshness and preference by consumers. When selecting fruits and vegetables, consumers were mainly influenced by quality attributes. Moreover, Sarma (2014) measured preference for fresh vegetable attributes in Bangladesh. The results found that, among other attributes, freshness recorded a positive statistical significance with preference. This means that consumers place a high preference for fresh vegetables which can significantly stimulate their demand.

Product origin refers to the country or place where the product was either manufactured, grown or was made. The extent to which consumers really value information about product country of origin is quite unclear. Results of a study conducted by Balcombe et al. (2016) established that consumers are less interested in country of origin information for numerous of the food products. Despite this, Touzani et al. (2015) argued that product origin can be so complex as many products e.g. canned vegetables, can be manufactured locally but some of the ingredients may be sourced from elsewhere, particularly organic ingredients.

Newman et al. (2014) explained that a product's country of foundation displays an important role, mostly in the food marketing strategies. The author argued that this is mostly adopted by

generic and brand advertisers to promote food and beverages. These could also be meaningful in association with reference groups for market segmentation. In another study, Lim et al. (2013) assessed the impact of country-of-origin on consumers' preference and willingness to pay, as well as safety of beef steak in the US. The findings showed that only 36% of the sampled consumers were willing to pay directly for costs that were related to a country-of-origin programme.

According to Jin et al. (2015), consumers from less developed countries considered products from developed countries to be of higher quality than those from emerging economies. Despite this, there are some underdeveloped countries that have a history of producing products that are of world class and of the highest quality (Gurtner, 2010). For example, India is seen as a developing country/economy but their culinary spices are considered to be of the best quality in the world (Prasad and Aggarwal, 2011). Due to this, some experts contend that as globalization progresses, the effect of a product's nation of origin will diminish and be replaced by factors like price and brand (Tjandra et al., 2013).

In support of country-of-origin being a significant factor on consumer preference perceptions of product quality, Kalicharan (2014) compiled a research on the effect and influence of country-of-origin on consumers' perception of product quality and purchasing intentions. It was concluded that besides country-of-origin, other factors are equally important and can influence consumers' purchasing decisions. Consumers with ethnocentric views are likely to select products that are manufactured locally, or at least that are made in nations that share their own culture, politics, and economic conditions.

Therefore, Consumers are more likely to choose domestically produced goods than those from other nations (Adina et al., 2015). Studies that were conducted in developed countries have proven that ethnocentric consumers were more willing to buy their domestic products instead of foreign products (Karoui and Khemakhem, 2019). However, Wang et al. (2012) revealed that consumers from less developed and developing countries have more preference for imported goods over local ones. The experience of enjoying a certain kind of food increases the likelihood of developing preferences for its flavour, as well as its benefits. Some authors, such as Chelang'a et al. (2013), have therefore highlighted the importance of shaping eating patterns at an early age in humans, as food preferences formed early can be firm foundations for healthy eating late in adult life.

Recent trends in food preference show that the concept of food has undergone radical transformation. In addition to food's nutritional and sensory attributes, a vital role in the up keeping of health has been placed on the priority list of attributes. Lately, food is not intended

to only satisfy hunger but to provide most, if not all, the nutrients for humans. Most importantly, food is to prevent and manage nutrition-related diseases. The results from a study that was ushered by Oroian et al. (2017) exposed a positive outlook on the association between preference and health benefits of food commodities. The survey further showed that there is vast interest for more information on food that possesses health benefits. The findings are consistent with the results from other studies which evidenced the positive effect of health benefit on consumers' preference (Hanspal and Devasagavan, 2017).

Family beliefs refer to the traditional principles upheld and passed on within a family. Research has further supported the notion that preference and intake patterns are largely a reflection of the foods that consumers are familiar with, which is in most cases passed from one generation to another (Voinea et al., 2020). Similarly Scaglioni et al. (2018) reported related results and stated that early-life experiences with food plays a role in shaping future eating habits, and this is shaped by a family system that surrounds ones' domestic life from birth. Furthermore, Hunt et al. (2011) also explored the impact of family beliefs and household dietary patterns on preference for food. The authors established that adult consumers tend to maintain eating patterns adopted from previous generations through the use of either documented recipes or food choices. Research on household dietary consumption patterns and family beliefs on food choices has been sparsely researched, and more needs to be done in order to establish this association (Verma, 2020).

Product availability plays a vibrant role in fabricating a recognized position in consumers' minds, because consumers are likely to forget a product that is not available as well as the features it carries (Verma, 2020). Product availability can be referred to as a biological convenience which creates the likelihood that a buyer will perceive, differentiate, and visualize a product in buying circumstances (Vainikka, 2015). Udomkun et al. (2018), observed some key factors influencing consumers' preference for meat products in Eastern DRC. Nutrition and availability of meat products were revealed as important factors that influenced purchasing decisions among the consumers. Frýdlová and Vostrá reported similar outcomes (2014), and showed that consumers' incomes and product availability played an important role in the choice of organic food.

Conlon and Mortimer (2010) determined the effects of product availability, and emphasised the importance of product availability for firms' profits and consumers' preferences. The results of the study revealed that product unavailability from the shelves resulted in lower revenues for some firms. However, in the absence of the preferred product, consumers opted for alternative products but with lower purchasing costs. In the same vein, Bidar and Ragashtai

(2019) analysed the factors influencing consumer preference for purchasing of processed food products in India. The results of the study identified easy availability of food products among other factors as an influencing factor for making purchasing decision. Similar results were echoed by Gorham et al. (2015), who mentioned availability of food as a purchasing attribute that was identified by the participants of the study.

Lastly, Arsil et al. (2018) analysed the factors influencing consumers' preferences for locally produced food. Among the five factors that were found to influence consumers' preferences, availability was identified as a determinant factor for food preferences for shoppers. The study recommended that the factors that were found to be significant should be used in designing some marketing campaigns for promoting consumption of local foods.

2.9 Food Consumption

Numerous studies have indicated that consumption of healthy food is associated with a lower risk of chronic diseases such as coronary heart disease, diabetes, and cancer. Moreover, habitual consumption of these food products may contribute to improved health in general, especially in children and adults. Studies on the utilization of the health-benefiting food products have revealed that numerous factors can influence consumers' consumption of food that promises health-related rewards or benefits (Bakker et al., 2020). With increasing consumption of healthy food products in South Africa, it becomes important to understand and identify factors that determine utilization and utility of spices and herbs in the country.

Consumption studies are often used to establish why consumers utilize certain food products as well as the influencing factors considered by consumers prior to utilization. Researchers have in most cases hypothesized that consumption is influenced by some socio-economic factors, and challenges encountered during purchasing of food products, as well as sources of information in relation to the food products under discussion. In addition, issues of quality and quantities of products in demand also play an important role in influencing consumption of certain food products.

2.9.1 Factors influencing consumption of food

Various studies have studied the determinants of food consumption in both developed and developing countries (Anstruther et al., 2021; Mottaleb et al., 2018; Miller et al., 2017; Mengesha, 2021). These authors have argued that, despite improved global food production,

prevalence of ill-health is still high in many countries. These arguments revealed that food intake and nutritional improvement are likely to enhance not only the economic sector of countries but also the health status of consumers. Consumer theory is based on the assumption of consumer utility functions as well as consumer preferences. Consumers normally plan to allocate their income on commodities that promise the highest utility.

According to Obayelu (2019a) and Seidu et al. (2021) the type of food, and frequency of consumption is normally associated with several socio-economic factors such as age, marital status, gender, race, household size, and many other factors. In their study on socio-economic determinants of consumption of fruits in Ogun State, the authors (Akerele et al., 2018) utilized a survey tool to collect data from 100 participants. Multistage sampling procedure was used to sample the respondents and the data was analyzed using ordinary least squares regression analysis. From the results, it was established that factors such as marital status, level of education, and availability, as well as income received, influenced consumption of fruits in general.

In another study that was conducted by Pengpid and Peltzer (2018), the prevalence and socio-determinants of fruit and vegetable consumption were determined in Kenya using primary data. Similarly, the study adopted multi-stage cluster sampling method to select 4479 respondents to participate in the survey. With the engagement of adjusted logistic regression analysis, the result of the study showed that education level as well as gender played a significant role in influencing consumption of fruits and vegetables in the country. Da Silva et al. (2022) reported that food consumption is influenced by education level (tertiary qualification), age, and consumer sedentary behaviour.

Additionally, Thorpe et al. (2016) conducted a study on comparison of dietary patterns using principal component analysis in Australia. The results of the study demonstrated that older respondents consumed more vegetable-based diets, and the dietary guidelines were associated with being female and having a high level of education. Furthermore, a study on analysis of fast food consumption among teenagers in India by Kumari and Kumari (2020) applied principal component analysis for data analysis. The study used a structured questionnaire to collect data from the respondents. From the analysis, the authors established that television as a source of information played a significant role in influencing consumption of food among teenagers.

In addition, a study on food consumption changes during the COVID-19 pandemic that was conducted by Durães et al. (2021) used the bivariate and multinomial logistic regression model to analyze for effects of socio-demographic, economic, and health conditions on consumption

of food. Using an online questionnaire, 15,641 respondents participated in the survey. The study results revealed that socio-economic factors such as age, gender, income, and marital status, as well as behavioural characteristics, were bi-directionally associated with changes in food consumption. Furthermore, Streeter (2017) conducted a study on socio-economic factors affecting food consumption in China. Income, education, and urban residency were shown to be positively correlated with food consumption, particularly when it came to animal meals, fruits, and dairy items, according to the study's analysis of the data using ordinary least squares. Packaging of food is an essential element of response to address challenges of sustainable food consumption (Guillard et al., 2018). Packaging of food is of paramount importance in the food industry as it helps reduce transmission of food-borne diseases, as well as reducing the negative impact from the production and distribution of uneaten/inedible food on the environment and the economy at large. Previous studies such as that of Chu et al. (2021) highlighted the importance of packaging food, as it influences the quantity of consumption of nutrient-dense foods.

Sources of information also play an important role in food consumption. For instance, a study on the effects of socio-economic factors on sustainable food consumption by Ifeanyichukwu and Nwaizugbo (2019) collected data from 500 respondents using a structured questionnaire. Results from multiple regression revealed that, amongst other factors that influences consumption of food, social groups such as friends and family influence food consumption. Education was also amongst the listed factors, with the authors highlighting that education enhances and enables consumers to understand the nutritional value behind the consumption of certain foods.

In another study authored by Sinyolo et al. (2020) on access to information and consumption of fruits and vegetables in South Africa, the authors indicated that, among various policy interventions aimed at improving consumption of fruits and vegetables, raising awareness and educating the masses on nutritious diets and healthy lifestyles must be highly considered. The authors further highlighted that the extent to which consumers receive messages about nutrition depends largely on the kind of communication technologies put in place within the society. Therefore, their study used survey data to investigate the relationship between four communication technologies, namely mobile phones, radio, television, and the internet, and their influence on consumption of fruits and vegetables in the country. Results from the study showed that access to mobile phones, radio, television, and the internet showed an increase in the consumption of fruits and vegetables. Lastly, the study revealed that some socio-economic factors play an important role in shaping consumption patterns of the consumers.

Similar results were reported by Senyolo et al. (2019), who indicated that consumption of African leafy vegetables was influenced by various factors including age, and gender, as well as level of education. The study further revealed that integration of awareness campaigns with media such as radio and television should be considered to promote consumption of the leafy vegetables.

In addition, availability of food has been found to play a significant role in improving consumption (Obayelu et al., 2019). Herforth and Ahmed (2015), who emphasized the importance of availability of food to enable consumers to consume food of their choice, echoed the same. The authors indicated that what is available is normally what is consumed, and that at a very basic level, availability must precede consumption, as food that is not available cannot be consumed. Viljoen et al. (2005) conducted a study on factors contributing to changes in food practices of a Black South African community. The study collected data through audio-taped focus group discussions and interviews. Aggregated descriptive summaries of the practices as they related to food practices of the community was used for interpretation. Similar to previous authors, availability was emphasized as an important factor that influences the type of food that can be gathered and consumed; limited availability of indigenous vegetables was often mentioned as reason for not consuming these food products.

A study was conducted in Ladysmith by Xaba and Dlamini (2019) on establishing factors associated with the consumption of fruits and vegetables amongst adults in the municipality. The study used a structured questionnaire to collect data from the respondents. Multivariate analysis was used to identify the factors, with binary logistic regression employed to measure the strength of the associations between daily consumption and other variables. The outcome of the study reported that gender, age, employment, income, level of education, age, and availability, influenced consumption of fruits and vegetables in the municipality.

In their study on spicy food consumption, Xue et al. (2017) inspected the associations between consumption of spicy food and lipids in Chinese adults. The research extracted data from a national survey and targeted only adults aged between 18 and 65 years old. Using ANOVA, the study used x^2 tests to compare participants' characteristics according to the frequency of spicy food consumption. The results established that respondents who consumed spicy food more frequently were likely to be of a young age, male and belonging to the ethnic minority. However, there were no significant differences in educational level between participants who consumed spicy food less frequently and the others. Overall, the study emphasized the importance of consumption of spicy foods, as they have the ability to improve the general health condition of the consumers, more especially or control of cholesterol.

Similarly, Rakhi et al. (2018) conducted a study on a broad spectrum of benefits of culinary herbs and spices. The authors also reported that culinary herbs and spices presents an important role in improving the health of the consumers. However, if consumed in excess, they have a tendency of causing allergic reactions, and therefore consumers must be warned about overdosing on the commodities. In another study conducted by Lv et al. (2015), on consumption of spicy food and total causes for specific mortality, a baseline data collected through a structured questionnaire was analyzed using multivariate models on STATA version 13.1 version. The P values were two-sided and statistical significances was defined as $p<0.05$. The study also revealed that consumers who consumed spicy foods less than once a week and those who consumed them daily had 14% lower risk of death. The study concluded that there was an inverse relationship between spicy food consumption and death due to non-communicable diseases.

Similar results were echoed by Forouhi (2015), who also reported that there is an inverse association between spicy food consumption and mortality, as majority of spicy foods such as hot chilli has an antimicrobial attribute, which plays an important role in the health of the consumers. In addition, multivariable logistic regression was used to determine the association of spicy food consumption with hypertension. According to Wang et al. (2012), of the 53,916 participants, young, male and well-educated respondents were found to consume spicy food frequently compared to the others. A univariate analysis compared spicy food consumers and non-consumers. After adjusting for gender, education level, age and household income, participants who consumed spicy food one to twice per week, and more than thrice per week showed some odds ratios (95% CI) of 1.05, 1.03 and 0.97 for hypertension over non-consumers. The study concluded that frequency of spicy food consumption is inversely associated with hypertension more in females than in males.

Furthermore, a study on evaluation of low-income populations' preference for spicy food by Liu and Zhang (2019) analyzed data from the China Health and Nutrition Survey using ordinary least squares designed to examine influence of social and economic transformations in China on demographics and health status. The statistical results show that income in the group showed highest preference and consumption of spicy food. Also, the results show that gender (male), marital status (married), formally employed, and young consumers, had a positive significance with consumption of spicy food.

Research on association of hot red chilli pepper consumption and mortality rate by Chopan and Littenberg (2017) measured frequency of chilli pepper consumption in 16,179 participants aged 18 years and older. The association between the predictor and outcome variable was measured

by multivariate Gox proportional hazards regressions. Results from the models revealed that age, ethnicity, education level, marital status, and monthly income influenced consumption of red and hot chilli peppers and thereby reduced mortality. The importance of spices such as chilli pepper, cumin, ginger, mustard, and allicin was also highlighted by Bousquet et al. (2020) in their study on using spices to control COVID-19 symptoms.

In another study on establishing the association of spicy chilli food consumption with cardiovascular mortality by Ofori-Asenso et al. (2021), 564 748 adults above the age of 18 years were involved. The data compared the mortality rate in respondents who did not consume spicy food regularly with those who were regular consumers. The study highlighted that consumption of spicy chilli food was associated with reduced risk of mortality from heart diseases. The effects of mortality from lower consumption of spicy food were consistent in both males and females, but appeared to be variable across different age groups. The antioxidant and anti-inflammatory effects of capsaicin, which is a pungent and irritating agent found in chilli and red pepper, has been reported to display an important role in improving protection against obesity and thus lower the risk of other cardiovascular and metabolic diseases.

Analysis on consumption of spicy pepper and preferences in the United States by LillyWhite et al. (2013) used data collected from 1104 consumers using online panel survey and face-to-face live interviews. The data was analyzed using simple descriptive statistical analysis, and X^2 tests were performed on the data using statistical analysis software (SAS) statistical software version 9.2. From the results of the study, it was established that consumption of spicy food was influenced by gender (male), age, and household income, as well as ethnicity. Furthermore, a study by Szűcs et al. (2018) explored seasoning practices and factors affecting the herb and spice consumption habits in Europe. A self-administered questionnaire was developed and implemented in seven participating European countries (Austria, Germany, Hungary, Ireland, Latvia, Slovakia, and The Netherlands). Data was collected from 1731 spice and herb consumers and analysed using principal component analysis (PCA). Demographic profile of the respondents by country percentage revealed that most of the consumers across all the countries were female. Age wise, most of the consumers were from Germany, Latvia, and Slovakia. All consumers from all countries held higher education qualifications. The study established that a common determining factor for spice and herb consumption in all the countries was consciousness of one's health.

2.10 Willingness to pay for spices and herbs

Several studies on willingness to pay for healthy food products have been conducted across the globe (Marozzo et al., 2020; Muhammad et al., 2015). With increasing health consciousness and awareness about health attributes of food products in South Africa, it becomes important to understand and identify the factors that affect consumers' willingness to purchase these spices and herbs. Studies on consumers' willingness to pay are often used to determine the market potentials for some products. Researchers have in most cases hypothesized that consumers' willingness to pay is influenced by socio-demographic factors such as age, education, household size, income, marital status, and gender. In addition, the number of years that consumers have used a product, and consumer knowledge, as well as market factors such as price, packaging, and branding have also played a significant role in influencing willingness to purchase a product.

2.10.1 Socio-economic factors and willingness to pay for spices and herbs

Various studies have surveyed the bases of household socio-economic factors affecting willingness to pay for food products in both the developed and developing countries (Haghjou et al., 2013; Nandi et al., 2017; Sekhampu, 2012; Villano et al., 2016). These authors have argued that in many countries domestic policies aimed at improving households' nutrition have been beneficial and yielded positive outcome. Despite the increasing worldwide food production, there is a prevalence of ill-health in many countries. These findings revealed that food intakes and nutritional improvement are likely going to enhance Gross Domestic Products (GDP), purchasing power, food intakes, and consumers' health.

A study was conducted by Ortmann (2014) on analysing consumers' willingness to pay for underutilized vegetable crops. The Probit model was used to identify the socio-economic factors that influence willingness to pay. The results showed that willingness to pay was a function of age, gender, and taste. Age had a negative effect on consumers' potential willingness to willingness to pay, implying that the younger consumers were willing to pay more for the vegetables. Furthermore, male respondents were found to be more likely to pay a premium of six percent or more relative to their female counterparts. Similarly, Nandi et al. (2017) identified factors such as family income, household size, gender, and other variables such as availability and use of chemicals, to have some positive influences on consumers' willingness to pay. The study further established some barriers to buying organic fruits and vegetables such as high price, lack of availability, and irregular supply of products in the retail outlets, as well as branding/labelling.

Additionally, Haghjou et al. (2013) conducted research in Iran using an Ordered Logit Regression model to examine the variables influencing customers' prospective willingness to pay for organic food goods. The survey's findings showed that 95% of the respondents were willing to pay a premium, while 10% were willing to pay more than 35 percent for organic products. Some of the factors that significantly increased consumers' willingness to pay a premium include income, environment concerns, marital status, and gender, amongst others. Furthermore, a study on willingness to pay for organic foods that was investigated by Rodríguez et al. (2007) reported that socio-economic variables such as age, gender, age, average household income, and education level, were all significantly influencing willingness to pay for organic products. On the contrary, gender was reported to have a negative effect on willingness to pay for food by Wanjuu et al. (2019).

In a similar vein, George (2010) used logistic regression to analyze Dominica's readiness to pay for locally farmed organic fruits and vegetables. According to the study's findings, male respondents' willingness to pay grew across categories of rising household income from 9.7% to 13.0%, while female respondents' willingness to pay climbed by 3.4% from 10.9%. Makweya and Oluwatayo (2019) determined the factors influencing consumers' willingness to pay for graded beef in Polokwane. The study employed double bounded dichotomous choice format to analyse data. The results showed that a 5% significance of income coefficient. This means that consumers were willing to pay more as their incomes increased. Similar results on income were reported by several authors (Alinda and Kavoi (2013). The study further showed a negative but significant sign on age, implying that a one-year increase from the mean reduced consumers' willingness to pay by 0.4%. Thus, older respondents were not willing to pay more as compared to younger consumers. Household size was reported to have a negative but significant sign. This implies that an additional member in the family is likely to reduce the respondents' willingness to pay for the product. Similar results were reported by Darby et al. (2006). However, different results were reported by Danso et al. (2017), who found that household size was the most vital and significant factor that influenced consumers' willingness to pay for fish products.

Furthermore, Muhammad et al. (2015) and Kucher et al. (2019) studied consumers' willingness to pay for organic foods, and used a regression model to identify the major determinants of willingness to pay. From the results, it was noted that a majority of the consumers were willing to pay more for the organic food products. Age, household size, education, and nationality were mentioned as significant factors that influence consumers' willingness to pay for organic food. On the other hand, ethnicity was reported by several authors to have a positive effect on

willingness to pay. According to George's (2010) research on consumers' willingness to pay more for locally grown, organic fruits and vegetables, being Black was found to have a favourable impact on consumers' desire to do so. Moreover, Phillip and Dipeolu (2010) investigated the willingness to pay for organic vegetables using a dichotomous response model (Logit). Similarly, the results of the study found evidence that ethnicity plays an important role in consumers' willingness to pay for food. The results from Naanwaab (2014) also provided some evidences that ethnicity plays a significant role in influencing willingness to pay for fresh produce.

Rani et al. (2018) analysed willingness to pay for organic vegetables in Pakistan. The authors confirmed that some socio-economic and demographic variable were important determinants of willingness to pay for organic vegetables. Empirical results of the study highlighted employment status as one of the socio-economic factors that influenced willingness to pay for the vegetables. Similarly, Akaichi and Revoredo-Giha (2014) reported that willingness to pay for safe milk was determined by socio-demographic characteristics. Ayhan (2014) also reported age, gender, income, and employment status among the factors influencing willingness to pay for organic milk in the study.

The results on the relationship between households' food expenditure and willingness to pay indicate that there is an association between the two parameters. For instance, Gil et al. (2000) argued that when consumers are given more money to make food choices, health conscious consumers tend to buy more of healthy food. Furthermore, Chekima et al. (2016) also reported that income and monthly food expenditure had a positive effect on willingness to pay for non-genetically modified products. The results mentioned by Zhang et al. (2018) were however contrary to those of other authors, as the relationship between food expenditure and willingness to pay was found to be negative in nature.

2.10.2 Socio-economic factors and willingness to pay for spices and herbs for health related issues

Human beings have used spices and herbs as both a food source and as medicine for at least several thousand years due to their attributes such as use as colourant agents, preservatives or medicines. Most of the spices and herbs are used as herbal remedies, and they seem to be more important for maintaining health and preventing disease than for treating it. According to Elizabeth et al. (2017), spices contain chemical compounds that enable them to be used as preservatives in many foods, especially in the meat processing industry. The authors further

revealed that the main compounds in spices also confer other properties, providing a variety of applications for spices such as medicines, colourants and natural flavouring. Furthermore, Singh et al. (2017) reported that spices are bio-nutrient supplements that enhance the taste, flavour and aroma of food, and also treat several diseases. Moreover, the authors revealed that cumin is one such spice that is used as a culinary spice for both its aromatic effect and medicinal properties, which consumers tend to take advantage of and include in their meals. Nadeem (2012) also conducted a study on potential benefits of cumin and concluded that cumin has a good antioxidant potential. The essential oil of the spice possesses good inhibition properties against free radicals, hence the use of cumin for personal care and health purposes.

Additionally, Taghizadeh et al. (2015) performed a study to determine the effects of cumin intake on weight loss and metabolic profiles among overweight subjects. The study conducted a clinical trial among 78 overweight subjects aged 18-60 years old. The participants were randomly assigned into three groups to receive cumin and other weight loss enhancing agents three times a day for 8 weeks. The results of the study showed a significant decrease in weight from participants who consumed cumin compared to other participants. Furthermore, taking cumin also led to significant reduction in insulin levels. The study concluded that taking cumin for 8 weeks among overweight subjects results in reduced weight and has beneficial effects on insulin metabolism. Similarly, Mnif and Aifa (2015) and Jafari et al. (2016), revealed that cumin is used for its medicinal properties in treating a variety of diseases such as cancer and diabetes.

On the other hand, origanum has recorded positive results in the treatment of stress and anxiety (Son et al., 2019). In addition, on modelling the anti-cancer activities of origanum essential oil in human skin disease, Han and Parker (2017) reported that origanum has gained popularity in treating skin diseases. Similar benefits for origanum were reported by Kouremenos (2019) and Gomes et al. (2020), who confirmed that, due to the bioactive potential of origanum as well as its antimicrobial properties, it can be used for both medicinal and aromatic purposes.

Another spice used for personal care is turmeric powder which, according to Alasadi et al. (2020), can be used as a food and for personal and health purposes. The authors mentioned that in the kitchen, it can be used to enhance food aromas. Medicinally, it can be used in the prevention of arthritis and cancer. Furthermore, in day-to-day household management, it can be used to treat wounds, and also facially to improve skin condition.

On the other hand, adoption of spices and herbs that are used in meat and meat products has been highlighted by various researchers (Stefanaki and van Andel, 2021). For instance, Flores et al. (2021) conducted a study on the use of herbs and spices in food packaging. The results

of the study revealed that spices and herbs have the potential of being used as valuable sources of chemicals to improve the shelf-life of meat as well as meat products. Furthermore, Haugaard et al. (2014) also testified the potentials of herbs being used to mend shelf-life, taste, appearance, and texture of meat. Additionally, Sobral et al. (2019) used herbs to reduce toxins in chicken breasts. The study compared two methods of preparing chicken by covering the chicken with or without herb extracts, and established that chicken cooked with herb extracts showed no toxins compared to those cooked without herb treatment. Mielnik et al. (2008) marinated turkey thighs using by-products from the production of herbs' essential oils and scored the results for acidity, smell, and flavour. The study's findings demonstrated that the flavour and aroma of meat and meat products are enhanced by the by-products of herbs.

According to Lu et al. (2018), spices can be used to enhance flavour, and process meat products to improve both quality and texture as well as taste. Similarly, Sivarajan et al. (2017), used spice extracts in packaging and preserving chicken meat under controlled conditions. The spice extracts proved to increase the shelf-life of chicken from 4 days to 24 days when coated with clove and cinnamon extracts. Similar results on chicken were reported by Babuskin et al. (2015), who modelled the effects of spice extracts on raw chicken meats that were stored at different temperatures.

2.11 Demand for spices and herbs

The world has in the past realised a significant growth in population size and this increase has shown significant implications on demand for food across all continents and countries. Because of the increase in demand for agricultural resources, as diets shift away from starchy staples to healthier food with spices and herbs, estimation of demand functions has become more important, with more attention on both the theoretical and empirical aspects. However, some studies have in the past ignored the connections between theory and empirical analyses while concentrating on the estimation of single linear demand equations. Empirical work such as that of Van Oordt (2016) has been directed towards the estimation of complete demand systems which are useful in providing information on income and price elasticities.

One of the main goals of demand analysis is to model expenditure patterns for households on a group of related items in order to estimate price and income elasticities as well as welfare. Empirical evidence on consumer behaviours is increasingly important in the formulation and analysis of policies for any country.

2.11.1 Socio-economic factors and demand for spices and herbs

A study conducted by Oyinbo et al. (2013) ascertained the determinants of rice consumption in Nigeria. Using Almost Ideal Demand System analysis, the results of the study disclosed that age had a statistically significant negative effect on demand for rice. The study also displayed that household size, price, expenditure, and income were significant in influencing households' demand. Similarly, Ashagidigbi (2019) analysed some data to establish the factors influencing demand for fruits and vegetables in Nigeria using Almost Ideal Demand System analysis. The results of the study confirmed that age has a negative association with demand. The results imply that demand was decreased with a unit change in age. Furthermore, the study analysed for other socio-economic factors against demand for fruits and vegetables. The results presented that household size and expenditure reported a positive significance, while results on price and gender showed an inverse relationship with demand for fruits and vegetables.

Moreover, Bundi et al. (2013) also conducted an analysis on demand for smallholder crops (the case of fruits and vegetables) in Kenya using Almost Ideal Demand System. Results from household demographic characteristics showed varying effects on the demand for crops. For instance, age showed a positive and significant effect on the demand for cabbage but a negative effect for kale. In the fruit demand system, age showed a positive effect on demand for bananas. On another note, households' expenditures on vegetables showed a positive significant effect on demand for kale but a negative effect on onions and cabbage. Similarly, using Quadratic Almost Ideal Demand System model (QAIDS), Obayelu et al. (2019) confirmed that age and other factors such as gender and income significantly influence demand for fruits amongst students in Nigeria.

On another note, Okello et al. (2015) conducted a study that looked at demand for value-added products in African indigenous vegetables in Kenya. The study used descriptive analysis to describe vegetable consumers and demand for basic value added practices by retailers. On the contrary, results from a study conducted by Nankwenya et al. (2017), on demand for fish products in Malawi, showed that age had a negative significant effect on demand for fish products.

Gulseven and Wohlgenant (2014), in their study on demand for functional and nutritional enhancements in specialty milk products, estimated a two-stage hedonic model. From the study, the demand estimated indicated that demographic attributes have effect on households' demand function for the specialty milk products. Households' education level, age and ethnicity showed a statistical significance with demand for specialty milk products. According to a related study by Gulseven and Wohlgenant (2014) on the estimation of factors influencing

the demand for organic milk in Turkey, the only significant household-specific factor influencing demand for organic milk was education level.

In addition, a study on food demand system estimation conducted by Maganga et al. (2014) modelled demand using Almost Ideal Demand System model. From the study, price and expenditure elasticities were computed from the food aggregates. The outcome of the study showed that the expenditure was significantly associated with the expenditure share equations. Furthermore, results from expenditure elasticity estimates accorded with economic intuition. All the food items were estimated to have a positive expenditure elasticity.

Moreover, a study by Moni (2014) modelled demand for meat in rural areas of Kenya using Almost Ideal Demand System approach. The results of the study revealed that all estimated own-price elasticities were negative to satisfy the law of demand, while the cross-price effects of the specified meats were found to be gross-substitutes to one another. The positive expenditure elasticities implied that all the meats were normal goods in the country. Elasticities further classified three of the meats as luxury commodities. Moreover, socio-economic factors namely age, education level, gender, and household size showed a statistical effect on demand for meat in Kenya.

Results from a study conducted by Ayanwale et al. (2019) who applied Quadratic Almost Ideal Demand systems model to analyse implications of protein demand on underutilised indigenous vegetables in Nigeria showed varying results on effect of households' socio-demographic characteristics on share of the protein food sources. Gender showed a positive and significant effect on beef and fish, while on fish a negative relationship existed on bush meat. The results implied that being female increased budget allocated to beef and fish and reduced expenditure on bush meat significantly. On age, demand for beef and egg were negatively and significantly affected, with fish positively significant.

Similar results on age were reported by Lanfranco and Rava (2014) on demand elasticities for meat products in Uruguay. The analysis of the study involved a two-step estimation of an incomplete system of censored demand equations using household data from income and expenditure survey. Results of the study showed that socio-economic factors such as age and household size had a significant effect on demand for meat. Income, own-price and cross-price elasticities were computed and the results showed that all meat items were necessary goods and these was evidenced by income-inelastic response. Furthermore, the results suggested that all meats behaved as normal goods, although they exhibited different reactions to change in price.

On the other hand, Akerele et al. (2018) conducted a study on factors that influenced meat consumption among households, and used descriptive statistics and Seemingly Unrelated Regression model for data analysis. The results showed that household size, marital status and access to tertiary education by the household head positively and significantly influenced demand for meat. Additionally, Ani and Antriyandarti (2019) in Yogyakarta modelled Almost Ideal Demand System on household demand for chicken meat. Empirical results from the study showed that estimated elasticity of chicken was found to be price inelastic. Furthermore, the relationship between household expenditure and budget share for chicken meat showed a direct relationship between the price of chicken meat. The study recommended that price and availability of chicken meat be maintained in order to meet the demand for chicken.

In their study on modelling the demand for meat in Bangladesh, Selvanathan et al. (2020) modelled for three types of meat chicken, beef and mutton. Results from the study revealed that meat as a group is a necessity for the consumers in the country. Chicken was found to be price elastic and to be a luxury consumption. Cross price elasticity indicated that chicken and beef were complements, while results further revealed that chicken and mutton were substitutes. Lastly, elasticity estimates also indicated that price inelasticity for beef means it is a necessity, while mutton was price inelastic, making it an inferior meat type.

In addition, Ansah et al. (2020) applied Quadratic Almost Ideal Demand system model to investigate how some socio-economic and demographic factors like household size and age affect demand for food. The results of the study revealed that age had a statistical significance on the demand for all food commodity groups. Furthermore, female-headed households disburse a higher portion of the food budget across a majority of the food groups compared to their male counterparts. The positive signs of the expenditure elasticities indicate that all the food categories are normal goods across all the regions, and that an increase in income will cause an increase in the expenses on all food groups. On price elasticities, the results show a mixture of gross and/or net complements and substitutes. The estimated elasticities also suggest that the quantities demanded of most food groups are not sensitive to price changes. Again, all substitute food products and most complementary food products across rural and urban households had inelastic uncompensated cross-price elasticities. Compensated price elasticities indicated that most food groups tend to compensate and are likely to lead to substitutability and complementarity effects.

Vargas-Lopez et al. (2021) applied Quadratic Almost Ideal Demand System to evaluate consumer food expenditure and food waste during the Coronavirus Disease-2019 (COVID-19). The aim of the study was to examine how households' culinary traditions and food

management could have been affected by the pandemic due to related restrictions and management of the disease. The results in the analysis of expenditure elasticity showed a positive value, and confirmed that the products are normal goods for which food waste increases with expenditure (thus, wealthier families are more likely to discard food as they are less concerned about wasting). The expenditure elasticities calculated identified some goods as luxury goods for which the share of waste increased more than proportionally to the total food expenditure. Lastly, the study concluded that, regarding the elasticity analysis, households reduced food waste but this was dependent on food-specific category. These is in light of different households treating some goods as normal and others as luxury.

In their study on analyzing for demand on honey imported from different countries, Alnafissa and Alderiny (2020) imported Almost Ideal Demand System to analyze the data. The study reported that Marshallian elasticities estimation showed all own-price elasticities were negative and significant, except for own-price elasticity associated with demand for natural honey imported from Pakistan. Furthermore, results from honey imported from Yemen showed its own price-inelastic demand. Results of cross-price elasticities indicated that natural honey imported from Yemen showed a substitutability relationship with honey imported from Australia, whereas the demand for natural honey from Yemen showed inelasticity to changes in price of that imported from Australia. Also, natural honey imported from Australia showed significant substitutability with that imported from Yemen, Mexico and Germany. Moreover, the estimated values of expenditure elasticities indicated that demand for imports from Yemen, Argentina and Mexico is elastic to expenditure on natural honey imports, while natural honey imported from Pakistan and Germany is inelastic to expenditure on imports. The study recommended that production of local honey be encouraged in order to meet local demand and boost the economy.

Delport et al. (2017) used a Linear Approximation of an Almost Ideal Demand System to assess the demand for meat in South Africa. The study modelled for the country's meat complex including beef, mutton, pork, and poultry, but focused widely on consumed animal protein, which is poultry that was disaggregated into two separate product groups, namely IQF portions and other poultry groups. Expenditure elasticities for all the meat were positive and this implies that they are all normal goods. Again, the compensated own-price elasticities were negative and met the a priori expectations of negative own-price elasticities. Cross-price elasticities were particularly high between mutton and pork, and this could have been due to the complicated nature of the country's meat market and also due to the fact that consumers who earn a high income consume the largest portions of both mutton and pork. Moreover, another

high cross-price elasticity included substitution effects between IQF portions and the price of other meat products.

Additionally, Kharisma et al. (2020) applied Quadratic Almost Ideal Demand System model to model demand for household animal-sourced food in West Java. The study looked at the effect of demographic and socio-economic factors and household response and changes to price and income in relation to demand for animal-source food in the Province. The results showed that household demand for animal-sourced food was influenced by price, income, and some social demographic factors. With an income elasticity value of more than zero, all groups of animal-sourced food were categorized as normal goods. The income elasticity established meat commodities as the highest, with eggs being the lowest, and the nature of the commodity determined that the animal-sourced food groups are luxury goods. Results on own-price elasticity also revealed meat as the most responsive commodity to increase in prices compared to fish, poultry, milk, and eggs. The five food groups achieved a negative elasticity as reflected by the reduced share when the decreasing demand responds to the commodity price increase. Lastly, results on cross-price elasticity of most animal-sourced food groups recorded a negative elasticity, which indicated that the related animal-sourced food commodity groups were complementary, while a positive elasticity indicated that the related food commodities group were more of substitutes.

2.12 Chapter Summary

Having revised different studies associated with preference, willingness to pay, consumption for food, and demand, it is apparent that South Africa is still lagging behind in terms of documenting issues surrounding spices and herbs in general, as compared to other countries. It is therefore imperative that the study adopts research methodologies previously used in order to determine factors that positively or negatively influence preference, consumption, willingness to pay, and demand for spices and herbs. The succeeding chapter presents the methodology adapted to accomplish the objectives of the study.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter details the research methodology that was adopted to analyse the data to answer the research questions. The chapter provides information on the study settings, sources of data, study design, analytical procedures comprising methods and techniques used to analyse data, variables adopted in the study, data quality, summary of analytical plan and ethical consideration.

3.2 Study Settings

This study was conducted in Gauteng, South Africa. The province is one of the nine provinces in the country, and it is situated in the Highveld. Furthermore, the province is the smallest province in terms of land area, accounting for only 1.5% of South Africa's total land area (Oelofse et al., 2018). Nevertheless, the province is highly urbanized and is marked by the highest population (±13.2 Million). As indicated by Nhamo et al. (2021), the province is divided into three metropolitan municipalities, namely Tshwane-Pretoria, Johannesburg, and Ekurhuleni metropolitan municipalities, as well as two district municipalities, Sedibeng, and West Rand municipalities. The province is the fastest-growing province and though the smallest in land area, hosts the largest population of any province in South Africa. Farming activities such as cultivation of corn, maize, sorghum, peanuts, market gardening, and dairy farming are practiced. Some of the major livelihoods of the people include food production through farming, trading of goods and services, artisanship, agro-processing, and marketers.

3.3 Study Design

The study is quantitative in nature and a cross-sectional approach was adopted. According to Omair et al. (2015), cross-sectional research refers to a study which derives its results from once-off data gathered from selected respondents. As a cross-sectional study, some factors related to spices and herbs usage and consumption in the study area were gathered mainly from the respondents. Additionally, other factors linked with the consumers in the study area such as their socio-economic and demographic characteristics were collected. It is imperative to note that results derived from data collected from a cross-sectional study acts as good basis to present the findings of the study to the entire population in question (Omair et al., 2015). The

study design benefits creating an understanding in trying to answer the research questions as to what factors influence preference, willingness to pay, and demand for spices and herbs in Gauteng.

3.4 Study Protocol

This study utilized primary data. The data were collected using a survey tool administered to participants in the study area. The questionnaire was constructed by the researcher with the assistance of experts from the Agricultural Research Council (ARC) and North-West University. The questionnaire was divided into four sections according to the study's objectives. The first section was a general set of questions relating to the respondents' socio-economic factors and the second section was made up of questions relating to consumer preferences and consumption of spices and herbs, while the last two sections comprised questions on consumers' willingness to pay and consumer's demand factors for spices and herbs respectively. The questionnaire adopted close-ended questions as they are associated with consistency, reduce doubts, provide concrete results, and are easy to code and analyze. To ensure that the questions were understood and correctly interpreted by the intended respondents, the questions were then interpreted into a local language understood by the respondents when requested to do so.

3.5 Sampling and Sampling Frame

The study area comprises of estimated 13,339,725 people. The online statistical sample size calculator was used to compute the sample size as 385 (Raosoft online sample calculator - *Raosoff incorporation 2004*). The software allowed for a 5% margin of error and 95% confidence level with response distribution of 50%. The sample was representative, sufficiently robust and satisfactory to give unbiased estimates at a provincial level. The sample size *n* and margin of error E are given by:

$$x = Z\left({}^{c}/_{100}\right)^{2} r(100-r) \quad \ldots\ldots 1$$

$$n = {}^{NX}/_{(N-1)E^{2}+x} \quad \ldots\ldots 2$$

$$E = Sqrt\left[{}^{(N-n)x}/_{n}(N-1)\right] \quad \ldots\ldots 3$$

where *N* is the population size, *r* is the fraction of the responses being interested in, *n* is the sample size, *x* is the x score and Z(*c*/100) is the critical value for the confidence level c.

3.5.1 Sampling procedure

A multi-stage sampling technique was used to choose the study's participants. Data were collected in 2021 through administration of questionnaires. Face-to-face interviews were done with respondents who were above the age of 18 years. The sampling frame for the study consists of population of households in all the Gauteng municipalities. This sampling frame was selected for the study on the basis that respondents in these locations were expected to be using or have used spices and herbs and to have pre-knowledge on the health benefits of spices and herbs. They are also more likely to be conscious of their own health status given the knowledge base. The first stage involved the purposive selection of the province and the three municipalities within the province. The second stage involved the random selection of clusters (these are regions that are within the municipalities) from within each municipality. The third stage involved the random selection of the household members within the selected clusters. A total number of 385 respondents were selected in total.

The study followed some ethical procedures. Prior to the interview, the objectives of the study and the interview as well as the confidentiality clause was clearly explained to the respondents and their consent to participate in the study was solicited. Respondents were not coerced into participating, and those who showed no response were dropped for those who gave verbal consent to participate. Respondents were interviewed at different places but mostly at shopping centres, places of residence and work places.

3.6 Analytical Procedures

3.6.1 Univariate analysis

Frequency distribution and percentage were computed and used to describe the socio-economic characteristics of the consumers.

3.6.2 Multinomial logit model

Multinomial logit model was employed to establish the determinants of consumers' preferences for the origin of spices and herbs (objective 1). The multinomial logit model is more applicable and more relevant than the other regression models because the dependent variable is the preference choices with more than two categories. Preference choices were considered as dependent variable which has three categories in the study.

To identify the determinants of consumers' preferences in the origin of spices and herbs, the research assumes that in a given period, rational consumers choose among the options of product origin: local, imported and not particular or origin. Consider Agboola et al. (2018)'s scenario where the ith responder, given j options, makes the following utility choice:

$$U_{ij} = Zij\beta + \varepsilon ij \ldots\ldots\ldots\

X_{10} = Taste of spices/herbs

ε = error term

In the above model, the dependent variable is the preference for the origin of spices and herbs which has three categories, with the choice "not particular" being the reference choice in the study. Estimated coefficients measure the change in the logit for one unit change in predictor variable while the other explanatory variables are held constant. A positive estimated coefficient implies an increase in likelihood that a respondent will choose the alternative choice of spice/herb origin while a negative estimated coefficient indicates that there is less likelihood that a respondent will choose the alternative spice/herb origin. The table below presents the variables that were used in the multinomial regression model for establishing the deteminants of consumers' preferences for the sources of spices and herbs.

Table 3.1: Variables used as correlates of preference for spices and herbs in the multinomial logit regression

Variables	Description	Expected Sign
Socio-economic factors		
Age	Number of years lived – continuous	+
Gender	Dummy; 1= female and 0 otherwise	±
Marital status	Dummy; 1= married 0 = not married,	+
Household size	Number of household members residing in one house	-
Education level	Dummy; 1= formal, 0 = informal	+
Ethnicity	Dummy; 1= Black and 0= other	±
Other factors		
Spice origin	Dummy; 1 = local and 0= import	+
Number of years consuming spices/herbs	Continuous	+
Labelling is important	Yes = 1, 0 otherwise	+
Visual attractiveness is important	Yes = 1, 0 otherwise	+
Heath attributes are important	Yes = 1, 0 otherwise	+
Packaging is important	Yes = 1, 0 otherwise	+
Taste is important	Yes = 1, 0 otherwise	+
Price is important	Yes = 1, 0 otherwise	+

3.6.3. Principal component analysis model

Principal component analysis (PCA) is a statistical approach used to reduce large data sets into smaller data sets without losing much of the original sample data (Schwedhelm et al., 2018 and Muziri et al., 2021).

To identify difficulties encountered when buying spices and herbs and to identify variables that influenced use, PCA was first done on the data set in this study. Secondly and lastly, all variables including socio-economic variables were considered when analysing for determinants of spices and herbs utilization.

Principal component analysis is a technique primarily used to display patterns in multivariate data. The model aims to display the relative positions of data in fewer dimensions while retaining as much information as possible and exploring the relationships between them. In general, PCA creates sets of new variables, also called principal components. Each new variable captures the relationship among the food consumption indicators. The model can be specified as follows**:**

If an *i* – dimensional variable with mean μ is defined according to Equation (8) below,

$$X^T = [X_1 \dots \dots \dots \dots \dots . X \ ] \quad \text{.....8}$$

Therefore, X= factors, i=i^{th} factor, and X^T is the transpose of X.

To establish a new set of variables, $Y_1, Y_2 \dots$ Yp (variance decreases from the beginning to the end), each Y_i (principal components) is considered to be linear combination of the X_j (socio-demographic and either health or challenge variables) as in Equation (9) :

$$Y_j = a_{1j}X_1 + a_{2j}a_{2j}X_2 + \cdots + a_{pj}X_p \quad \text{.....9}$$

where $a_j^T = [a_{1j} \dots . a_{pj}]$ 10

In the above model, Principal Component Analysis (PCA) was computed using spices and Some responses form sources of information, consumer socio-economic factors as well as general factors considered before buying spices and herbs were computed into the model to generate utilization indices. A regression analysis and estat hettest were than perfomed to check for heteroscedasticity in a linear regression model.

The table below presents the variables that were used for the PCA model when analysing for utilization and utility of spices and herbs.

Table 3.2: Variables used as determining factors for utilization and utility in PCA model

Variables	Description	Expected Sign
Utilization of spices	Continuous	
Utilization of herbs	Continuous	
Socio economic factors		
Age	Number of years lived – continuous	+
Marital status	1=married and 0 = not married	±
Household size	Number of household members residing in one house	+
Gender	0 = male, 1= female	±
Education level	1=formal education and 0 = no formal education	±
Religion	1=Christian, 0= non-Christian	±
Ethnicity	1 = Black 0 = not Black	±
Employment status	1= employed and 0 = unemployed	±
Food expenditure	Continuous	±
Sources of information		
Television	Dummy;1= yes, 0 = otherwise	±
Newspaper	Dummy; 1= yes, 0 = otherwise	±
Radio	Dummy; 1= yes, 0 = otherwise	±
Internet	Dummy; 1= yes, 0 = otherwise	±
Friends and family	Dummy; 1= yes, 0 = otherwise	±
Health practitioner	Dummy; 1= yes, 0 = otherwise	±
Health awareness campaign	Dummy; 1= yes, 0 = otherwise	±
Challenges when purchasing		
Unknown benefits	Dummy; 1= yes, 0 = otherwise	±
Lack of proper packaging	Dummy; 1= yes, 0 = otherwise	±
Difficulty storing	Dummy; 1= yes, 0 = otherwise	±
Unavailability	Dummy; 1= yes, 0 = otherwise	±
Unknown brands	Dummy; 1= yes, 0 = otherwise	±
Quantity demand	Dummy; 1= yes, 0 = otherwise	±
Quality demand	Dummy; 1= yes, 0 = otherwise	±

3.6.4 Logistic regression model

Logistic regression model was employed to analyse the factors influencing willingness to pay for spices and herbs. Logistic regression is preferred over discriminant analysis in situations of non-normality. The dependent variable in logistic regression is willingness to pay for spices and herbs with "1" representing willing to pay and "0" otherwise.

The choice of socio-economic factors influencing willingness to pay for spices and herbs was guided by various studies such as the works of Vorage (2020) and Weatherspoon et al. (2014). The following equations portray the specification of the logistic regression modelling:

$$Z_i = \delta_\mu + \sum(\beta_{iXki}) \ldots\ldots\ldots\

The explanatory (independent) variables inputted in the binary logistic regression modelling to elicit socio-economic factors influencing willingness to pay for spices and herbs include age, average monthly income, gender, average monthly food expenditure, household size, ethnicity, and various use of spices and herbs.

The table below presents variables that were inputed into the logistic regression model to analyse factors influencing willingness to pay for spices and herbs.

Table 3.3: Variables used as correlates of willingness to pay for spices and herbs in the logistic regression model

VARIABLE	DESCRIPTION	EXPECTED SIGN
Willingness to pay for spices	0 = not willing to pay for spices 1 = willing to pay for spices	
Willingness to pay for herbs	0 = not willing to pay for herbs 1 = willing to pay for herbs	
Age	Number of years lived – continuous	+
Average monthly income	Respondent's total money earned in Rands – continuous	-
Average monthly food expenditure	Respondent's money spent on food in Rands – continuous	±
Household size	Number of household members residing in one house	-
Ethnicity	Dummy; 1= Black and 0= other	±
Use of spices for personal and health care	Dummy, 1 if yes, 0 if otherwise	±
Use of spices in meat and meat products	Dummy, 1 if yes, 0 if otherwise	±
Use of spices in ready to eat meals	Dummy, 1 if yes, 0 if otherwise	±
Use of spices and herbs in sauces and dips	Dummy, 1 if yes, 0 if otherwise	±
Use of spices and herbs in snacks & convenience food	Dummy, 1 if yes, 0 if otherwise	±
Use of spices and herbs in soups & noodles	Dummy, 1 if yes, 0 if otherwise	±
Use of spices and herbs in beverages	Dummy, 1 if yes, 0 if otherwise	±

Coefficients of each independent variable in the above model did not represent the impact of the variable on the dependent variable in terms of magnitude or size. Thus, marginal effects were used to interpret the results of logistic regression model effectively and these effects show the probabilities of occurring the dependent variable with respect to the changes in each explanatory variable.

3.6.6 Quadratic Almost Ideal Demand System (QUAIDS)

QUAIDS was employed to determine the factors influencing consumer demand for spices and herbs. The linearity of the spending function is not assumed in the QUAIDS model, which is an expanded version of the AIDS model. Under the presumption that there is a non-linear relationship between income and expenditure, the model's per capita expenditure is quadratic. Numerous demand studies have attested to QUAIDS' suitability for demand modelling. Chengappa et al. (2017) applied QUAIDS to the food expenditure data from India, and Korir et al. (2018) used expenditure data on consumption data from Kenya.

The QUAIDS model, by its nature, has a three budget share system that is quadratic in the logarithm of total expenditure. Furthermore, it has the ability of allowing goods to have characteristics of luxuries at low levels of total expenditure, and necessities at higher levels.

The Inverse Mills' Ratio (IMR) for the various spices and herbs was first estimated from a Probit model and then included in the demand equation. This method of estimation was devised by Shonkwiler and Yen (1999). This process corrects for any sample selection bias that may have occurred due to the presence of zero expenditure for some types of spices and herbs, as reported by some households. As reported by Mutuc et al. (2007) and Sheng et al. (2009), the first step establishes the likelihood that a specific home purchased a particular spice and herb.

The Almost Ideal Demand System (QUAIDS) model was extended quadratically in the second stage to include spending share equations with IMRs incorporated as instrumental variables. In the second phase, if the IMR coefficient is statistically significant, the subsample of purchasing households represents itself and is excluded from the study. Therefore, selectivity bias affects the calculated model. There will be no selectivity bias in the data, though, if the IMR coefficient is not substantial. Thus, the subsample of families who make spice and herb purchases represents the general population.

According to McLaren et al. (216), the QUAIDS which is derived from a generalization of the Price Independent Generalised Logarithmic (PIGLOG) preferences starts from an indirect utility function of the form:

$$lnK = \left\{\left(\frac{b(p)}{lnE - ln\ a(p)}\right) + \lambda(p)\right\}^{-1} \quad \text{.....16}$$

Where the term $[lnE - ln\ a(p)]$ is the indirect utility function of the PIGLOG demand system (that is, a system with budget shares linear in log total expenditure), E is the total expenditure, and a(p), b(p) and λ(p) are functions of the vector of prices p. To ensure the homogeneity

property of the indirect utility function, it is required that a(p) is homogenous of degree one in prices, and b(p) and λ(p) homogenous of degree zero in prices. The ln a(p) given in equation (1) has the Translog form:

$$lna(p) = \omega_o + \sum_{j=1}^{j} \omega_i lnP_i + \frac{1}{2}\sum_{i=1}^{j}\sum_{i=1}^{j} \eta_i lnP_j \ldots\ldots\ldots\

$$\phi_i = \omega_i + \sum_{j=1}^{k} \eta_{ij} \ln P_j + \beta_i ln\left[\frac{E}{a(p)}\right] + \frac{\lambda_i}{b(p)}\left\{ ln\left(\frac{E}{a(p)}\right)\right\}^2 + \sum_{s=1}^{m} \delta_{is} Z_s + \pi i IMR_I + U_I ..22$$

Where αi , λ, β, γ are parameters to be estimated

αi = average value of expenditure share in the absence of price and income effects.

β = parameter that determines whether goods are luxuries or necessities

η_{ij}= effects on the budget of item i of 1 percent change in the prices of items in group j Pj = price of item j

ρ_i= vector of socioeconomic and demographic variables

πi = vector of IMRs

ui = error term

As with the original AIDS model, the theoretical restrictions of adding-up, homogeneity, and symmetry in the QUAIDS model are expressed in terms of its parameters. Adding-up requires Σi wi = 1, and can be expressed in terms of model parameters as:

$$\sum_{i=1}^{k} \alpha_i = 1; \sum_{i=1}^{k} \beta_i = 0; \sum_{i=1}^{k} \lambda_i = 0 ; \sum_{i=1}^{k} \eta_{ij} = 0 \quad ш \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 23$$

Since Marshallian demands are homogenous of degree zero in (p, m),

$$\sum_{i=1}^{k} \eta_{ij} = 0 \quad ш \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 24$$

Slutsky symmetry implies that:

$$\eta_{ij} = \eta_{ji} \quad ш \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\

G= 1 to 6 (See table 4.4 on Food category aggregation)

STATA software was used to run the QUAIDS (*Raosoff incorporation 2004*). In order to avoid a singular covariance matrix, all the six expenditure share equations were specified, while the QUAIDS programme automatically omits one of the demand equations by itself and recovers it in the course of the analysis through adding-up restrictions.

Elasticities were obtained by first differentiating the expenditure share equation (28) with respect to lnE and lnpj respectively to obtain:

$$u_i = \frac{\partial_{\phi i}}{\partial ln_x} = \beta_i + \frac{2\lambda_i}{b(p)}\left\{ln\left[\frac{E}{b(p)}\right]\right\} \dots\dots\dots\

The table below presents the classification of spices and herbs. Spices are categorised into three groups, namely: hot spices, mild spices and aromatic spices while herbs are categorised into medicinal, culinaty and aromatic herbs.

Table 3.4: Spices and herbs classification

SPICES		
Hot spices	**Mild Spices**	**Aromatic spices**
Chilli	Paprika	Cumin
Cayenne pepper	Coriander	Cinnamon
White pepper		Clove
mustard		Masala
		Turmeric
HERBS		
Medicinal herbs	**Culinary herbs**	**Aromatic herbs**
Rosemary	Parsley	Garlic
Thyme	Paprika	Star anise
Origanum	Celery	Fennel seeds
	Mint	Vanilla
	Basil	

Source: Adeeyo et al. (2021) classifications

Futhermore, the table below presents variables that were inputted into QUAIDS model for analysis of demand or spices and herbs. Both the description and expected signs of the variables as per literature are presented on the table.

Table 3.5: Variables used as demand factors in the Quaids model

Independent variable	Description	Expected sign
Household size	Number of household members residing in one house	+
Gender	Dummy; 1= female and 0 otherwise	-
Age	Number of years lived – continuous	+
Expenditure for hot spices	Continuous- amount paid for hot spices	+
Expenditure for mild spices	Continuous- amount paid for mild spices	+
Expenditure for aromatic spices	Continuous- amount paid for aromatic spices	+
Expenditure for medicinal herbs	Continuous- amount paid for medicinal herbs	+
Expenditure for culinary herbs	Continuous- amount paid for culinary herbs	+
Expenditure for aromatic herbs	Continuous- amount paid for aromatic herbs	+
Price for hot spices	Continuous- amount of money required to buy hot spices	±
Price for mild spices	Continuous- amount of money required to buy mild spices	±
Price for aromatic spices	Continuous- amount of money required to buy aromatic spices	±
Price for medicinal herbs	Continuous- amount of money required to buy medicinal herbs	±
Price for culinary herbs	Continuous- amount of money required to buy culinary herbs	±

Price for aromatic herbs	Continuous- amount of money required to buy aromatic herbs	±

3.6.7 Computation of price and income elasticities of demand

According to Guerrero-López (2017), elasticity articulates the percentage change in the quantity of one variable that results as a response to a one-percent change in another. The concept of elasticity has many different applications, but the study focused mainly on demand elasticity in relation to price and income changes. Demand elasticity is based on the assumption that consumers choose to purchase quantities of goods in a manner that simply brings most satisfaction for their money, and this is referred to as utility maximization. The maximization yields an equation for each good purchased that specifies that each particular quantity demanded by the consumer is determined by the prices of all goods considered and the consumer's income. These equations are called the consumer's ordinary, or Marshallian, demand equations. For the i^{th} good, the demand equation is given by:

$$q_i = f(p_1, p_2 \dots \dots \dots \dots p_N, Y) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots 33$$

In this equation, q_i, is the total quantity of good i demanded by the consumer at prices p_1, p_2.....p_N, respectively, and Y is the consumer's income. Based on this demand equation, three significant elasticities can be demarcated in terms of partial derivatives as follows:

1) Own-price of good i:

$$\epsilon_{ii} = \left(\delta_{qi}/\delta_{pi}\right)p_i/q_i \dots\dots\dots\

substituted for the other, as is the case with electricity and natural gas in some space heating, then the elasticity will be positive.

3) Income elastic if demand for good i:

$$\epsilon_{iY} = \left(\delta_{qi}/\delta Y\right)Y/q_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 36$$

The equation expresses the association between changes in the consumer's income and the quantity of good i demanded. Income elasticity varies based on nature of good considered. For normal goods, that is, goods consumers demand more of as income increases, income elasticity is positive. These normal goods contrast to inferior goods, for which consumers demand fewer as income increases, which indicates a negative elasticity.

3.7 Data Testing and VBalidity

A number of procedures were used to check data quality. Firstly, interview questions were clearly determined and the data instrument was reviewed by experts both at the North-West University and Agricultural Research Council. The interview process involved three stages which were pre-interview, during interview and post-interview stage. Prior to the commencement of the interview session, the researcher conducted a pilot test interview session and only questions relevant to the study were asked. During the interview, the researcher ensured good seating for the interview in order to make the respondents at ease by explaining the interview process as well as recording of data. Upon completion of the interviews, the data from the interviews were transcribed, coded, and themed according to the research objectives. The use of multiple approaches in verifying the data is essential to ensure that quality of data is guaranteed.

3.8 Model Testing

3.8.1 Post estimation

To test for fitness of the model, the following tests were applied on the data set

i. Maximum likelihood estimation

Maximum likelihood estimation (MLE) is a widely used as a process of projecting the parameters of a statistical model given data. The method selects the set of values of the model parameters that maximizes the likelihood function and gives a combined tactic to estimation.

ii. Log likelihood

This is described as the log likelihood of the fitted model. The model is used in the Ratio Chi-Square test in checks of nested models and also to establish whether all predictors' regression coefficients in the model are concurrently zero. The log likelihood value is always negative for a logistic regression model, and this is because the likelihood contribution from individual observation is a possibility between 0 and 1.

iii. Crag and Uler R^2

This is the McFadden's pseudo R-squared. The rule of thumb states that a McFadden's pseudo R-squared fluctuating from 0.2 to 0.4 shows very good model fit. However, McFadden's R^2 can be as little as zero but certainly not equal one.

iv. Coefficient of Determination test

The coefficient of determination, denoted R^2 or r^2 and pronounced "R squared", is a number that indicates the proportion of the variance in the dependent variable that is predictable from the independent variable. Its main purpose is either the prediction of future outcomes or the testing of hypotheses, on the basis of other related information. It provides a measure of how well observed outcomes are replicated by the model, based on the proportion of total variation of outcomes explained by the model.

R^2 is a statistic that will give some information about the goodness of fit of a model. In regression, the R^2 coefficient of determination is a statistical measure of how well the regression line approximates the real data points. An R^2 of 1 indicates that the regression line perfectly fits the data. Values of R^2 outside the range 0 to 1 can occur where it is used to measure the agreement between observed and modelled values, and where the "modelled" values are not obtained by linear regression and depending on which formulation of R^2 is used. If the first formula above is used, values can be less than zero.

3.8.2 Multicollinearity test

Variance Inflation Factors (VIF) was run to check for multi-collinearity. From the test, the variables were expected not to be collinear if the inflation factors were within the range of 1-10.

3.9 Ethical considerations

Ethical clearance was obtained from the Ethical Review Board at North West University, which gave the study an ethical clearance number: NWU-00491-21-A9. The clearance letter was then used to obtain permission from the municipalities and districts to collect data for the study by interviewing households within their jurisdictions. A consent statement was read to the

participants to give their consent to participate in the study, from which they were assured about the privacy and confidentiality of information they provided.

3.10 Chapter Summary

The chapter explained the research methodology that was applied to analyze data to address the objectives. It explained the study settings, study design, data and study population, sample determination, study protocol, analytical procedure, model testing, data quality and validity, as well as ethical considerations. Fitted models for the inferential statistics included multinomial logistic regression analysis, principal component analysis, logistic regression analysis and Quadratic Almost Ideal Demand System (QUAIDS). The following chapter seeks to establish the determinants of consumers' preferences for sources of spices and herbs in Gauteng Province.

CHAPTER FOUR

SOCIOECONOMIC AND CONSUMERS' PREFERENCES FOR THE SOURCES OF SPICES AND HERBS

4.1 Introduction

This chapter presents the socio-economic and demographic variables for spice and herb consumers in Gauteng province. The chapter is divided into two sections. The first section presents a summary of the socio-economic characteristics of respondents, and their consumption history, as well as their preferred place of purchase for both spices and herbs. The second section presents result on socio-economic characteristics in relation to demand preference for both spices and herbs in the province. The last part of the chapter is the summary of all the sections presented within the chapter. Lastly, the last section of the chapter presents multinomial logit model estimates for spices and herbs preference followed by the summary of the chapter.

4.2 Socio-Economic and Demographics of Spices and Herbs Consumers

Table 4.1 presents a general summary of socio-economic factors of all spice and herb consumers in the province in frequencies and percentages.

Table 4.1: Summary of socio-economic and demographics of spice and herb consumers

Variable	Frequency	Percentage
Age		
<27	32	8.31
27<37	170	44.16
37<47	116	30.13
47<57	44	11.43
>57	23	5.97
Marital status		
Single	121	31.43
Married	240	62.34
Other	24	6.23
Household size		
<2	84	21.82
2<4	217	56.36
4<6	61	15.84
>6	23	5.97
Gender		
Male	95	24.68
Female	290	75.32
Educational level		
No formal	27	7.01
Primary	22	5.71
High school	86	22.34
Tertiary	250	64.94
Religion		
Christian	322	83.64
Non-Christian	63	16.36
Ethnicity		
Black	168	43.64
Coloured	24	6.23
White	114	29.61
Asian	79	20.52
Employment status		
Formal	257	66.75
Self-employed	82	21.30
Unemployed	46	11.95
Monthly income(R)		
<3500	12	3.12
3500>8500	48	12.47
8500>13500	34	8.83
13500>18500	102	26.49
18500>23500	79	20.52
>23500	110	28.57
Food expenditure(R)		
<1000	34	8.83
1000<2000	159	41.30
2000<3000	152	39.48
3000<4000	15	3.90
>4000	25	6.49

Source: Field survey

Table 4.1 above presents a summary of consumers' socio-economic characteristics. The results showed that the majority (44.16%) of the spices' and herbs' consumers were between twenty-seven and thirty-seven years old. Additionally, married respondents were in the majority (62%) of those who consumed spices and herbs. Majority of the consumers (56%) were from households with a minimum of two and maximum of four members. Again, 75% of consumers were females. The results further revealed that 65% of the consumers had tertiary educational qualifications, while 84% were Christians. Amongst the ethnic groups, the majority (44%) of the consumers were from the Black group, followed by the White consumers who recorded 30%. Formally employed consumers were in the majority with 67%, while the unemployed were the lowest number with 12%. The largest group (29%) of the spices' and herbs' consumers earned a monthly income of above R24000, while the least number (3%) earned less than R3500 per month. Lastly, 41% of the consumers spent a minimum of R1000 and maximum of R2000 on food, including spices and herbs.

Table 4.2 Consumers consumption summary for spices and herbs

Variable	Frequency	Percentage
Number of years consuming spices		
< 5 years	127	32.99
5<10	145	37.99
>10	113	29.35
Number of year consuming herbs		
< 5 years	153	39.74
5<10	142	36.88
>10	90	23.38

Source: Field survey

Table 4.2 provides a summary of consumption history of spices and herbs. The results showed that most of the spice consumers (38%) had consumed spices for an average of eight years. This is followed by those who had consumed spices for five years and less. The last group of spice consumers have been consuming them for more than ten years and were marked by a recording of 29%. On herbs, a majority (40%) of the respondents have been consuming herbs for five years and less, followed by those who have been consuming herbs for an average of eight years. The last group, which is the smallest with 24%, have been consuming herbs for ten years and longer.

Table 4.3: Consumers' preferred place for purchasing spices and herbs

Spice and herbs preferred place of purchase

	Spices		Herbs	
Place of purchase	Frequency	Percentage	Frequency	Percentage
Grocery store				
No	41	10.65	43	11.17
Yes	344	89.35	342	88.83
Spice and herb shops				
No	217	56.36	221	57.40
Yes	168	43.64	164	42.60
Farm supermarkets				
No	242	62.86	201	52.21
Yes	143	37.14	184	47.79

Source: Field survey

Table 4.3 presents a summary of consumers' preferred place for purchasing spices and herbs on a daily basis. From the results, most of the consumers, 89% and 89% respectively, preferred purchasing their spices and herbs in grocery stores. On the other hand, 44% and 43% respectively, utilized spice and herb shops to purchase their products. Similar results were reported for farm supermarkets as an alternative point of purchase for spices and herbs, as only a small minority of the consumers used them for purchasing their spices and herbs.

4.3 Socio-economic attributes of the respondents related to preferences for source of spices and herbs

The socio-economic characteristics of the respondents in relation to preference for spices and herbs are presented in the table below using frequencies and percentages

Table 4.4: Socio-economic characteristics of the respondents in relation to preference for spices and herbs origin

	Spices Origin						Herbs Origin					
	Local spices		Imported spices		Not particular		Local herbs		Imported herbs		Not particular	
Variables	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Age												
<27	9	5.77	0	0.00	23	11.62	10	6.17	2	3.45	20	12.12
27<37	50	32.05	29	93.55	91	45.96	51	31.48	40	68.97	79	47.88
37<47	76	48.72	0	0.00	40	20.2	76	46.91	4	6.9	36	21.82
47<57	9	5.77	2	6.45	33	16.67	13	8.02	8	13.79	23	13.94
>57	12	7.69	0	0.00	11	5.56	12	7.41	4	6.9	7	4.24
Marital status												
Single	33	21.15	28	90.32	60	30.3	36	22.22	39	67.24	46	27.88
Married	100	64.1	3	9.68	137	69.19	103	63.58	18	31.03	119	72.12
Other	23	14.74	0	0.00	1	0.51	23	14.2	1	1.72	0	0.00
Household size												
<2	59	37.82	3	9.68	22	11.11	59	36.42	7	12.07	18	10.91
2<4	70	44.87	27	87.1	120	60.61	75	46.3	42	72.41	100	60.61
4<6	27	17.31	1	3.23	33	16.67	27	16.67	7	12.07	27	16.36
>6	0	0.000	0	0.00	23	11.62	1	0.62	2	3.45	20	12.12
Gender												
Male	38	24.36	28	90.32	29	14.65	38	23.46	32	55.17	25	15.15
Female	118	75.64	3	9.68	169	85.35	124	76.54	26	44.83	140	84.85
Education level												
No formal	16	10.26	1	3.23	10	5.05	16	9.88	2	3.45	9	5.45
Primary	8	5.13	1	3.23	13	6.57	8	4.94	1	1.72	13	7.88
High school	46	29.49	3	9.68	37	18.69	47	29.01	6	10.34	33	20.00
Tertiary	86	55.13	26	83.87	138	69.7	91	56.17	49	84.48	110	66.67
Religion												
Christian	143	91.67	31	100	148	74.75	146	90.12	50	86.21	126	76.36
Non-Christian	13	8.33	0	0.00	50	25.25	16	9.88	8	13.79	39	23.64
Ethnicity												
Black	115	73.72	1	3.23	52	26.26	116	71.6	8	13.79	44	26.67
Coloured	23	14.74	0	0.00	1	0.51	22	13.58	1	1.72	1	0.61
White	4	2.56	29	93.55	81	40.91	8	4.94	40	68.97	66	40.00

Asian	14	8.97	1	3.23	64	32.32	16	9.88	9	15.52	54	32.73
Employment status												
Formal	96	61.54	22	70.97	139	70.2	101	62.35	39	67.24	117	70.91
Self employed	49	31,41	4	12,9	29	14,65	49	30,25	7	12,07	26	15,76
Unemployed	12	7,05	5	16,13	30	15,15	12	7,41	12	20,69	22	13,33
Monthly income												
<3500	12	7,69	0	0.00	0	0.00	12	7,41	0	0.00	0	0.00
3500>8500	23	14,74	2	6,45	23	11,62	24	14,81	5	8,62	19	11,52
8500>13500	0	0.00	0	0.00	34	17,17	4	2,47	4	6,9	26	15,76
13500>18500	40	25,64	0	0.00	62	31,31	40	24,69	6	10,34	56	33,94
18500>23500	32	20,51	0	0.00	47	23,74	34	20,99	7	12,07	38	23,03
>23500	49	31,41	29	93,55	32	16,16	48	29,63	36	62,07	26	15,76
Food expenditure												
<1000	12	7.69	1	3.23	21	10.61	13	8.02	4	6.90	17	10.30
1000<2000	112	71.79	1	3.23	46	23.23	114	70.37	4	6.90	41	24.85
2000<3000	28	17.95	28	90.32	96	48.48	31	19.14	45	77.59	76	46.06
3000<4000	2	1.28	1	3.23	12	6.06	2	1.23	3	5.17	10	6.06
>4000	2	1.28	0	0.00	23	11.62	2	1.23	2	3.45	21	12.73

Source: Field survey

Table 4.4 presents a summary of the socio-economic characteristics of the respondents in relation to their preferences for the sources of spices and herbs. The first model of the results presents spice origin, while the second model presents herbs origin. Both models have three categories of origin of commodities namely: local, imported, and not particular about origin of the spices and herbs. From the first model, results on age shows that the majority (49%) of the respondents who preferred local spices were between the ages of thirty-seven and forty-seven. Of those that preferred imported spices, the majority (94%) were aged between twenty-seven and thirty-seven. Consumers who were not particular about the origin of the spices also showed a majority in the age group of twenty-seven to thirty-seven, at 46%.

On marital status, most of the consumers (64%) who preferred local spices were married, while most of those who preferred imported spices were single (90%). The respondents who were not particular about the origin of the spices were 69%. Local spices were also preferred by 75% of the consumers with household sizes of between two and four members. Similarly, 87% of the respondents who preferred imported spices were from household size of between two and four members, while those who were not particular about the origin of spices made up 60% of the same household size group.

Based on gender, most of the female respondents (76%) showed preference for local spices. However, most of the male respondents (90%) showed preference for imported spices. For those respondents who were not particular about the origin of spices, female accounted for 85%, more than their male counterparts. Furthermore, 55% of the respondents with tertiary educational qualifications showed preference for local spices as against 84% of this group with preference for imported spices. A similar pattern was noticed among those who were indifferent about the origin of spices, with 70% of them having tertiary educational qualifications.

The results for religion revealed that Christians dominated the three categories of preferences, with recordings of 92%, 100% and 75% respectively on preference for local spices and imported spices as well as those that were not particular about the origin of spices. Ethnicity, on the other hand, revealed that a majority (74%) preference for local spices was dominantly from the Black consumers. However, on imported spices, 94% of the consumers from the White group showed dominance over the other ethnic groups. Lastly, on ethnicity, most of the

consumers who were not particular about the origin of spices was recorded from the White group with 41%.

Furthermore, 62% of the consumers who were formally employed showed preference for local spices. Also, 70% of the consumers who were formally employed showed preference for imported spices. However, 70% of the consumers with formal employment were not particular about the origin of spices. Also, 31% and 94% of the respondents who earned R23 500 monthly showed preference for local and imported spices, respectively. However, from the group that was not particular about the origin of spices, respondents who earned an average of R16 000 recorded the highest preference with 31%. Lastly, on food expenditure, preference for local spices was highest among the respondents who spent an average of R1500 on food monthly. From the last group of consumers who were not particular about the origin of spices, respondents who spent an average of R2500 showed the most preference.

Table 4.4 also shows the consumers' demand preferences in relation to herbs. The results are also categorised into three groups namely: local preference, imported preference, and not particular about the origin of herbs. The results revealed that preference for local herbs was high in respondents aged between thirty-seven and forty-seven years with 47%. On imported herbs, the highest preference for the age categories was recorded for respondents in the twenty-seven and thirty-seven age range. Among the respondents who were not particular about the origin of herbs, the age group of twenty-seven to thirty-seven records the highest percentage. On marital status, preference for local spices was highest among the respondents who were married (64%). However, for imported herbs, preference was highest among respondents who were single (90%).

Also, preferences were highest among respondents from households with two or three with 46% for local herbs, 72% for imported herbs, and 60% for those who were indifferent. Moreover, female respondents showed more preference (77%) for local herbs than their male counterparts. On the other hand, male respondents showed more preference for imported herbs (55%). The results for education level revealed that the respondents who held tertiary level of education preferred both local and imported herbs with 56% and 85%, respectively.

The results for religion and preference for herbs showed that Christians preferred both local and imported herbs with 90% and 86%, respectively. Most of the respondents who were not particular about the origin of herbs were also from the Christian group with 76%. From the ethnicity groups, preference for local herbs was highest amongst the Black group with a 72%,

while for imported herbs, preference was highest amongst the White group with 69%. A majority (40%) of the respondents who were not particular about the origin of herbs was recorded from the White ethnic group. Employment status also showed that local herbs were preferred mostly by the respondents who were formally employed with 62% and 67% for the local and imported products, respectively. Moreover, formally employed respondents were the majority (71%) in the category of those who were not particular about the origin of herbs.

Based on the respondents' monthly incomes, 30% and 62% of those who earned an average of R 23000 monthly respectively prefered local and imported herbs. Those who also showed preference but were not particular about the origin of the herbs earned an average of R16000 monthly. The respondents who spent an average of R1500 showed preference for local herbs while those who spent R2500 showed a higher preference for imported herbs. A majority (46%) of the respondents showed no particular preference for the origin of the herbs.

4.5 Respondents' Preferred Forms of Spices and Herbs

Table 4.5: Summary of the forms in which respondents prefer spices and herbs

Form	Spices		Herbs	
	Frequency	Percentage	Frequency	Percentage
Fresh				
No	326	84.68	17	4.42
Yes	59	15.32	368	95.58
Whole				
No	283	73.51	280	72.73
Yes	102	26.49	105	27.27
Dried				
No	142	36.88	80	20.78
Yes	243	63.12	305	79.22
Crushed				
No	107	27.79	98	25.45
Yes	278	72.21	287	74.55
Seeds				
No	112	29.09	329	85.45
Yes	273	70.91	56	14.55
Essential oil				
No	322	83.64	282	73.25
Yes	63	16.36	103	26.75

Source: Authors Compilation from Survey Data

Table 4.5 above summarises the forms in which the respondents preferred to consume spices and herbs. The table comprises of six forms made up of two sets, one for spices and the other for herbs. The first set represents the fresh form followed by whole, dried, crushed, seeds, and essential oil form. The results show that a majority (72.21%) of the consumers preferred crushed spices followed by 70.91% who preferred them in the form of seeds, then 63.12% who preferred their spices dried. Some of the forms preferred include fresh, whole and processed into essential oils and this accounts for 15.32%, 26.49% and 16.36% respectively. Similarly, herbs are used in different forms, like spices, and the results of the survey revealed that a majority (95.58%) of the consumers preferred their herbs fresh, 79.22% preferred dried, while 74.55% preferred theirs in a crushed form.

4.7 Determinants of Consumers' Preferences for the Sources of Spices and Herbs

This section presents the results of analyses for the determinants of consumers' preferences for the sources of spices and herbs in Gauteng province. The first sub-section presents multinomial logit model results for spices, followed by the results from the consumer preference for sources of herbs.

4.8 Multinomial Logit model estimates for spices preferences

Table 4.6: Estimation of multinomial logit model for consumer's preference for sources of spices: Spice origin (three categories- local, imported, not particular about origin)

Variable	Coefficient	Std. Err	P Value	dy/dx	p> IzI
(Local spices vs no preference)					
Socio-economic factors					
Age	0.015	0.018	0.409	0.002	0.445
Marital status	1.188	0.284	0.000	0.288***	0.000
Household size	-0.439	0.082	0.000	-0.076***	0.000
Gender	-2.056	0.427	0.000	-0.318***	0.000
Education level	0.018	0.143	0.902	0.009	0.731
Product attributes					
Labelling	-0.095	0.164	0.563	-0.245	0.454
Attractiveness	-1.039	0.254	0.000	-0.151**	0.002
Health attribute	0.307	0.235	0.193	0.083*	0.093
Packaging	0.358	0.191	0.062	0.067*	0.074
Taste	-0.238	0.217	0.273	-0.053	0.222
Availability in the market	-0.197	0.185	0.285	-0.040	0.918
Cons	2.926	1.220	0.017		
(Imported spices vs not particular)					
Socio-economic factors					
Age	0.010	0.040	0.797	0.000	0.988
Marital status	-1.200	0.713	0.091	-0.094**	0.002
Household size	-0.516	0.149	0.001	-0.010*	0.081
Gender	-3.761	0.774	0.000	-0.114***	0.000
Education level	-0.198	0.315	0.531	-0.009	0.483
Product attributes					
Labelling	0.142	0.330	0.666	0.009	0.510
Attractiveness	-2.205	0.636	0.001	-0.072**	0.009
Health attribute	-0.598	0.741	0.420	-0.037	0.266
Packaging	0.262	0.403	0.514	0.001	0.941
Taste	0.085	0.409	0.834	0.011	0.534
Availability in the market	-1.212	0.705	0.085	-0.051**	0.011
Cons	7.190**	2.622	0.006		
Number of observations	385				
LR Chi2 (22)	153.210				
Prob > chi^2	0.000				
Pseudo R^2	0.219				
Log Likelihood	-272.66784				

Table 4.6 above shows that from the first model, five explanatory variables were statistically significant for preference for local spices at different levels. The results for local choice showed that being married has a positive and significant parameter with a marginal coefficient of 0.288. The result implies that compared to those with no preference, those who were married had a higher probability of preferring local spices. This could be due to the support from spouses among married people, who may exhibit healthier behaviour. Similar results were conveyed by Vinther et al. (2016) and Haapala et al. *(*2012), who indicated that marital status plays an vital

part in the preference of local food against imported. This implies that the economic well-being of married consumers (in terms of support for each other) may be better than that of an individual who is divorced. Therefore, the tendency for married couples to be able to afford buying quality local spices is higher.

On the other hand, household size showed statistical significance on preference for local spices and a negative effect on preference for local spices with a coefficient of -0.076. This means that, compared with those with no preference, an increase in household size reduces the probability of preferring local spices. The results are however contrary to literature from previous studies that mentioned that household size has a positive influence on demand preference for food (Bryla, 2021). However, Skallerud and Wien (2019) reported a negative correlation between household size and food choices, indicating that as household size increases, consumers are likely to ease preference for local food. This could be as a result of a decrease in the budget share of food as the number in the household increases.

The parameter of gender showed statistical significance and a negative effect on preference for local spices with a marginal coefficient of -0.318. This implies that, compared with those with no preference, females tend to buy less local spices than their male counterparts. The outcome is contrary to the conclusions of Salleh et al. (2018), who highlighted that females, being the decision-makers when it comes to family meals, tend to prefer locally-produced food commodities. Marginal effect of the results of the parameter also showed a negative effect on preference for local spices and statistical significance, with a coefficient of -0.114 and p value of 0.000.

The parameter of attractiveness showed a negative coefficient of -0.151 and statistical significance. The result implies that, compared to those with no preference, those who were in favour of the attractive attribute had a lower probability of preferring local spices. Similarly, Picha et al. (2018) indicated that consumers tend to show more preference for local food that looks attractive with some essence of freshness linked to it. Attractiveness of food products provides an increased level of appeal to the consumers.

Similarly, results on packaging recorded a positive effect with a marginal effect of 0.067 which was statistically significant for preference for local spices over the base model. The results implied that, compared to those with no preference, those are concerned about products' packaging had a higher probability of choosing local spices. The results are contrary to those reported by Jensen et al. (2019) and Steenis et al. (2017), who stated that proper packaging of

food is not only good for shelf life but also tends to influence consumers' preference for such, as it looks appealing and provides some element of safety in it.

From the second model on preference for spices that were imported against the base model of having no preference for origin of spices, marital status showed a negative effect and is statistically significant for imported spices with a marginal effect coefficient of -0.094. This implies that, compared to those with no preference, those who were married showed a lower probability of preferring imported spices. The results differ from those reported by Wekeza and Sibanda (2019), who indicated that marital status positively influenced preference for imported food. This could be due to food safety issues that are associated with proper handling of food before it reaches the hand of the consumer. In most cases, consumers prefer food that is produced and processed locally for them to also be able to trace the food back to its source.
On the other hand, household size showed a negative effect (-0.010) on preference for imported spices and a statistical significance. Compared with those with no preference, larger household size showed a lower probability of preferring imported spices. This could be due to an increase in demand for food in the household, thus putting pressure on money allocated for various food products. Similar results were reported by McKinnon (2014), who stated that additional members in the household tend to put pressure on finances and thus force consumers to make priorities when purchasing their food.
Similarly, results from gender showed a negative effect (-0.114) for preference for imported spices. The results however showed statistical significance, with p value of 0.000, and this implies that, compared with those with no preference, female respondents had a lower probability of preferring imported spices. The outcome is aligned with results reported by Piao et al. (2020), who indicated a positive association between gender and preference for imported rice. The results of this study could imply that consumers gender plays an important role in preference for imported spices due to reduced trust of food from other countries.
Moreover, the parameter of concern for products' attractiveness recorded a negative coefficient -0.072 with a p value of 0.001. The result implies that compared to those who showed no preference, those who favoured spice attractiveness had a lower probability of preferring local spices. According to Ikonen et al. (2020) and Kodali and Telaprolu (2018), attractiveness of food products plays a vital part in increasing the probability of imported foodstuff being preferred over local food as it provides some sense of improved traits and taste. Lastly, from the second model, availability showed a negative association with preference for imported spices and a statistical significance and a negative effect of -0.051. The results of the parameter

implied that, compared to those who showed no preference, availability of imported spices in the market had a lower probability of being preferred. The results are however contrary to those reported by Jeli (2017), who reported a positive association between availability and preference for imported rice in Kelantan.

Results from the two models against the base model highlight that marital status, household size, gender, attractiveness, packaging, and availability in the market somehow showed an effect on preference for both local and imported spices. The next section presents multinomial logit results on consumer preference for herbs, with three preference levels.

4.9 Multinomial Logit model estimates for herbs preferences

Table 4.7: Estimation of multinomial logit model for consumer's preference for sources of herbs: Herb origin (three categories- local, imported, not particular about origin)

Variable	Coefficient	Std. Err	P Value	dy/dx	P Value
(Local herbs vs not particular)					
Socio-economic factors					
Age	-0.054	0.024	0.030	-0.008*	0.052
Marital status	2.355	0.386	0.000	0.436***	0.000
Household size	0.710	0.102	0.000	-0.105***	0.000
Gender	-3.027	0.542	0.000	-0.414***	0.000
Education level	-0.140	0.159	0.381	-0.283	0.302
Product attributes					
Labelling	0.312	0.189	0.099	0.052*	0.096
Attractiveness	-1.360	0.278	0.000	-0.187***	0.000
Health attribute	0.000	0.264	0.997	0.012	0.795
Packaging	0.993	0.225	0.000	0.144***	0.000
Taste	0.121	0.233	0.602	0.025	0.526
Availability in the market	-0.284	0.198	0.151	-0.016	0.541
Cons	5.253	1.474	0.000		
(Imported herbs vs not particular)					
Socio-economic factors					
Age	-0.504	0.042	0.231	0.000	0.703
Marital status	-0.054	0.688	0.937	-0.090**	0.005
Household size	-0.684	0.146	0.000	-0.012*	0.067
Gender	-3.854	0.752	0.000	-0.104**	0.002
Education level	0.686	0.326	0.833	0.009	0.597
Product attributes					
Labelling	0.144	0.300	0.630	-0.003	0.819
Attractiveness	-1.712	0.531	0.001	-0.045*	0.092
Health attribute	-0.320	0.551	0.561	-0.018	0.539
Packaging	1.040	0.371	0.005	0.021*	0.241
Taste	-0.076	0.409	0.852	-0.008	0.680

Availability in the market	-0.820	0.496	0.099	-0.035	0.183
Cons	6.422	2.506	0.010		
Number of observations	385				
LR Chi2 (22)	210.68				
Prob > chi^2	0.000				
Pseudo R^2	0.294				
Log Likelihood	-252.60169				

In Table 4.7 above, results show that seven explanatory variables from the first model and five from the second model were statistically significant, with different levels and magnitude of each coefficient. The first parameter, age, showed statistical significance and a negative association with local herbs, with a coefficient of -0.008 and p value of 0.030. The results implied that, as consumers age, their preference for local herbs decreases and this could be due to lack of trust of locally-produced herbs. The results are, however, contrary to those reported by Denver and Jensen (2014), who revealed that preference for local food increases with age. Among local choices, marital status reported a statistical significance ($p<0.000$) and a positive impact of 0.436 on preference for locally-sourced herbs. The results implied that, compared to those with no preference, those who are married showed a higher probability of preferring local herbs. This is due to the effect of spousal support in decision making. Similarly, Sedem et al. (2017) also reported that being married increased preference for local rice in Ghana. In addition, household size recorded a negative effect with marginal coefficient of -0.105 on preference for local herbs and statistical significance, with $p<0.000$. This means that, compared to those with no preference, household size showed a higher probability of preference for local herbs. The results are contrary to those reported by Codjoe et al. (2016), who reported that household size decreases preference for local food. This could be due to the fact that as the number of household members' increases, demand for local herbs increases, and thus also preference and consumption of the commodity. Gender was found to have a negative association with preference for local herbs, with a marginal effect coefficient of -0.414. The results implied that, compared to those with no preference, gender showed a lower probability of preference for local herbs. The results are in agreement with those reported by Ogunleke (2020), who also postulated that gender had a negative effect on preference for local food.

Concerning households' preference for attractiveness, the parameter is negatively signed (-0.187) and statistical significance ($p<0.000$) for local herbs. The results implies that, compared to those who showed no preference, those who were for attractiveness showed lower probability for preferring local herbs. This could be because consumers tend to doubt the quality of local food and thus demand less of it. However, on the contrary, Nwachukwu and

Achike, (2020) reported that attractiveness showed a positive relationship with preference for local rice versus imported rice in Enugu State, Nigeria. Furthermore, results on packaging recorded a positive effect of 0.144 and statistical significance ($p<0.000$) for preference for local herbs. The results implied that, compared to those who showed no preference, those who were for packaging had a higher probability of preferring local herbs. This could be because packaging prevents waste and is associated with good quality and improved shelf life. Similarly, Picha et al. (2018), reported that consumers' preference for local food was highly influenced by proper food packaging. The results are also in agreement with those reported by Wyrwa and Barska (2017), who stated that consumers prefer food products that are properly packaged and also that possess good taste.

Results on labelling showed statistical significance with a p value of 0.09 and a positive association of 0.052 with local herbs. The results implied that, compared to those who showed no preference, those who were for proper labelling had a higher probability of preferring local herbs. According to Profeta and Hamn (2019), consumers in Germany showed preference for local food that was properly labelled. Also, Parcell and Gedikoglu, (2012) reported that consumers preferred domestic food versus imported food, and mostly labelling played a significant role. Surprisingly, availability in the market showed a negative impact and statistical significance, with preference for local spices over the base model. This implies that, compared to those who showed no preference, those who were for availability in the market showed lower probability for preferring local herbs. The results differ from those reported by Udomkun et al. (2018) and Vainikka (2015), who indicated that product availability plays an important role in consumer loyalty for products in the market.

From the second model on preference for herbs that were imported, household size showed a negative effect of -0.012 and statistical significance with preference for imported herbs. The results implied that, compared with those who showed no preference, an increase household size had a lower probability of preferring imported herbs. The results are in agreement with those reported by Jeli (2017), who highlighted that consumers' preference for local food was highly influenced by the number of members in the household. This could be due to an increase in demand for herbs which tends to result in constraints of budget for food in the household.

In addition, gender showed a negative association (-0.104) with preference for imported herbs and a statistical significance. The results are however contrary to those reported by Piao et al. (2020), who reported a positive association between age and imported rice. Attractiveness and availability also reported a negative association (-0.045 and -0.035 respectively) with imported herbs in the province. This implies that, compared with those who showed no preference, those

who were for attractiveness and availability of herbs had a lower probability of preferring imported herbs. The results are however contrary to those reported by Yang and Panjaitan, (2021) and Sinanga (2017), who indicated that attractiveness and availability play an important role in influencing consumer preference for imported food.

Lastly, packaging of food showed a positive association with preference for imported food. The parameter reported a coefficient of 0.021 and p value of 0.009. The results implied that, compared to those who showed no preference, those who preferred imported herbs paid attention to the packaging of the herbs. Proper packaging plays an important role in protecting food from outside damage and also to provide consumer with vital information regarding the food product. These outcome is in with results that were reported by Bukhari et al. (2020), who also emphasised the importance of packaging in influencing preference for imported western food products.

Results from the two models against the base model highlight that age, marital status, household size, gender, labelling, attractiveness, packaging, and availability of herbs in the market had an impact on influencing probability of preference for herbs. From the first model on preference for local herbs, marital status, household size, labelling, and packaging showed a positive association with preference while the other parameters showed a negative association.

4.10 Chapter summary

The aim of this chapter was to present a summary of consumers' socio-economic and demographic characteristics in the province and also identify the determinants of consumers' preferences for the origin of culinary spices and herbs in. The results revealed that the majority of spice and herb consumers were of an average age of thirty-two years, married and from a household that consisted of three members. Moreover, a majority of the consumers were female, had tertiary educational qualifications, and were from a Christian background. In addition, the Black ethnic group dominated the spice and herb consumers, were formally employed and earned an average monthly income of R23000 with a monthly food expenditure of R1500. The majority of the consumers have been consuming spices and herbs for at least five years and more, and preferred purchasing their supply from grocery stores. From the preferred forms of spices and herbs, the data revealed that the majority of the consumers preferred their spices in a dry, crushed or seed form, while a majority preferred their herbs in a fresh, dried or crushed form. The subsequent chapter details further the results on determinants of consumer preference for sources of spices and herbs in the province. Results from the

multivariate analysis revealed that preference for spices and herbs was influenced by socio-economic factors such as age, gender, and marital status. Other factors associated with preference were age, marital status, gender, product labelling, packaging, and availability in the market. Given the general determinants of preference for spices and herbs, the next chapter will look at factors that influence willingness to pay for different spices and herbs in Gauteng province. The next chapter presents the results on determinants of consumer utilization and utility for spices and herbs in Gauteng.

CHAPTER FIVE
DETERMINANTS OF CONSUMER UTILIZATION AND UTILITY FOR SPICES AND HERBS

5.1 Introduction

This chapter presents analysis of the determinants of consumers' utilization and utility for spices and herbs in Gauteng province. The chapter is divided into two sections. The first section presents the results of consumer utilization choices, followed by determinants of consumers' utility for spices and herbs in the province. Lastly, the summary of the chapter is based on the results presented.

5.2 Spices Utilization

Utilization indices for spices were computed using the Principal Component Analysis (PCA). From an initial set of correlated variables, PCA creates uncorrelated indices or components, where each component is a linear weighted combination of the initial variables. The uncorrelated property components are highlighted by the fact that they are perpendicular. The weights of each component are given by the eigenvectors of the correlation matrix, or, if the original data were standardized, the co-variance matrix (Jolliffee and Cadima, 2016). The variance (λ) for each principal component is given by the eigenvalue of the corresponding eigenvector. The components are ordered so that the first (PC1) explains the largest possible amount of variation in the original data, subject to the constraint that the sum of the squared weights is equal to one. As the sum of the eigenvalues equals the number of variables in the initial data set, the proportion of the total variation in the original data set accounted for by each principal component is given byλ_i/n. The second component (PC2) is completely correlated with the first component, and explains additional but less variation than the first component, subject to the same constraint (Nasser, 2019). Subsequent components are uncorrelated with previous components; therefore, each component captures an additional dimension in the data, while explaining smaller proportions of the variations of the original variables. The higher the degree of correlation among the original variables in the data, the fewer components required to capture common information.

The results from the principal component for each spice and herb is shown below (tables attached in the appendices). The interpretation of the principal components is based on finding variables that are strongly correlated to each component, that is, numbers that are large in

magnitude, the farthest from zero in each direction. In this particular study, the level of correlation above 0.5 is deemed significant.

Further to the utilization of spices and herbs, the Breusch-Pagan test for heteroscedasticity shows that, when compared to a Chi square distribution with one degree of freedom, some of the p values fell below the standard 0.005 level. To correct for heteroscedasticity in the residual of the regression model, robust standard errors were used (heteroscedasticity results for each model are in the appendices).

In addition, to evade discrepancy and biasness from the estimated parameters, the study exposed the fitted variables to a multicollinearity test using Collin command (mfx) in STATA. Variance Inflation Factors (VIF) was used to test multi-collinearity in which the variables were assumed not to be collinear if inflation factors were contained in a range of 1-10. To achieve a tolerable range of VIF, some variables were dropped to produce a model with significant coefficients. The mean VIF was recorded at 2.89 and regarded as acceptable, as it was below five (Table of results in the appendix).

5.2.1 PCA results for cumin

Cumin results on appendix 1 revealed that about 34% of the variation was explained by the first main component. Additionally, the first five principal componentsaccounted for 100% of the variation, but the first three principal components only explained 76%.

The first principal component was strongly correlated with three of the original variables. The first principal component increased with health, medical, and taste scores. The results proved that these three criteria vary together. If one increased, then the remaining ones tend to increase as well. The component was therefore viewed as a measure of the quality of health, medical, and taste. Furthermore, the first component was highly correlated with health. In fact, based on the correlation of 0.5706, this principal component was primarily regarded as a measure of health. The second principal component increased with increasing consumption of cumin for weight management and can be viewed as a measure of weight management. Only one of the values - that of reducing aroma -led to an increase in the third main component. Contrarily, the component grew with higher ingestion as a result of cumin's flavour. This factor largely evaluated scent, with taste being measured to a lesser extent. A weight and health assessment as well as a taste assessment made up the fourth factor. The element was linked to poorer taste,

greater medical, and weight assessments. The fifth main factor was correlated with high medical measure and negative health ratings.

5.2.2 PCA results for mustard

Mustard results on appendix 2 revealed that for mustard, the first main component accounted for around 35% of the variation. Additionally, the first five principal componentsaccounted 97% of the variation, while the first three principal components only explained 74%.

The first principal component was strongly correlated with two of the original variables. The first principal component increased with medical and aroma scores. This revealed that if one increased, the other will also increase as well. The component was therefore viewed as a measure of medical and aroma. The first component was highly correlated with medical use for mustard. In fact, based on the correlation of 0.5853, this principal component was primarily a measure of medicinal use. The second principal component increased with increasing consumption of mustard for health reasons and decreased with weight management, and can therefore be viewed as a measure of health. With just one of the values—the additional uses for mustard—the third main component rose. On the other hand, taste and weight control boosted the fourth primary component. But the ingredient was mostly a test of taste, with a small amount of weight control.

The fifth main factor was thought to be a gauge for mustard's scent and potential medicinal use. The component was associated with a higher taste and lower medical ratings. The sixth and the last principal component was associated with medical use for mustard and was marked by a rating of 0.5299

5.2.3 PCA results for turmeric

Turmeric results on appendix 3 revealed that for turmeric, the first main component accounted for around 31% of the variation. Additionally, the first three main components accounted for 71% of the variation, whereas the first five principal components accounted for 94% of it.

The first principal component was strongly correlated with three of the original variables. The first principal component increased with other uses of turmeric, medical, and weight then the remaining ones tend to increase as well. The component was therefore viewed as a measure of other benefits, medical, and weight management respectively. Based on the measurement of 0.6003, this primary component was primarily viewed as a gauge of additional advantages associated with turmeric. Due to the aroma and health benefits of turmeric, the second main component increased with rising consumption and can be seen as an indicator of aroma and, to

a lesser extent, health. The consumption of turmeric increased due to taste, while the third component increased with just one of the values. The fourth element was regarded as a gauge for weight control and fragrance. The element was linked to lower ratings for weight management and increased fragrance.

The fifth component was associated with a high measure of medical and a low on weight management, and this implies that the component is more of a measure for medicinal than weight management. Lastly, the sixth component increased with only one of the values, increasing with other uses of turmeric with a rating of 0.6709.

5.2.4 PCA results for red chilli

Results on chilli on appendix 4 revealed that for red chillies, the first main component accounted for around 24% of the variation. Additionally, the first five principal componentsaccounted for 90% of the variation, but the first three principal components only explained 59% of it.

The first principal component was strongly correlated with two of the original variables. The first principal component increased with aroma and taste scores. This suggests that if one increased, the others will also increase as well. The component was viewed as a measure of aroma and taste. Based on the correlation of 0.6695, this principal component was primarily regarded as a measure of taste. The second principal component increased with increasing consumption of red chilli for health benefits and other benefits. The component, which grew with both variables, can be used as a gauge of the health benefits and, to a lesser extent, the advantages from other factors. With the addition of one of the values, the red chili's therapeutic properties, the third main component grew. On the other hand, the fourth key factor increased with weight control and reduced with red chilli's scent. The ingredient served primarily as a weight-management tool and only somewhat as a red chili pepper scent enhancer. A red chilli health and other use index is the sixth main component. The element was mostly used for health purposes and had few additional uses. The final element had relationships with the scent and flavour, two of the initial elements. The component was considered to be a measure of taste, and to a lesser extent, scent, with a strong correlation of 0.6988.

5.2.5 PCA results for coriander

Coriander results on appendix 5 revealed that for coriander, the first main component accounted for around 27% of the variation. Additionally, the first five principal

componentsaccounted for 90% of the variation, but the first three principal components only explained 63% of it.

The first principal component was strongly correlated with three of the original variables – taste, health, and weight management. The first principal component increased with aroma followed by taste and weight management scores. This suggests that if one increased, the others will also increase as well. The first component was highly correlated with aroma for coriander. In fact, based on the correlation of 0.5697, this principal component was regarded as a measure of aroma. The second principal component increased with increasing consumption of coriander for medicinal benefits. The component increased with an increase in medicinal use for coriander and is therefore regarded as a measure for medicinal use. The third principal component increased with one of the values, the other uses for coriander. On the other hand, the fourth principal component, was more of a measure for taste for coriander with a rating of -0.6130. The fifth principal component was recorded as a measure of health and weight management for coriander. The component was associated with a higher weight management and lower health benefits. The last component was correlated with aroma for coriander and with a strong correlation of 0.7162, the component is regarded as a measure of aroma.

5.2.6 PCA results for Black pepper

Black pepper results from appendix 6 revealed that for Black pepper, the first major component accounted for around 28% of the variation. In addition, the first five principal componentsaccounted for 90% of the variation, while the first three main components only explained 74%.

The first principal component was strongly correlated with two of the original variables, health and weight management. The first principal component increased with weight management followed by health benefit scores. This suggests that if one increased, the others will also increase as well. This primary component was largely viewed as a measure of weight management and, to a lesser extent, health benefits, based on the correlation of 0.5855. As Black pepper use for flavour grew, the second main component also did. It is thought of as a measure of flavour because the component grew as taste increased. The value of the aroma of Black pepper increased the third main component. A value of -0.7773 was assigned to the fourth primary component, which served as a measure for medicinal usage. Three of the original variables, taste, health, and weight management were linked with the fifth main component for Black pepper. The element was linked to better health and worse weight control.

The component, which had a rating of -0.5272, declined as weight control improved. This led to the component being seen as a gauge of taste and, to a lesser extent, health benefits.

5.2.7 PCA results for cinnamon

Cinnamon results from apprendix 7 revealed that for cinnamon, the first main component accounted for around 23% of the variation. Additionally, the first five principal componentsaccounted 93% of the variation, while the first three principal components only explained 78%.

The first principal component was strongly correlated with two of the original variables – taste and medicinal benefits. The first principal component increased with medicinal benefits followed by taste scores. This suggests that if one increased, the others will also increase as well. This primary component's correlation score of 0.6847 indicates that it mostly measures flavour and, to a lesser extent, health benefits. With increased intake of cinnamon for its health advantages and aid in weight management, the second primary component grew. The component increased with an increase in both variables and is therefore regarded as a measure of health due to a high correlation of 0.6958. The third principal component increased with one of the values, the other benefits for cinnamon. On the other hand, the fourth principal component, was more of a measure for aroma with a rating of 0.8686. The fifth principal component was correlated with other benefits for cinnamon with a correlation of 0.6271. The last component was correlated with two of the original variables and is primarily a measure of medicinal, with a rating of 0.5580. and a low of 0.5398 for taste.

5.2.8 PCA results for ginger

Results on ginger from appendix 8 revealed that a little over 30% of the variation was explained by ginger's first main component. Additionally, whereas the first five principal components accounted for 95% of the variation, the first three principal componentsonly explained 77% of it.

The first principal component was strongly correlated with two of the original variables, health and medicinal benefit. The first principal component increased with medicinal followed by weight management scores. This suggests that if one increased, the others will also increase as well. This primary component was considered a measure of medical benefit and, to a lesser extent, health advantages based on the correlation of 0.6335. As more ginger was consumed for its flavour and scent, the second main component also rose. The component increased more

with an increase in aroma than taste and is therefore regarded as a measure of aroma. The third principal component increased with one of the values, the other benefits for ginger, and decreases with weight management. The component was seen as a way to regulate weight and, to a lesser extent, provide other advantages. On the other hand, the fourth primary component, which received a grade of 0.5699, was more of a gauge for other advantages and, to a lesser extent, taste. The aroma and taste of ginger, two of the initial variables, were associated with the fifth main component. The ingredient was linked to higher scores for fragrance and lower ratings for taste. The component, which measures fragrance more so than taste, diminishes as flavour is increased. Two of the initial variables, health and therapeutic benefits, were linked with the final main component. The component received a rating of 0.7145 for medicinal value and a low of 0.5646 for health benefits.

5.2.9 PCA results for masala

Masala results fom appendix 9 revealed that on masala, approximately 25% of the variation was explained by masala's first main component. Additionally, the first five principal components accounted 91% of the variation, whereas the first three principal components only explained 62%.

The first principal component was strongly correlated with two of the original variables, aroma and taste. The first principal component increased with taste, followed by the aroma scores. This suggests that if one increased, the others will also increase as well. According to the correlation of 0.6770, this major component mostly measures the benefits that can be tasted and, to a lesser extent, those that can be smelled. With rising medicinal masala intake and falling health benefits, the second main component grew. The component's value of -0.6739 was used as a gauge of health benefits. The third main factor goes up with one of the values, masala's health benefits, and down with other benefits. The component was regarded a measure of health benefit, with a rating of 0.7946, and to a lesser extent other benefits. On the other hand, the fourth principal component was more of a measure for other benefits, with a rating of 0.7132, and to a lesser extent health benefit, with a rating of 0.5940. The fifth principal component was correlated with two of the original variables, aroma and medicinal benefit for masala consumption. The component was associated with a higher medicinal and lower aroma scores. The component decreases with an increase in aroma and was a measure of medicinal more than of aroma. The last principal component was correlated with taste for masala with a score rating of -07069.

5.2.10 PCA results for cloves

Cloves results from appendix 10 revealed that about 25% of the variation was explained by the first main component for clove. Furthermore, the first five principal components accounted 94% of the variation, whereas the first three principal components only explained 63%.

The first principal component was strongly correlated with two of the original variables, taste and medicinal benefits. The first principal component increased with taste, followed by medicinal scores. This suggests that if one increased, the others will also increase as well. This primary component was predominantly categorized as a measure of taste and to a lesser extent as having therapeutic advantages based on the correlation of 0.7214. With increased consumption of cloves for their aroma and declining usage due to their health benefits, the second main component grew. The component was regarded as a measure of health benefits, with a rating of -0.7086. The third principal component increased with one of the values (0.5010 for other clove benefits), decreases with health benefits. The component was therefore primarily a measure of health benefit with a rating of -0.7059, and to a lesser extent other benefits. On the other hand, the fourth principal component was more of a measure for other benefits, with a rating of 0.7794 and to a lesser extent health benefit, with a rating of 0.5888. One of the initial variables, fragrance, and clove consumption were linked with the fifth main component. The substance was connected to a better scent score of 0.6883. With scores of 0.6473 and 0.5444, respectively, the final main component was linked with the flavor of clove and its therapeutic properties. The ingredient was largely valued for its taste and to a lesser extent for its potential health benefits.

5.2.11 PCA results for Cayenne pepper

Results on cayenne pepper from appendix 11 revealed that for cayenne pepper first major component accounted for around 26% of the variation. Furthermore, the first five principal components accounted 94% of the variation, whereas the first three principal components only explained 72%.

The first principal component was strongly correlated with two of the original variables, weight management and medicinal benefits. The first principal component increased with weight medicinal and weight management scores. This suggests that if one increased, the others will also increase as well. This primary component was largely viewed as a measure of medicinal and, to a lesser extent, health advantages based on the correlation of 0.5934. As more cayenne

pepper was consumed for taste, the second main component grew. The component was therefore regarded as a measure of taste with a rating of 0.7427. The third principal component decreased with one of the values (-0.5259) for aroma with cayenne pepper. The component was therefore primarily regarded as a measure of aroma. On the other hand, the fourth principal component was more of a measure for other benefits, with a rating of 0.6442, and to a lesser extent of health benefit, with a rating of 0.6328. The fifth principal component was correlated with two of the original variables, health benefit and medicinal benefit for cayenne pepper consumption. The component was associated with a higher health benefit score of 0.6888. The last principal component was correlated with aroma and taste benefits for cayenne pepper, with ratings of 0.5996 and -0.6124 respectively. The element's main purpose was to assess flavour, with an aromatic advantage coming in second.

5.2.12 PCA results for White pepper

White pepper results form appendix 12 revealed that for White pepper, the first main component accounted for 41% of the variation. Additionally, the first four principal components accounted for 100% of the variation, while the first three principal components only explained 89% of it.

The first principal component was strongly correlated with two of the original variables, aroma and taste. The first principal component increased with aroma and taste scores. This suggests that if one increased, the others will also increase as well. This primary component was predominantly a measure of scent and, to a lesser extent, taste benefits, according to the correlation of 0.6828. With increased usage of White pepper for its health and other benefits, the second main component grew. The component was regarded as a measure of other benefits, with a rating of 0.7085, and to a lesser extent health benefits, with a score of -0.6926. The third principal component increased with two of the original variables, health and medicinal benefits, with score ratings of 0.6187 and 0.6694 respectively. This suggested that the component's primary purpose was to assess the medical benefit, with a secondary focus on the health benefit. With scores of -0.7244 and 0.6399, the fourth and final components were significantly linked with the scent and flavour of White pepper. The ingredient was mostly used as a gauge for scent and, to a lesser extent, flavour.

5.3 Herbs Utilization

5.3.1 PCA results for rosemary

Resutls on rosemary from appendix 13 revealed that the first primary constituent of rosemary accounted for about 31% of the variation. The first three principal components only explained 69% of the variation, while the first five principal components explained 97% of it.

The first principal component was strongly correlated with two of the original variables, health and medicinal benefit. The first principal component increased with medicinal, followed by weight management scores. This implies that if one were to increase, the others would follow suit. This primary component was viewed as a measure of medical value and, to a lesser extent, health advantages based on the correlation of 0.6671. The second main factor went up as rosemary usage went up for taste and went down as health benefits went up. The component increased more with an increase in taste than medical and is therefore regarded as a measure of taste.

The third principal component increased with one of the values, the other benefits for rosemary. On the other hand, the fourth principal component, is more of a measure for taste and health benefits, with ratings of -0.6532 and 0.7197 respectively. The component was regarded a measure of health and to a lesser extent taste. The aroma and flavor of rosemary, two of the initial variables, were associated with the fifth main component. The component was associated with a higher aroma and lower taste scores. The component decreased with an increase in aroma and is a measure of taste more than aroma. Two of the original variables—weight and therapeutic advantages—were associated with the final principal component. The component was regarded a measure of medicinal, with a rating of 0.6754, and a low of 0.6665 for health benefits.

5.3.2 PCA results for parsley

Results on parstly from appendix 14 revealed that for parsley, the first main component accounted for around 27% of the variation. In addition, the first three principal components accounted for 71% of the variation whereas the first four principal components accounted for 87%.

The first principal component was strongly correlated with three of the original variables, aroma, taste, and weight management. The first principal component increased with weight management followed by taste and aroma scores. Based on the association between this primary component and weight management of 0.6134, weight management was considered to be the main outcome, with fragrance being a secondary outcome. The second main factor went

up as parsley intake went up for medicinal and health reasons and went down as the health advantages went up. The component increased more with an increase in health benefits and was therefore regarded as a measure of health benefits. The third principal component increased with two of the values, the health benefits and medicinal benefit for parsley. On the other hand, the fourth principal component, is more of a measure for taste, health and medicinal benefits, with ratings of -0.5481, 0.5263 and 0.6036 respectively. The ingredient was valued for its therapeutic properties and, to a lesser extent, for its flavor. Two of the original variables, scent and the health benefits of parsley, were linked with the fifth main component. The component was associated with higher aroma and lower health benefit scores. The component increased with an increase in aroma, and due to the rating of 0.6458, was therefore regarded more as a measure of aroma than of health benefit.

5.3.3 PCA results for thyme

Results on thyme from appendix 15 revealed that for thyme, the first main component accounted for around 45% of the variation. Additionally, the first five principal components accounted 99% of the variation, but the first three principal components only explained 80%. The first principal component was strongly correlated with two of the original variables, medical and other benefits for thyme. The first principal component increased with medical benefit more than other thyme benefit scores. The component was considered a measure of medical benefit and, to a lesser extent, other thyme advantages, based on the correlation of 0.566 for medicinal benefit. Aroma and health advantages, two of the original variables, were likewise associated to the second main component. The component increased with increasing consumption of thyme for both aroma and health benefit scores. As a result, the component is viewed as a measure of aroma and to a lesser extent, a health advantage, as it grew more with an increase in aroma. With a score of 0.9124, the third main factor improved with taste for thyme. On the other hand, the fourth principal component was correlated with health benefits for thyme and has an inverse relationship with a score of –0.6241. The fifth principal component was correlated with one of the original variables, weight management for thyme. The component was associated with a higher score of 0.8028, and this implied that an increase in the component will also result in an increase in weight management for thyme. The last component was correlated with two of the original variables, medical and other benefits of thyme. The component was regarded a measure of other benefits for thyme, and to a lesser extent medical benefit.

5.3.4 PCA results for garlic

Garlic results from appendix 16 revealed that for garlic, the first main component accounted for around 35% of the variation. Additionally, the first five principalcomponents accounted 95% of the variation, but the first three principal components only explained 72%.

The first principal component was strongly correlated with one of the original variables, weight management. The component was regarded a measure of weight management with a positive score of 0.5899. The second principal component was correlated with two of the variables, aroma and other benefits for garlic. The latter showed an inverse relation while aroma had a positive relationship with a score of 0.5683. The third component increased with increasing consumption of garlic for aroma and medicinal benefit and is marked with positive recordings. This primary component was considered a marker of medical benefit and, to a lesser extent, aroma, based on the correlation of 0.7173. The fourth component was correlated with taste for garlic, with a score of -0.7773. On the other hand, the fifth component was also correlated with one of the original variables, health benefit, and is marked by a positive score of 0.7877. The component is primarily a measure of health benefit. The last component was negatively correlated with one of the original variables, weight management, with a rating of -0.6485.

5.3.5 PCA results for paprika

Results on paprika from appendix 17 revealed that for paprika, the first main component accounted for around 62% of the variation. In addition, the first three principal components accounted 50% of the variation, whereas the first five principal components only contributed 25%.

The first principal component was strongly correlated with one of the original variables, aroma. The component had a positive correlation with a rating of 0.5946, and was considered a measure of aroma more than the other variables. Three of the original variables, including taste, health benefits, and additional paprika advantages, were substantially linked with the second main component. Based on the rating of 0.6263, the component was regarded of a measure of other benefits of paprika, and to a lesser extent taste and health benefits. The third component was also regarded as a measure of other benefits of paprika, with a rating of 0.6102, and to a lesser extent health benefits, with a lower rating of -0.5208. The second last component was highly correlated with medical benefit for paprika with a rating score of 0.8003. The last principal component was positively correlated with two of the original variables, aroma and

health benefit, and negatively correlated with taste. The component was regarded as a measure of taste based on the score rating of 0.6285, and to a lesser extent taste.

5.3.6 PCA results for fennel seeds

Results on fennel seeds from appendix 18 revealed that for fennel seeds, the first main component accounted for around 37% of the variation. Additionally, the first five principal components accounted 95% of the variation, but the first three principal components only explained 73%.

The first principal component was strongly correlated with three of the original variables, aroma, taste, and medicinal benefit. The first principal component increased with medicinal benefit, followed by taste and aroma scores. A measure of medical benefit and, to a lesser extent, scent, based on the major component's correlation of 0.5264 with medicinal benefit. With a rating score of 0.7899, the second main factor improved when fennel seed consumption rose for weight management. The component was therefore regarded as a measure of weight management. The third principal component increased with one of the values, the other benefits of fennel seeds. On the other hand, the fourth principal component is more of a measure for weight management, with a rating score of 0.5482, and to a lesser extent medicinal, with a score of -0.5172. The fifth principal component was correlated with two of the original variables, taste and health benefits for fennel seeds. The component was associated with a higher taste and lower health benefit scores. The component increased with an increase in taste, and based on the rating of 0.6881, the component was regarded as a measure of taste more than of health benefit. The sixth component was correlated with two of the original variables, aroma and medicinal benefit. The component was classified as a measure of medicinal, and to a lesser extent scent, with a score of -0.6083, based on the score rating of 0.6427.

5.3.7 PCA results for mint

Results form mint as presented in appendix 19 revealed that for mint, the first main component accounted for around 34% of the variation. Furthermore, the first four principal components accounted 100% of the variation, whereas the first three principal components only explained 90%.

The first principal component was strongly correlated with two of the original variables, taste and weight management. The first principal component increased with weight management, followed by taste scores. Based on the 0.7491 correlation between weight management and this principal component, weight management was considered to be the primary outcome, with taste as a secondary outcome. Aroma and taste, two of the original variables, have a positive

correlation with the second main component. The component's rating score of 0.7955 indicated that it was a measure of scent and, to a lesser extent, taste. Its rating score of 0.5678 indicated the same. Also, the third component was regarded a measure of health benefit with a score of 0.9669. The fourth and last principal component for mint was highly correlated with three of the original variables, aroma, taste, and weight management. The component was regarded as a measure of weight management based on the score of 0.6029, and to a lesser extent aroma, and taste, with scores of 0.5475 and -0.5768 respectively.

5.3.8 PCA results for celery

Celery results as presented on appendix 20 revealed that about 70% of the variation in celery was explained by the first main component. Additionally, the first three main components fully described the variation.

The first principal component was strongly correlated with three of the original variables, aroma, taste, and health benefit. The first principal component increased with aroma, with a rating score of 0.6204, followed by taste with 0.5563, and lastly health benefit, with 0.5529. Based on the high correlation with aroma, the component was regarded as a measure for aroma, and to a lesser extent taste and health benefit. The second component was correlated with two of the original variables, taste and health benefit. Based on the scores, the component was primarily regarded as measure of health benefit, and to a lesser extent taste. The last principal component was correlated with aroma with a negative score of -0.7842.

5.3.9 PCA results for vanilla

Appendix 21 shows results on vanilla and revealed that approximately 37% of the variation was explained by the vanilla first main component. Additionally, the first five principal components accounted 97% of the variation, while the first three principal components explained 89%.

The first principal component was strongly correlated with one of the original variables, taste for vanilla. The component increased with taste score (0.5857) for the variable and is primarily regarded as a measure for taste. The second component was negatively correlated with two of the original variables, health benefit and weight management. The component was considered a gauge of health benefit and, to a lesser extent, weight management, based on the score rating of 0.5385. With a score of 0.9235, the third factor for vanilla was positively connected with other advantages. With a score of 0.5758, the fourth component was viewed as a measure of

weight control and, to a lesser extent, taste, with a score of 0.5189. It was connected with two of the original variables, taste and weight management. From the sixth principal component, the positive score of 0.5856 implied that the component increased with an increase in health benefit and is therefore regarded as a measure of health benefit.

5.3.10 PCA results for star anise

Star anise results on appendix 22 revealed that for star anise, the first main component accounted for around 34% of the variation. Additionally, the first five principal components accounted for 100% of the variation, but the first three principal components only explained 76%.

The first principal component was strongly correlated with two of the original variables, aroma and health benefit scores. The component was considered to be a measure of health benefit, and to a lesser extent fragrance, with a score of 0.5567, based on the correlation of 0.5671 for health benefit. The second principal component was correlated with taste for star anise, with a score of 0.6074, meaning the component will increase with an increase in taste for star anise. With a score of 0.8547, the third main factor was used to gauge the various advantages of star anise. In addition, the fourth component was negatively correlated with aroma and positively correlated with health benefit for star anise. The component was evaluated as a measure of health benefit and, to a lesser extent, aroma, based on a score of 0.5925. The final element, which had a score of 0.6331, had a strong correlation with the therapeutic value of star anise. The element was therefore seen as a gauge of therapeutic value.

5.3.11 PCA results for basil

Basil results from appendix 23 revealed that for basil, the first main component accounted for around 31% of the variation. Additionally, the first five principal components accounted for 100% of the variation, but the first three principal components only explained 76%.

The first principal component was strongly correlated with three of the original variables, aroma, taste, and weight management scores. The first principal component increased with taste, followed by weight management and lastly aroma. The component was viewed as a measure of flavour and, to a lesser extent, weight control and scent, based on the correlation of 0.5703 for taste. The second principal component was also highly correlated with one variable, health benefit. The score rating of 0.7153 implied that the component is a measure of health benefit for basil. Results of the third principal component showed a strong correlation with

medicinal benefit. Based on the correlation of 0.9491 for medicinal benefit, the component was regarded as a measure of medicinal benefit. The fourth component was highly correlated with aroma with a score of 0.7337. The component increased with increasing consumption for basil for aroma. The last principal component for basil was highly correlated with three of the original variables, taste, health, and weight management. The component was viewed as a measure of weight control and, to a lesser extent, health and taste, based on the correlation of 0.5984 for weight management.

5.3.12 PCA results for origanum

Origanum results from appendix 24 revealed that for origanum, the first main component accounted for around 52% of the variation. In addition, all of the variation was explained by the first three major components.

The first principal component was strongly correlated with three of the original variables, aroma, taste, and health benefit. The component increased with each of the variables' scores for origanum. The component was considered to be a measure of scent and, to a lesser extent, taste and health benefits, based on the correlation of 0.6612 for aroma. The second principal component was correlated with taste and health benefit for origanum. The component increased with health benefit more than other origanum benefit scores Based on the component's score of 0.7150, it was determined to represent a gauge of origanum's health benefits and, to a lesser extent, its flavour. With a score of -0.7502, the third and final component was adversely linked with scent for origanum.

5.4 Utilization regression analysis results

The following section presents regression results on consumer utilization of different spices and herbs. The first section present results on spices and the second section presents results on utilization of herbs

5.4.1 Spice utilization

Table 5.1: Regression results on consumer utilization of spices: cumin, mustard, turmeric and chilli

Parameters	Cumin			Mustard			Turmeric			Chilli		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Socio-economic attributes												
Age	0.184	0.015	0.233	0.027**	0.014	0.062	0.014	0.013	0.296	-0.204*	0.013	0.121
Marital Status												
Married	0.306	0.224	0.173	-0.182	0.270	0.500	0.226	0.314	0.472	0.531**	0.242	0.029
Divorced	0.574	0.569	0.313	0.201	0.654	0.759	0.793	0.641	0.217	1.329**	0.488	0.007
Household size	0.321*	0.077	0.068	-0.111	0.078	0.154	-0.007	0.076	0.925	-0.066	0.828	0.425
Gender	0.167	0.231	0.469	0.147	0.272	0.588	0.222	0.312	0.476	-0.511**	0.258	0.049
Education level	0.210	0.345	0.542	0.255	0.392	0.515	0.806*	0.036*	0.027	0.844**	0.330	0.011
Religion	-0.236	0.290	0.417	-0.571	0.327	0.081	0.076	0.350	0.828	0.487	0.301	0.107
Ethnicity												
White	0.187	0.428	0.662	-0.277	0.488	0.571	0.339	0.442	0.443	-0.439	0.399	0.271
Coloured	-0.129	0.215	0.549	-0.228	0.264	0.390	-0.149	0.276	0.589	-0.251	0.237	0.290
Asian	0.733	0.353	0.836	0.690*	0.416	0.098	0.536	0.404	0.185	0.362	0.338	0.285
Employment status	-0.657	0.437	0.133	-1.181**	0.503	0.019	-0.399	0.518	0.441	-0.213	0.520	0.682
Food expenditure	0.000	0.000	0.694	0.000*	0.000	0.099	-9.75E-06	0.000	0.943	0.000	0.000	0.260
Sources of information on spices												
Television	-0.170	0.137	0.216	0.159	0.159	0.651	-0.052	0.159	0.742	0.100	0.148	0.500
Newspaper	0.326**	0.158	0.039	0.559**	0.179	0.002	0.606***	0.000	0.001	0.271*	0.145	0.063
Radio	-0.349	0.352	0.322	0.967**	0.432	0.026	-0.472	0.159	0.298	2.235**	0.713	0.002
Internet	-0.059	0.134	0.656	-0.219	0.160	0.172	-0.068	0.178	0.675	-0.302	0.140	0.032
Friends and family	0.363**	0.171	0.035	-0.354**	0.168	0.036	-0.230	0.453	0.201	0.357*	0.243	0.143
Health practitioner	0.150	0.181	0.407	0.536**	0.202	0.008	0.652	0.162	0.001	0.706***	0.178	0.000
Health campaign	0.088	0.220	0.689	-0.224	0.197	0.256	0.058	0.179	0.759	-0.193	0.268	0.471
Challenges when purchasing spices												
Unknown benefits	0.051	0.047	0.778	0.113**	0.544	0.037	0.161	0.052	0.759	0.014	0.047	0.765
Proper packaging	0.042	0.148	0.575	0.009	0.165	0.955	0.054	0.164	0.759	0.090	0.167	0.558
Difficulty with storing	0.122***	0.218	0.000	-0.702	0.230	0.761	0.210	0.254	0.741	0.124	0.215	0.566
Unavailability on the shelves	0.775	0.210	0.208	0.091	0.272	0.738	0.401	0.256	0.407	0.161	0.215	0.454
Unknown brands	-0.201**	0.159	0.017	-0.461**	0.180	0.011	-0.308	0.174	0.119	-0.167	0.184	0.365
Quantity and quality demand for spices												
Spice quantities	0.337	0.140	0.017	0.207	0.161	0.201	0.431**	0.158	0.007	0.273*	0.174	0.065
Right quality spices	0.024	0.325	0.940	0.235	0.245	0.388	-0.702**	0.315	0.027	0.019	0.222	0.929
Cons	-1.808	0.885	0.042	-2.024	0.850	0.018	-1.827	0.834	0.029	-0.435	0.779	0.576

Table 5.1 presents the results of consumers' utilization of different spices. The first model presents result on cumin, and revealed that utilization of cumin was positively influenced by household size, with a coefficient of 0.321. The result implies that an increase in the number of household members increased utilization of cumin by 0.321. Additionally, sources of information also played an important role in influencing utilization of cumin by consumers. Parameters such as use of newspaper as a source of information recorded a positive influence (0.326) on utilization for cumin. This means that it provides useful information regarding spice utilization. Information from friends and family also showed a positive association, with a coefficient of 0.363 and p value of 0.035. Moreover, challenges linked to purchasing of spices also influenced utilization of the commodities. From the results, difficulty in storing cumin presented a positive effect with a coefficient of 0.122 and statistical significance with utilization of cumin. On the other hand, unknown brands showed a negative influence (-0.201) and statistical significance with utilization for cumin. This could be due to discomfort on consuming products that are lacking in both popularity and information on health-related issues. Regarding quantities and quality for spices, quantity recorded a positive coefficient and statistical significance, implying that an increase in quantity increased utilization of cumin. Demand for cumin in the diets of the consumers was highlighted by Bhathal et al. (2020), who showed that there is an increase in consumption level amongst households in India.

From the second model on mustard, socio-economic factors such as age influenced utilization of mustard in a positive direction, and was marked by a coefficient of 0.027 and a p value of 0.062. This means that as consumers grow older, they somehow increase their consumption of mustard for health-related and other valuable reasons. Ethnicity, specifically being from the Asian group, also reported a positive relationship (0.690) with utilization of mustard and a statistical significance. Similar results were also reported for food expenditure, which recorded a coefficient of 0.000 and a p value of 0.099. On the other hand, employment status recorded a negative coefficient and statistical significance of -1.181 and p value of 0.019. These results implied that, as employment status increased, utilization of mustard reduces by 1.181, meaning that as consumers' employment status improves, they are likely to opt for different spices. Studies on mustard have proven a demand for the spice; for example, in Bangladesh, a study by Sampa et al. (2020) revealed that demand for mustard is on the increase as it can assist the country in reducing imports of oilseed.

On sources of information regarding spice use, newspaper (0.556), radio (0.967), and advice from health practitioners recorded positive association (0.536) and statistical significance with utilization of mustard. The outcome indicates that a unit increase in each of the parameters is likely to increase consumers' utilization of mustard. On the other hand, information from friends and family recorded a negative coefficient (-0.354), yet showed statistical significance. This could be due to lack of trust regarding the kind of information received. Unknown health benefits for mustard recorded a positive coefficient (0.113) and statistical significance with utilization of mustard. This could be due to consumers' inquisitiveness to gain more information regarding all the benefits of the spice. On the other hand, unknown brands revealed that a unit increase in the parameter decreases utilization of mustard and this was marked by a negative coefficient of -0.461. This is so due to lack of trust regarding unknown brands. Furthermore, Gygier (2022) and Mhatre et al. (2020) also revealed an increase in utilization of mustard for health-related purposes in India.

Turmeric results revealed that only education level, among the socio-economic factors, influenced utilization of turmeric positively witha coefficient of 0.806. This could be due to an improved knowledge and understanding regarding benefits offered by the spice. Moreover, information from newspapers and from health practitioners also influenced utilization of turmeric in a positive direction with a coefficient of 0.606. On the other hand, unknown brands again recorded a negative effect on utilization of turmeric. This could be due to lack of proper packaging and lack of information regarding the product, which normally leaves consumers unsure of the safety for such products. Both quality and quantities showed statistical significance with utilization of turmeric. However, quantity of the product recorded a positive effect (0.431) while quality showed a negative effect (-0.702). This implies that a unit increase in quantity will result in increase in consumption of the spice. The results are contrary with those reported by Šugrová et al. (2017), who reported that good quality products influence consumption of the products.

The last model from the table presents factors that determines utilization of chilli. Age showed statistical significance and recorded a negative coefficient of -0.024, meaning that as consumers get older, they reduce their utilization of chilli. This could be due to a change in older consumers' taste preferences, as well as health-related conditions. Furthermore, a unit increase in marital status increased utilization of chilli, and this was marked by a positive coefficient 0.531 as well as statistical significance 1.329 for both married and divorced

consumers respectively. On the other hand, gender reported a negative effect with a parameter of -0.511 on the utilization of chilli, and it is statistically significant (0.05). In addition, education level and religion also influenced utilization of chilli in a positive direction (0.844 and 0.487 respectively). As consumers get more educated, they gain the ability to get more important information that tends to increase utilization of healthy food products.

Sources of information such as newspapers also showed a positive effect (0.271) on the utilization of chilli. Although a majority of the consumers relied mostly on social media and other advanced methods of getting information regarding health improvements, some articles in the newspapers as well as recipes seem to be still useful in providing consumers with important information. In addition, information received from the radio (2.235), friends and family (0.357) as well as that received from health practitioners recorded a positive effect (0.706) on utilization of chilli. Lastly, on sources of information regarding spices, the internet as a source recorded a negative effect (-0.302) on utilization of chilli. The outcomes implied that a unit change in use of the internet as a source of information reduces utilization of chilli, and this could be because the majority of the consumers are not familiar with searching for information on the internet. Lastly, quantity demand for chilli recorded a positive effect (0.273) on utilization of chilli, and this implied that utilization increased as quantity demanded increased. Results from Oguntoye et al. (2020) also emphasised the importance of chilli for human consumption for health-related benefits.

Table 5.2: Regression results on consumer utilization of spices: coriander, Black pepper, cinnamon and ginger

Parameters	Coriander			Black pepper			Cinnamon			Ginger		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Socio-economic attributes												
Age	0.015	0.010	0.143	0.022	0.010	0.263	-0.020*	0.012	0.097	0.014	0.114	0.220
Marital Status												
Married	0.188	0.187	0.317	-0.135	0.265	0.609	0.289	0.198	0.145	0.141	0.254	0.579
Divorced	1.010**	0.457	0.027	0.079	0.448	0.859	0.119	0.472	0.800	-0.277	0.511	0.588
Household size	-0.069	0.058	0.229	-0.013	0.569	0.813	0.070	0.068	0.306	0.071	0.071	0.289
Gender	-0.111	0.191	0.562	-0.074	0.235	0.753	-0.411*	0.215	0.057	0.054	0.272	0.841
Education level	0.595**	0.284	0.037	0.268	0.313	0.393	-0.174	0.322	0.590	0.091	0.314	0.774
Religion	0.137	0.244	0.574	0.202	0.275	0.463	0.480	0.268	0.074	-0.231	0.322	0.472
Ethnicity												
White	-0.324	0.385	0.400	-0.033	0.332	0.919	0.057	0.396	0.886	0.456	0.391	0.244
Coloured	-0.160	0.192	0.406	-0.296	0.193	0.126	0.072	0.191	0.706	-0.136	0.208	0.513
Asian	0.482*	0.264	0.068	-0.040	0.246	0.871	-0.607**	0.285	0.034	0.198	0.285	0.488
Employment status	-0.447	0.376	0.235	-0.073	0.389	0.850	0.427	0.453	0.346	-0.066	0.471	0.889
Food expenditure	0.000	0.000	0.583	0.000	0.000	0.562	0.000	0.000	0.035	0.000	0.000	0.369
Sources of information on spices												
Television	-0.138	0.116	0.238	0.052	0.148	0.722	-0.040	0.131	0.709	-0.061	0.135	0.651
Newspaper	0.571***	0.126	0.000	-0.018	0.156	0.907	-0.410**	0.137	0.003	-0.320**	0.148	0.031
Radio	0.721*	0.410	0.080	1.355***	0.320	0.000	2.382***	0.338	0.000	-1.821**	0.262	0.000
Internet	-0.062	0.110	0.597	-0.190*	0.115	0.095	-0.082**	0.130	0.053	0.200	0.134	0.882
Friends and family	0.277	0.156	0.859	-0.137	0.177	0.438	-1.346***	0.213	0.000	1.142***	0.218	0.000
Health practitioner	0.595***	0.159	0.000	0.122	0.212	0.563	0.540**	0.180	0.003	-0.980***	0.190	0.000
Health awareness campaign	-0.677***	0.150	0.000	0.334*	0.193	0.08	1.717***	0.241	0.000	-1.330***	0.238	0.000
Challenges when purchasing spices												
Unknown health benefits	0.063*	0.037	0.099	-0.110	0.047	0.808	-0.058	0.042	0.171	-0.022	0.486	0.650
Lack of proper packaging	-0.212*	0.123	0.086	0.040	0.153	0.780	-0.003	0.144	0.980	-0.256*	0.144	0.076
Difficulty with storing	0.350	0.157	0.260	-0.225	0.163	0.170	-0.130	0.194	0.501	0.226	0.201	0.262
Unavailability on the shelves	0.012	0.183	0.948	0.010	0.207	0.961	0.444*	0.234	0.058	-0.133	0.216	0.538
Unknown brands	-0.152	0.125	0.227	0.111	0.173	0.518	0.252	0.158	0.113	-0.697	0.161	0.667
Quantity and quality demand for spices												
Right quantities of spices	0.173	0.110	0.135	0.195	0.128	0.129	0.129	0.139	0.354	0.422**	0.136	0.002
Right quality spices	-0.093	0.191	0.626	1.000***	0.253	0.000	0.386	0.296	0.193	0.544*	0.281	0.054*
Cons	-1.585	0.590	0.008	-2.149	0.840	0.011	0.640	0.712	0.369	-0.910	0.618	0.142

Table 5.2 presents utilization results on the spices coriander, Black pepper, cinnamon and ginger. Some socio-economic factors on the first model showed some statistical significance with utilization of coriander. For instance, divorce positively influences consumers' utilization of coriander, with a p value of 1.010. Similarly, education level showed a positive effect (0.595) on utilization of coriander. This results implied that as consumers get more educated, they increase their utilization of coriander, and this could be due to their improved knowledge and understanding about the benefits offered by the spice. Being from the Asian group also reported an increase in utilization of coriander, and the parameter recorded a coefficient of 0.482.

Sources of information on spices, such as newspapers (0.571), radio (0.721) and health practitioners also showed a positive effect (0.595) on utilization of coriander. However, information from campaigns aimed at raising awareness about healthy life choices presented a negative effect (-0.677) on utilization of coriander. This could be due to lack of participation from consumers, or lack of such campaigns in their areas. Results from challenges experienced by consumers when purchasing spices revealed that unknown health benefits increased utilization of coriander (0.063), and this could be due to consumers being inquisitive to learn more about spices and their benefits. However, lack of proper packaging negatively affected (-0.212) utilization of coriander. Similar results were reported by Guillard et al. (2018), who mentioned that proper packaging has the ability of influencing consumption of food products as it presents information that can be valuable to the consumers. Results from a study conducted by Embuscado (2015) revealed that an increase in demand and utilization of coriander is influenced by its ability to provide the body with natural antioxidants.

The second model, on Black pepper, showed that none of the socio-economic factors influenced utilization of Black pepper. However, some sources of information such as radio and health awareness campaigns showed a positive effect (1.355 and 0.334 respectively) and statistical significance on utilization of Black pepper. Conflicting results were recorded on the internet as a source of information that influences utilization of Black pepper and was recorded with a coefficient of -0.190. Again, this could be due to consumers' lack of skill to search for information on the internet, or lack of accessibility of connection. Quality showed a positive effect on utilization of Black pepper with a coefficient of 1.000. According to Shori (2022), demand for Black pepper is mostly by its huge quantity and quality use in preparation of food as a preservative due to its antioxidant properties, and also as a flavouring agent in food.

Results on cinnamon showed that age negatively influenced utilization of the spice and was marked by a coefficient of 0.020 and p value of 0.097. The results implied that as consumers age, somehow utilization of cinnamon also reduces, and this could be due to affordability issues or loss of interest in the spice. Gender, on the other hand, showed a negative effect (-0.411) on utilization of cinnamon, while religion showed a positive effect. Being Asian recorded a negative coefficient (-0.607), meaning that a unit increase in ethnicity, and specifically being Asian, resulted in reduction in utilization of cinnamon. A majority of the sources of information (newspapers, radio, the internet, friends and family, health practitioners and health awareness campaign) showed statistical significance with utilization of cinnamon. However, newspapers (-0.410), the internet (-0.082), and friends and family (-1.346) as sources of information on spices recorded a negative effect while the other parameters showed a positive effect (1.717). Surprisingly, unavailability on the shelves showed a positive effect (0.444) on utilization of cinnamon, and this could be due to its effectiveness and positive impact on the lives of the consumers so that most of the time it is sold out. Demand for cinnamon has increased as a result of people using the spice, and this was highlighted by Muhammad and Dewettinck (2017), who reported that cinnamon can be utilized as an ingredient in the preparation of functional food for its health-rewarding benefits.

The last model presented results on ginger and showed no influence on utilization of the spice from all of the socio-economic factors presented. Similar to the previous model, sources of information such as newspapers (-0.320), radio (-1.821), friends and family (1.142), health practitioners and health awareness campaigns showed some effect and statistical significance with utilization of ginger. Of the five factors that influenced utilization, only one, namely friends and family as a source of information, showed a positive effect and statistical significance, while the others showed a negative effect. Lastly, on the model, quality (0.5440 and quantity (0.422) both showed a positive effect and statistical significance with utilization of ginger. Ginger plays an important role in minimizing household and industrial use of synthetic additives and adds value to consumer goods. This has therefore resulted in high demand and utilization of ginger by consumers for its ability to improve product quality, and also consumers' health in general (Akhtar et al., 2019).

Table 5.3: Regression results on consumer utilization of spices: masala, clove, cayenne pepper and White pepper

Parameters	Masala			Clove			Cayenne Pepper			White pepper		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Socio-economic attributes												
Age	0.017	0.011	0.124	-0.005	0.011	0.616	-0.022	0.112	0.046**	-0.001	0.011	0.917
Marital Status												
Married	0.137	0.232	0.553	0.212	0.223	0.341	0.313	0.253	0.217	0.637	0.184	0.729
Divorced	0.279	0.414	0.501	0.560	0.403	0.166	0.926	0.536	0.085	0.517	0.476	0.277
Household size	0.596	0.058	0.305	0.015	0.062	0.798	0.005	0.071	0.939	-0.123*	0.063	0.053
Gender	-0.231	0.225	0.304	-0.087	0.206	0.671	0.168	0.266	0.528	0.326	0.202	0.107
Education level	0.488	0.281	0.084	0.454	0.278	0.103	0.608*	0.345	0.079	0.113	0.265	0.668
Religion	-0.160	0.266	0.535	0.030	0.245	0.901	0.360	0.312	0.249	-0.393	0.232	0.091
Ethnicity												
White	0.285	0.316	0.368	0.055	0.336	0.868	0.263	0.407	0.518	-0.243	0.382	0.525
Coloured	-0.072	0.187	0.699	0.004	0.191	0.980	0.066	0.210	0.753	0.004	0.207	0.981
Asian	0.030	0.256	0.905	0.097	0.245	0.691	0.011	0.280	0.967	0.516*	0.290	0.077
Employment status	0.009	0.464	0.983	0.373	0.467	0.425	0.491	0.446	0.271	-0.842	0.349	0.016
Food expenditure	2.29E-06	0.000	0.975	0.000	0.000	0.335	0.000	0.000	0.201	0.000	0.000	0.527
Sources of information on spices												
Television	-0.147	0.122	0.229	-0.085	0.123	0.490	-0.225	0.137	0.100	0.153	0.129	0.238
Newspaper	0.470***	0.126	0.000	1.069***	0.124	0.000	0.125	0.143	0.379	0.824***	0.167	0.000
Radio	1.793***	0.404	0.000	2.340***	0.443	0.000	2.832***	0.260	0.000	-0.905***	0.205	0.000
Internet	-0.074	0.124	0.550	-0.195*	0.119	0.103	-0.193	0.139	0.166	-0.171	0.126	0.176
Friends and family	-0.431**	0.173	0.013	-0.115	0.159	0.469	-0.670***	0.201	0.001	-0.650***	0.134	0.000
Health practitioner	-0.082	0.184	0.655	0.791***	0.145	0.000	0.384*	0.210	0.069	0.473**	0.236	0.046
Health awareness campaign	0.997***	0.186	0.000	-0.530**	0.172	0.002	1.620***	0.220	0.000	-0.008	0.147	0.953
Challenges when purchasing spices												
Unknown health benefits	-0.016	0.040	0.676	0.024	0.040	0.545	-0.745	0.407	0.068	0.150**	0.047	0.002
Lack of proper packaging	-0.325**	0.136	0.018	-0.108	0.138	0.436	0.130	0.153	0.397	0.046	0.147	0.752
Difficulty with storing	0.216	0.184	0.239	0.092	0.199	0.644	-0.011	0.213	0.958	-0.209	0.179	0.245
Unavailability on the shelves	0.130	0.182	0.474	0.242	0.210	0.249	0.749***	0.233	0.001	0.207	0.244	0.397
Unknown brands	-0.103	0.147	0.486	-0.024	0.146	0.866	0.220	0.159	0.167	-0.261	0.171	0.129
Quantity and quality demand for spices												
Right quantities of spices	0.664***	0.118	0.000	-0.106	0.110	0.365	-3.776**	0.154	0.015	-0.508**	0.161	0.002
Right quality spices	-0.207	0.234	0.522	-0.216	0.232	0.352	0.649	0.320	0.043	-0.200	0.255	0.433
Cons	-1.438	0.633	0.024	-0.877	0.636	0.169	-0.887	0.644	0.169	-0.141	0.650	0.828

The last set of spices and factors that affect their utilization is presented in table 5.3 above. The first model on the table presents results on utilization of masala, and showed that education level influenced utilization of masala in a positive way. The parameter recorded a positive coefficient of 0.488 and a p value of 0.084. On sources of information, newspapers (0.470), radio (1.793), and health awareness (0.0997) campaigns showed a positive effect on utilization of masala, while friends and family as a source of information recorded a negative effect with a coefficient of -0431. Lack of proper packaging also showed a negative effect on utilization of masala and statistical significance of -0.325. The results imply that a unit change in packaging results in a decrease in utilization of masala. Lastly, from the first model, right quantities showed a positive effect of 0.664 on utilization of masala and statistical significance.

The second model presented results on clove spice and showed that none of the socio-economic parameters had an effect on utilization of clove. The second part of the results revealed that newspapers (1.069), radio (2.430), and health practitioners (0.791) as sources of information reported a positive effect on utilization of clove. The other parameters such as the internet and health awareness campaigns reported a negative coefficient (-00.195 and -0.530 respectively) and statistical significance.

The third model, on cayenne pepper, revealed that two socio-economic factors influenced utilization of cayenne pepper, namely age and education level. The results implied that as consumers' age increased, utilization of cayenne pepper decreases by 0.022. On the other hand, education level showed a positive effect (0.608) on utilization of cayenne pepper, meaning an increase in utilization of cayenne pepper.

Furthermore, radio as a source of information showed a positive effect (2.832) on utilization of cayenne pepper. This means that information received from the radio plays an important role in influencing consumers to utilize cayenne pepper. Similarly, information received from health practitioners and health awareness campaigns recorded a positive effect (0.384) on utilization of cayenne pepper, while friends and family as a source of information recorded a negative effect (-0.670) on utilization of cayenne pepper. The last part of the results from the third model revealed that unavailability on the shelves and right quantities affected utilization of cayenne pepper. Consumption of clove has been proven to be on the rise by Charfi et al. (2021), due to its incorporation in meals for nutritional and medicinal purposes.

From the last model on the table, two socio-economic factors influenced utilization of White pepper and was marked by a coefficient of -0.123. A unit increase in household members showed a decrease in utilization of White pepper, while an increase in ethnicity, specifically being Asian, showed a positive effect (0.516) on utilization of White pepper. Moreover, newspapers and health practitioners as sources of information showed a positive effect on utilization of White pepper. On the other hand, radio (-0.905), and friends and family (-0.650), showed a negative effect on utilization of White pepper. The results imply that a unit change in communication through the two parameters will reduce utilization of White pepper in the province. A positive effect was recorded by a positive coefficient for source of information through newspaper (0.824) and information through health practitioner 90.473) for White pepper. Similarly, Bhathal et al. (2020) reported an increase in utilization of White pepper in both urban and rural households of India. This is due to its potential in aiding weight loss and proper management of non-communicable diseases in the country. Lastly on challenges consumers come across when utilising spices, unknown health benefits showed a positive influence with a coefficient of 0.150 while quantity demanded recorded a negative (-0.508) coefficient. The results imply that change in the quantities demanded results in a decrease in the utilization of White pepper.

5.4.2 Herb Utilization:

Table 5.4: Regression results on consumer utilization of herbs: rosemary, parsley, thyme and garlic

Parameters	Rosemary			Parsley			Thyme			Garlic		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Socio-economic attributes												
Age	0.008	0.012	0.475	0.000	0.016	0.974	0.007	0.009	0.425	0.000	0.011	0.933
Marital Status												
Married	0.046	0.236	0.844	0.048	0.216	0.824	-0.224	0.191	0.241	0.376	0.230	0.103
Divorced	-0.215	0.472	0.648	0.747	0.432	0.085	-0.647	0.406	0.112	0.394	0.518	0.447
Household size	0.084	0.674	0.210	-0.041	0.072	0.566	0.039	0.055	0.470	0.084	0.067	0.215
Gender	-0.061	0.247	0.804	-0.096	0.250	0.700	0.358	0.209	0.088	-0.335	0.239	0.161
Education level	0.579	0.316	0.855	0.759**	0.244	0.002	-0.165	0.239	0.488	0.661	0.326	0.044
Religion	-0.168	0.302	0.577	0.294	0.294	0.318	-0.273	0.265	0.304	0.436	0.309	0.159
Ethnicity												
White	0.437	0.339	0.198	-0.390	0.404	0.335	0.374	0.336	0.266	0.163	0.397	0.680
Coloured	-0.152	0.201	0.451	-0.162	0.200	0.417	-0.021	0.172	0.903	-0.099	0.225	0.660
Asian	-0.081	0.306	0.790	0.146	0.263	0.579	0.046	0.205	0.820	-0.058	0.273	0.832
Employment status	0.100	0.495	0.840	0.571	0.364	0.118	-0.343	0.362	0.345	0.482	0.486	0.323
Food expenditure	0.000	0.000	0.741	0.000	0.000	0.468	6.55e-06	0.000	0.925	0.000	0.000	0.665
Sources of information on herbs												
Television	-0.400**	0.125	0.002	0.280**	0.134	0.038	0.098	0.107	0.361	0.331**	0.129	0.011
Newspaper	0.238***	0.132	0.001	-0.856***	0.125	0.000	0.523***	0.113	0.000	-0.637***	0.154	0.000
Radio	-2.559***	0.217	0.000	2.720***	0.141	0.000	3.783***	0.121	0.000	1.963***	0.162	0.000
Internet	-0.110	0.120	0.362	-0.064	0.128	0.616	-0.039	0.109	0.715	0.037	0.132	0.781
Friends and family	0.355**	0.139	0.011	0.266**	0.125	0.035	-0.198*	0.105	0.061	-0.217*	0.130	0.097
Health practitioner	0.567***	0.144	0.000	-0.697***	0.101	0.000	0.610***	0.132	0.000	0.375**	0.179	0.038
Health awareness campaign	-0.119	0.119	0.319	0.089	0.121	0.461	-0.205	0.108	0.058	1.967***	0.125	0.000
Challenges when purchasing herbs												
Unknown health benefits	-0.030	0.195	0.879	0.282	0.241	0.242	-1.611	0.195	0.410	-0.085	0.213	0.689
Lack of proper packaging	-0.228	0.151	0.133	0.174	0.149	0.242	0.094	0.123	0.448	-0.131	0.156	0.403
Difficulty with storing	0.190	0.139	0.173	0.184	0.142	0.196	-0.263*	0.126	0.037	0.112	0.154	0.466
Unavailability on the shelves	-0.042	0.145	0.771	-0.144	0.138	0.296	-0.064	0.119	0.586	0.000	0.148	0.997
Unknown brands	-0.060	0.133	0.648	-0.032	0.105	0.758	0.147	0.086	0.089	-0.216*	0.118	0.070
Quantity and quality demand for herbs												
Right quantities of herbs	-0.002	0.287	0.992	0.239	0.343	0.487	-0.782**	0.353	0.028	1.399***	0.276	0.000
Right quality herbs	0.143	0.151	0.342	-0.177	0.161	0.274	-0.164	0.122	0.181	0.123	0.168	0.464
Cons	-1.168	0.730	0.111	-0.281	0.916	0.759	-0.207	0.525	0.694	-2.977	0.627	0.000

Table 5.4 presents utilization results for rosemary, parsley, thyme and garlic. From the first model, none of the socio-economic factors influenced utilization of rosemary. Instead, sources of information such as television (-0.400) and radio (-2.559) showed a negative effect on utilization of rosemary, while newspapers, friends and family, as well as health practitioners recorded a positive effect (0.238, 0.355 and 0.567 respectively) on utilization of rosemary. The results imply that a unit increase in newspaper advertising, information from friends and family will increase utilization of rosemary by the consumers.

From the second model on parsley, education level showed a positive effect (0.759) and statistical significance with utilization of parsley. The results imply that as consumers' education level increases, utilization of parsley also increases. On sources of information, television and radio showed a positive effect (0.280 and 2.720) on utilization, while newspapers and health practitioners reported a negative effect (-0.856, -0.697) on utilization of parsley. A study conducted by Caquet (2004) also revealed that due to rosemary's ability to provide the body with vitamins and essential minerals, its utilization and consumption has been on the rise. Also, demand for parsley for control and management of ailments has been highlighted by authors such as de Oliveira et al. (2022) among others.

Results from the third model on thyme sources of information that influenced utilization of thyme positively included newspapers (0.523), health practitioners (0.610), and radio (3.783), and those that showed a negative effect included the internet (-0.039), friends and family 9-0.198), as well as health awareness campaigns (-0.205). The third model, which concluded that quantity had a negative impact on thyme use, suggests that a unit change in quantity demanded results in a 0.782 reduction in thyme use. On the other hand, authors such as Kuete (2017) and Adelakun et al. (2016) revealed an increase in demand and utilization of thyme due to its beneficial use for medicinal use and use in preserving food.

From the last model on garlic sources of information that showed a positive effect on utilization of garlic are television (0.331), radio (1.963), health practitioners (0.375), as well as health awareness campaigns (1.967), while those that showed a negative effect include newspapers (-0.637), and friends and family (-0.217). The last two parameters that showed an effect on utilization are unknown brands, which recorded a negative effect, and right quantities, that showed a positive effect on utilization of garlic.

Table 5.5: Regression results on consumer utilization of herbs: paprika, fennel seeds, mint and celery

Parameters	Paprika			Fennel seeds			Mint			Celery		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Socio-economic attributes												
Age	-0.004	0.010	0.643	0.007	0.012	0.553	-0.004	0.012	0.739	0.002	0.013	0.829
Marital Status												
Married	0.314	0.236	0.184	-0.279	0.229	0.224	-0.061	0.239	0.798	-0.245	0.196	0.213
Divorced	1.024	0.561	0.069	-0.344	0.421	0.414	-0.823	0.458	0.073	-0.374	0.421	0.374
Household size	0.001	0.070	0.979	0.004	0.063	0.949	0.017	0.073	0.814	-0.010	0.606	0.859
Gender	-0.567**	0.244	0.021	0.467**	0.222	0.037	0.009	0.245	0.969	0.122	0.215	0.569
Education level	0.565	0.346	0.104	-0.207	0.271	0.446	-0.413	0.317	0.193	0.086	0.253	0.734
Religion	0.518	0.302	0.088	-0.115	0.269	0.669	-0.007	0.301	0.981	0.040	0.238	0.865
Ethnicity												
White	-0.232	0.435	0.593	0.660	0.398	0.098	0.161	0.415	0.699	0.012	0.336	0.970
Coloured	-0.080	0.226	0.722	-0.145	0.202	0.473	0.021	0.224	0.924	-0.136	0.161	0.398
Asian	0.014	0.294	0.961	-0.024	0.246	0.920	0.128	0.263	0.625	-0.280	0.230	0.225
Employment status	0.517	0.443	0.244	-0.457	0.394	0.246	-0.437	0.482	0.364	0.031	0.346	0.927
Food expenditure	0.000	0.000	0.726	0.000	0.000	0.366	0.000	0.000	0.891	0.000	0.000	0.540
Sources of information on herbs												
Television	-0.098	0.187	0.601	-0.679***	0.150	0.000	-0.065	0.138	0.635	-0.114	0.125	0.365
Newspaper	-0.157	0.173	0.363	0.822***	0.166	0.000	-0.539***	0.157	0.001	0.860	0.125	0.000
Radio	-2.301***	0.203	0.000	-1.298***	0.264	0.000	-0.334	0.268	0.213	2.527	0.209	0.000
Internet	0.089	0.139	0.520	0.445***	0.123	0.000	0.462***	0.132	0.001	0.034	0.103	0.737
Friends and family	-0.216	0.200	0.282	-0.221	0.156	0.157	-0.310**	0.135	0.023	0.491	0.137	0.000
Health practitioner	0.768***	0.179	0.000	-0.889***	0.248	0.000	-0.170	0.190	0.370	-0.297	0.136	0.030
Health awareness campaign	0.559**	0.194	0.004	-0.842***	0.147	0.000	-0.125	0.159	0.430	-0.241	0.118	0.043
Challenges when purchasing herbs												
Unknown health benefits	0.361*	0.220	0.102	0.167	0.225	0.458	0.222	0.229	0.333	-0.097	0.198	0.623
Lack of proper packaging	-0.173	0.163	0.289	-0.048	0.173	0.782	-0.165	0.150	0.272	0.014	0.126	0.907
Difficulty with storing	0.253	0.158	0.111	0.003	0.148	0.982	0.103	0.155	0.506	-0.179	0.122	0.142
Unavailability on the shelves	0.003	0.160	0.985	-0.139	0.144	0.335	0.291**	0.151	0.055	-0.010	0.117	0.926
Unknown brands	-0.219	0.128	0.088	0.170	0.139	0.220	-0.090	0.099	0.367	-0.034	0.900	0.704
Quantity and quality demand for herbs												
Right quantities of herbs	-0.646**	0.298	0.031	0.425	0.464	0.360	0.822**	0.320	0.011	-0.849	0.265	0.002
Right quality herbs	0.098	0.165	0.553	0.177	0.145	0.224	0.384**	0.153	0.013	-0.232	0.130	0.074
Cons	-0.177	0.611	0.771	-0.410	0.770	0.594	-0.245	0.729	0.736	0.735	0.702	0.296

From table 5.5, the first model revealed that gender showed a negative effect with a parameter of -0.567 on paprika. The results imply that being female decreased utilization of paprika. Results from sources of information also revealed that some parameters, such as information from health practitioners and health awareness campaigns, reported a positive effect and statistical significance for utilization of paprika, with a coefficient of 0.768 and 0.559 respectively. The results imply that as consumers receive more information on paprika, their utilization for the spice will also increase significantly. Moreover, information from the radio revealed a negative impact on utilization of paprika. The parameter recorded a coefficient of -2.31 and significance of 0.000.

Lastly, unknown health benefits showed a positive effect (0.361) on utilization of paprika, and the results indicate that consumers become more inquisitive about herbs in an attempt to obtain some benefits by utilizing them. Quantity demanded showed a negative effect of utilization of paprika, and was marked by a negative coefficient of 0.645 and p value of 0.031. According to Coleto et al. (2021), utilization for paprika is on the rise due to its aromatic effect in food.

Results from the second model also revealed that socio-economic factors do affect utilization of Fennel seeds. Factors such as gender and ethnicity showed a negative effect on utilization of Fennel seeds, with statistical significance and coefficient of 0.467. A majority of the sources of information on herbs showed statistical significance with utilization of Fennel seeds. Television (-0.679), health practitioners' information (-0.889), health awareness campaigns (-0.842) and radio (-1.298) showed a negative effect on utilization of Fennel seeds and statistical significance. On the other hand, the internet (0.445) and newspaper (0.882), influenced utilization of fennel seeds in a positive direction.

Utilization of mint on the other hand was not influenced by any of the socio economic factors listed in the model. Similar to results of the second model, sources of information were reported on newspapers recorded a negative effect (-0.539) on utilization of mint, while friends and family recorded a positive effect (0.462) on utilization of mint. Unavailability on the shelves also recorded a positive effect (0.291) on utilization of mint. Mint consumption and demand has been recorded to be on the rise due to its antibacterial efficiency in preserved food (Akhtar et al., 2019). The last part of the results showed that quality and quantity influenced utilization of mint positively, with coefficients of 0.822 and 0.384 respectively.

The last model on celery showed that some sources of information on herbs, such as newspapers, radio, and friends and family, showed a positive effect on utilization of celery, with coefficients of 0.860, 2.527 and 0.491 respectively. Statistical significance was also demonstrated by data from health professionals and health awareness initiatives, with coefficient values of -0.297 and -0.241 respectively. Due to its medicinal benefits when consumed adequately, factors such as control for weight loss and blood pressure, Clegg et al. (2012) and Lasria et al. (2021) have highlighted the increase in the consumption and demand for celery, especially in the elderly consumers.

Table 5.6: Regression results on consumer utilization of herbs: vanilla, star anise, basil and origanum

Parameters	Vanilla			Star anise			Basil			Origanum		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Socio-economic attributes												
Age	0.007	0.115	0.489	0.111	0.123	0.370	0.002	0.010	0.791	0.018	0.013	0.158
Marital Status												
Married	-0.029	0.260	0.910	0.236	0.250	0.345	-0.089	0.217	0.680	-0.222	0.292	0.448
Divorced	-0.574	0.536	0.285	0.238	0.551	0.666	-0.591	0.452	0.191	-0.197	0.515	0.702
Household size	0.054	0.067	0.423	-0.228	0.682	0.738	0.006	0.056	0.902	0.000	0.067	0.989
Gender	0.060	0.301	0.842	-0.184	0.149	0.459	0.147	0.230	0.523	-0.052	0.293	0.585
Education level	-0.197	0.361	0.586	-0.225	0.359	0.530	-0.190**	0.294	0.052	-0.068	0.311	0.827
Religion	0.086	0.325	0.790	0.751	0.320	0.815	0.029	0.292	0.920	-0.005	0.364	0.987
Ethnicity												
White	0.203	0.032	0.537	0.006	0.375	0.985	0.461	0.342	0.178	-0.226	0.380	0.551
Coloured	-0.206	0.207	0.321	-0.271	0.206	0.190	-0.038	0.177	0.829	-0.342	0.224	0.127
Asian	-0.144	0.325	0.657	0.942	0.287	0.743	0.257	0.258	0.321	-0.032	0.306	0.914
Employment status	-0.265	0.499	0.596	-0.389	0.504	0.440	-0.456	0.410	0.266	-0.403	0.481	0.403
Food expenditure	0.000	0.000	0.334	0.000	0.000	0.641	-6.37e-06	0.000	0.933	8.50e-06	0.000	0.925
Sources of information on herbs												
Television	0.454***	0.142	0.001	0.604***	0.138	0.000	0.551***	0.119	0.000	-0.426**	0.136	0.002
Newspaper	0.195	0.143	0.174	-0.045	0.161	0.779	0.133	0.128	0.298	0.051	0.147	0.726
Radio	1.089***	0.228	0.000	-1.035***	0.238	0.000	2.352***	0.248	0.000	3.146***	0.457	0.000
Internet	0.253	0.125	0.044	0.171	0.130	0.190	0.231**	0.105	0.029	0.111	0.136	0.417
Friends and family	-0.776***	0.165	0.000	-0.217	0.147	0.143	-0.388***	0.121	0.001	-0.916***	0.152	0.000
Health practitioner	-0.153	0.170	0.368	-0.516**	0.196	0.009	0.008	0.139	0.951	0.700***	0.166	0.000
Health awareness campaign	-0.070	0.129	0.589	-0.755***	0.146	0.000	0.415***	0.121	0.001	-0.481***	0.134	0.000
Challenges when purchasing herbs												
Unknown health benefits	0.147	0.248	0.552	-0.315	0.208	0.132	0.381	0.249	0.127	0.229	0.244	0.349
Lack of proper packaging	-0.222	0.142	0.119	-0.288	0.161	0.075	-0.127	0.127	0.320	-0.308**	0.155	0.048
Difficulty with storing	0.000	0.141	0.997	-0.324**	0.142	0.024	-0.157	0.147	0.285	-0.336**	0.167	0.045
Unavailability on the shelves	-0.264	0.142	0.064	-0.033	0.143	0.815	0.268**	0.130	0.041	0.255	0.157	0.106
Unknown brands	0.044	0.107	0.680	0.689	0.177	0.557	0.063	0.084	0.457	0.103	0.106	0.335
Quantity and quality demand for herbs												
Right quantities of herbs	0.747**	0.349	0.033	1.173***	0.342	0.001	0.213	0.308	0.489	1.105***	0.276	0.000
Right quality herbs	0.112	0.146	0.445	0.113	0.178	0.524	0.047	0.131	0.721	0.114	0.147	0.437
Cons	-0.662	0.709	0.350	-0.796	0.684	0.245	-0.890	0.619	0.151	-1.393	0.725	0.055

The last part of the results presented in table 5.6 above are on utilization of the herbs vanilla, star anise, basil, and origanum. Results from the first model on vanilla revealed that sources of information such as television, newspapers (0.454), radio (1.089), the internet (0253), and friends and family (-0.776), significantly influenced utilization of vanilla. Only information from friends and family showed a negative association with utilization, while the other parameters showed a positive influence. Amongst the challenges experienced by consumers when purchasing herbs, unavailability on the shelves showed a negative effect (-0.264) on utilization of vanilla. Lastly, quantity demanded also showed a positive effect (0.747) on utilization of vanilla, recording a coefficient of 0.747 and a p value of 0.033. Vanilla has been used by a majority of the consumers for its aroma, and the resultant demand has been proven by researchers such as Bertelsen et al. (2021) and Amir et al. (2022).

The second part of the results also reported that sources of information influenced utilization of star anise both positively and negatively. Parameters such as radio (-1.035) and health awareness (-0.755) campaigns recorded a negative effect, while television recorded a positive effect (0.604) on utilization of star anise. On challenges experienced by consumers when purchasing star anise, lack of proper packaging (-0.288) and difficulty with storing (-0.324) the herb recorded a negative effect on utilization of star anise. The results mean that, as consumers struggle with how to store the herb, and if packaging of the herb does not meet their expectation, then consumption of the herb decreases. In addition, right quantity demanded showed a positive effect (1.173) on utilization of star anise. Rise in quantity demand has been reported by Liu et al. (2020), who reported that star anise is used to improve quality and shelf life of ready-to-eat meat products. The results implied that when quantity increased by one unit, consumption of star anise also increased by 0.342.

Subsequently, results on basil showed that a unit increase in education level resulted in a decrease (-0.190) in consumption of basil. The results implied that as consumers get more educated, they decrease their utilization of basil and could be opting for mixed herbs that are likely to include a variety of herbs in one packaging at a reasonable price. On sources of information, television, radio, the internet, and information received during health awareness campaigns also showed a positive effect on utilization of basil, and the parameters recorded a statistical significance, with coefficient values of 0.511, 2.352, 0.231 and 0.415respectively. On the other hand, information received from friends and family reported a negative effect with a coefficient of -0.388. From the challenges experienced by consumers when purchasing basil,

unknown benefits as well as unavailability on the shelves showed a positive effect on utilization of basil. Increase in utilization, according to Bravo et al. (2021) and Céspedes et al. (2021), has come as a result of the herb being used in preservation of food and also for various medicinal purposes by consumers.

Finally, yet importantly, the results for origanum showed that consumers' socioeconomic factors did notsignificantly influence utilization of origanum. In addition, television (-0.426), friends and family (-0.916) as well as healthy awareness campaign (-0.481) as sources of information revealed a negative effect on utilization of origanum. On the other hand, information received from health practitioners (0.700) and from the radio (3.146) showed a positive effect on utilization of origanum, meaning that as consumers receive more information from the radio, their consumption of origanum will also increase. In accordance with Jaspal et al. (2021) and Alagawany et al. (2020), an increase in the utilization of origanum is due to its therapeutic purposes and also for use in food preservation to improve quality and storage properties of food. Lack of packaging (-0.308) and difficulty in storing (-0.336) the herb also recorded a negative effect on the utilization of the herb, while unavailability on the shelves revealed a positive effect on the utilization. Lastly, quantity demanded revealed a positive effect on utilization of the herb and recorded a p value of 0.000 with a coefficient of 1.105.

5.5 Regression results on utility for spices and herbs

The following section presents regression results on consumer utility for different spices and herbs. The first section presents results on spices and the second section presents results on utility for herbs.

5.5.1 Spices Utility

Table: 5.7: Regression results on consumer utility of spices: cumin, mustard, turmeric and chilli

Parameters	Commodities											
	Cumin			Mustard			Turmeric			Chilli		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Age	-0.024	0.154	0.117	-0.027*	0.015	0.076	-0.018	0.012	0.129	-0.004	0.012	0.686
Marital Status												
Married	-0.053	0.231	0.681	0.023	0.226	0.315	-0.063	0.225	0.781	-0.303	0.237	0.201
Divorced	-1.143**	0.393	0.004	-1.545**	0.762	0.043	.3.720***	0.482	0.000	-0.526	0.359	0.144
Household size	0.120	0.073	0.104	0.217**	0.916	0.018	0.206**	0.066	0.002	0.761	0.607	0.211
Gender	-0.178	0.234	0.446	-0.101	0.229	0.658	0.066	0.235	0.777	0.671**	0.283	0.018
Education level	-0.595**	0.264	0.025	-0.977	0.510	0.056	-2.897***	0.308	0.000	0.311	0.225	0.167
Religion	0.506	0.299	0.091	-0.191	0.332	0.656	-0.257	0.287	0.372	-0.430	0.285	0.132
Ethnicity												
White	-0.238	0.369	0.519	0.203	0.423	0.631	0.001	0.391	0.996	-0.079	0.354	0.822
Coloured	-0.204	0.217	0.349	-0.122	0.243	0.615	0.091	0.203	0.652	-0.089	0.206	0.664
Asian	0.589**	0.279	0.036	-0.420	0.342	0.220	-0.863**	0.273	0.002	0.124	0.259	0.626
Employment status	-0.659**	0.429	0.013	-1.218**	0.459	0.008	-2.276***	0.445	0.000	-0.160	0.407	0.694
Food expenditure	0.000**	0.000	0.077	0.000**	0.000	0.004	0.000	0.000	0.143	0.000*	0.000	0.084
Constant	1.447	0.771	0.062	1.905	0.854	0.026	3.155	0.639	0.000	-0.213	0.589	0.718

Table 5.7 illustrates consumers' utility choices on four different spices, namely; cumin, mustard, turmeric and chilli. Cumin results revealed that age had a negative (-0.024) relationship with utility of cumin. The results implied that a unit increase in age results in a decrease in utility of cumin spice. This could be due to loss in the flavour and aroma of the spice as consumers age, which therefore affects demand for cumin. The results are however contrary to those reported by Obayelu et al. (2019), who reported that consumers tend to make healthier food choices as they age. Similarly, results on marital status (specifically, the divorced group) also showed a decreased in utility of cumin. The parameter showed significance of 0.004 and a negative relationship of -1.143. The results are similar to those revealed by Durães et al. (2021), who highlighted that marital status shows an important role in influencing consumers' food consumption. On the other hand, educational level showed a negative effect with a coefficient of -0.595 on utility for cumin. The results imply that as consumers get more educated, utility for cumin is reduced and this could be due to improved know of other food substitutes that could offer similar utility.

Food expenditure also recorded a positive relationship and statistical significance with utility of cumin. The results showed a 0.013 significance and a positive relationship of 0.000 with cumin. Lastly, for cumin, employment status showed a negative relationship (-0.659) yet a statistical significance with utility of cumin. The results implied that a unit increase in employment results in a decrease in utility of cumin, and this could be due to a decrease in purchases of cumin for reasons such as opting for substitutes or alternative spices. Furthermore, Sattar et al. (2019) reported that consumers in Bangladesh derive utility from consumption of cumin for various health benefits in combating metabolic disorders.

On mustard, age also showed a negative relationship (-0.027), though with statistical significance, with utility of mustard seeds. This implied that as consumers' age increases, there is a decrease in utility of mustard, and this could be due to loss in interest in the spice due to its strong flavour and aroma, or the establishment of mustard products that offer similar utility. Divorced consumers also showed a negative relationship (-1.143) and statistical significance with utility of mustard seeds. The results implied that a unit increase in marital status results in a decrease in utility of mustard. On the other hand, household size (0.217) presented a positive correlation and statistical significance with utility of mustard. The results implied that a unit increase in both household size will result in an increase in utility of mustard. This could be due to an increase in the number of people to feed in the household which turns to increase consumption of mustard in the household. Lastly, on mustard, employment status and food expenditure showed a negative (-1.218) and positive (0.000) relationship with utility yet a

statistical significance for mustard utility respectively. Results from a study conducted by Ghawi et al. (2014) revealed that an increase in mustard on food increased consumption of broccoli by consumers, thus increased utility of mustard consumption.

Results from turmeric showed a positive (3.720) significance from consumers who are divorced. This implies that a unit increase in being divorced increased utility of turmeric, and this could be due to lack of limitation in what an individual enjoys in their own personal space without the influence of their spouse. Similarly, a unit increase in household size increased utility of turmeric by 0.206. This could also be due to an increase in the number of household members who enjoy turmeric or appreciate the health benefits of turmeric. Moreover, ethnicity (-0.863) and employment status (-2.276) revealed a negative relationship and statistical significance with utility of turmeric. The results implied that a unit increase in being Asian and being employed result in a decrease in utility for turmeric and this could be due to personal choices such as dislike of the staining effect of turmeric, and its pungent smell. Lastly, Educational level negatively influenced utility of turmeric by -2.897. Derived utility from consumption was also reported by Siruguri and Bhat (2015), who also reported that increased consumption in turmeric, frequency and portion size of spices influenced consumer utility derived from turmeric.

Lastly, results for the utility of chilli showed a positive relationship and statistical significance with gender (0.671), and food expenditure (0.000). The results implied that being female increases utility of chillie and also that as consumers food expenditure increases, utility for chilli also increases significantly. The results are in agreement with those reported by Jitkuekul, (2020), who reported that consumers tend to prefer hot chilli with their food and this seems to be a growing trend in Thailand, as it promises promotion of good health.

Table: 5.8: Regression results on consumer utility of spices: coriander, Black pepper, cinnamon and ginger

Parameters	Commodities											
	Coriander			Black pepper			Cinnamon			Ginger		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Age	0.103	0.012	0.410	-0.001	0.011	0.928	-0.006	0.011	0.563	0.001	0.016	0.935
Marital Status												
Married	0.180	0.221	0.416	-0.327	0.233	0.162	0.195	0.188	0.300	-0.284	0.262	0.279
Divorced	0.954**	0.479	0.047	0.375	0.261	0.152	-0.262	0.383	0.494	2.560***	0.384	0.000
Household size	0.043	0.065	0.503	-0.097	0.065	0.140	0.050	0.057	0.382	-0.140**	0.075	0.049
Gender	-0.108	0.289	0.708	-0.284	0.218	0.194	0.053	0.195	0.784	0.534**	0.269	0.048
Education level	0.757**	0.278	0.007	0.343**	0.145	0.019	0.643**	0.220	0.004	2.311***	0.241	0.000
Religion	-0.210	0.349	0.547	0.214	0.373	0.565	-0.767**	0.285	0.007	0.263	0.301	0.383
Ethnicity												
White	-0.633	0.331	0.849	-1.042**	0.426	0.015	0.089	0.335	0.789	0.127	0.420	0.762
Coloured	0.216	0.203	0.287	0.252	0.211	0.233	0.120	0.174	0.490	-0.020	0.200	0.920
Asian	0.341	0.406	0.401	0.000	0.199	0.998	0.114	0.266	0.668	-0.052	0.265	0.845
Employment status	-0.106	0.446	0.812	1.263***	0.370	0.001	0.954*	0.392	0.015	2.925***	0.408	0.000
Food expenditure	0.000	0.000	0.654	0.000*	0.000	0.056	0.000	0.000	0.871	0.000	0.000	0.559
Constant	-1.272	0.622	0.042	0.409	0.508	0.936	-0.575	0.542	0.289	-1.995	0.820	0.015

Table 5.8 depicts outcomes on consumer utility of four spices, namely coriander, Black pepper, cinnamon, and ginger. On ginger, two parameters, marital status and education level showed a positive association and statistical significance with utility of the spice. The results implied that a unit increase in marital status (being divorced) will increase utility of ginger by 0.954, and a unit increase in education level also increases utility of ginger by 0.757. Consumers who make their own food choices are likely to consume coriander without any influence from their partners. Similarly, on education, consumers gain more knowledge and understanding as they get more educated; this tends to influence their consumption of spices like coriander.

Results on Black pepper also revealed that four parameters influenced consumption and hence utility of the spice. According to McAusland et al. (2020), consumers derive their utility from the aromatic flavoring attribute, and this increased consumption of the spice. Again, education level showed a positive effect and statistical significance with utility for Black pepper. A unit increase in education level increased utility of Black pepper by 0.343. On the other hand, ethnicity showed a negative relationship with utility for Black pepper. The results implied that a unit increase in being White reduces utility of Black pepper by 1.042. Lastly, employment status and food expenditure recorded a positive and statistical significance with utility of Black pepper. Being employed as well as an increase in food expenditure increases utility of Black pepper, with 01.263 and 0.000 respectively. The results are similar to those reported by Racette and Drake (2022), who indicated that consumer perception about the health benefits of Black pepper increased consumption of the spice.

On the two spices, cinnamon and ginger, education level and employment status showed a positive association with utility of cinnamon. On the other hand, religion showed a negative relationship (-0.767) with cinnamon, and this could be due to religious restrictions on consumption of certain food commodities. Marital status recorded a positive association (2.560) with utility of ginger. Surprisingly, household size showed a negative influence (-0.140) on utility of ginger. The reason behind this could be due to the strong and burning taste of ginger, resulting in more spice consumers resenting it, or opting for other spices that yield similar benefits as ginger does. Gender and education level also showed a positive association with utility of ginger and a statistical significance of 0.534 and 2.311 respectively. Lastly, employment status showed a positive significance of 2.925 and statistical significance of 0.00 on utility of ginger. A study by Song et al. (2014) indicated that an increase in cinnamon had favorable effect on consumer preference in all attributes of cinnamon. Also Akerele et al. (2017) indicated that the majority of the consumers in Ogun State were aware of ginger's medicinal benefits, and indicated constant purchase of the spice as it yields the expected utility.

Table: 5.9: Regression results on consumer utility of spices: masala, clove, cayenne pepper and White pepper

Parameters	Commodities											
	Masala			Clove			Cayenne pepper			White pepper		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Age	-0.025	0.131	0.056	-0.368**	0.012	0.003**	-0.019	0.127	0.128	-0.001	0.011	0.893
Marital Status												
Married	-0.118	0.244	0.628	0.098	0.184	0.595	0.345	0.211	0.103	0.104	0.223	0.641
Divorced	-0.880	0.528	0.097	-0.208	0.323	0.516	0.588	0.322	0.068	-0.766	0.502	0.128
Household size	0.126	0.690	0.067*	0.010	0.077	0.888	0.079	0.665	0.232	-0.031	0.071	0.665
Gender	0.018	0.251	0.940	-0.273	0.210	0.195	0.363	0.225	0.107	-0.158	0.248	0.524
Education level	-0.341	0.336	0.312	-0.161	0.268	0.547	0.816***	0.237	0.001	-0.880**	0.336	0.008
Religion	0.215	0.287	0.453	0.374	0.268	0.165	-0.399	0.259	0.124	-0.178	0.308	0.563
Ethnicity												
White	0.140	0.392	0.721	-0.300	0.377	0.427	0.752**	0.385	0.052	-0.452	0.413	0.276
Coloured	-0.041	0.201	0.835	-0.074	0.206	0.718	0.519**	0.209	0.014	-0.114	0.198	0.564
Asian	-0.103	0.277	0.709	0.775*	0.262	0.003	-0.607**	0.206	0.003	0.173	0.303	0.567
Employment status	0.000	0.429	0.999	-0.329	0.486	0.498	2.522***	0.456	0.000	-1.738***	0.471	0.000
Food expenditure	0.000	0.000	0.143	0.000	0.000	0.107	0.000**	0.000	0.008	0.000	0.000	0.690
Constant	1.140	0.676	0.093	1.774	0.666	0.008	-0.429	0.653	0.511	1.070	0.617	0.084

Results on utility for masala, clove, cayenne pepper and White pepper are presented in table 5.9 above. Household size showed positive (0.126) association and statistical significance on utility of masala. The results imply that as household size increases, utility for masala also increases by 0.126 significantly. Two parameters showed association with utility for clove; age and ethnicity. A unit increase in age decreased utility of clove by -0.368, and this could be due to loss of interest in the spice due to its pungent smell. However, being Asian increased utility of clove by 0.775, and showed a statistical significance of 0.003. The association of ethnicity and consumption of spices has been recorded by authors such as Rashid et al. (2018). Utility of clove was also recorded by Kang et al. (2019), who highlighted that consumers preferred consumption of clove with their meat products.

Results on cayenne pepper revealed education level showed a positive association (0.816) and statistical significance with utility of cayenne pepper. Moreover, ethnicity, and employment status, as well as food expenditure showed a positive effect and statistical significance with utility of cayenne pepper. Utility of cayenne pepper was also reported by authors such as Chopan and Littenberg (2017), who reported that a majority of consumers showed a high preference for cayenne pepper for its health benefit. Lastly, on White pepper, education level showed a negative association (-0.880) with utility of White pepper, but a statistical significance. The results implied education level and employment status (-1.738) showed a negative association with utility of White pepper. Utility of White pepper was also highlighted by Shori (2022), who revealed that consumers also prefer the spice as an enhancement in food preservation

The following section presents utility results on herbs

5.5.2 Herbs Utility

Table 5.10: Regression results on consumer utility of herbs: rosemary, parsley, thyme and garlic

Parameters	Commodities											
	Rosemary			Parsley			Thyme			Garlic		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Age	0.323*	0.129	0.013	-0.010	0.126	0.395	-0.013	0.013	0.311	-0.006	0.137	0.625
Marital Status												
Married	0.125	0.212	0.567	0.004	0.186	0.983	0.296	0.314	0.347	-0.006	0.252	0.980
Divorced	0.966**	0.498	0.053	-0.563	0.356	0.114	-0.624	0.781	0.936	-1.150	0.610	0.060
Household size	-0.039	0.068	0.568	0.134**	0.621	0.031	0.173	0.100	0.086	0.160*	0.806	0.047
Gender	0.614**	0.292	0.036	0.426**	0.191	0.026	-0.211	0.314	0.501	0.193	0.263	0.464
Education level	1.123***	0.317	0.000	0.203	0.232	0.384	-0.014	0.487	0.977	-0.379	0.403	0.348
Religion	-0.740*	0.412	0.074	-0.013	0.294	0.963	0.428	0.484	0.377	0.184	0.330	0.579
Ethnicity												
White	0.406	0.281	0.150	0.845**	0.367	0.022	0.502	0.520	0.334	0.431	0.493	0.382
Coloured	0.398**	0.179	0.027	0.467**	0.214	0.054	0.169	0.256	0.510	0.000	0.241	0.999
Asian	1.667**	0.525	0.002	-0.175	0.259	0.499	-0.167	0.387	0.666	-0.603	0.344	0.081
Employment status	-1.498**	0.529	0.005	0.150	0.392	0.707	0.008	0.510	0.987	0.656	0.527	0.214
Food expenditure	0.000	0.000	0.616	0.000	0.000	0.102	0.000	0.000	0.267	0.000	0.000	0.812
Constant	-2.794	0.706	0.000	-0.359	0.608	0.555	-0.584	0.669	0.930	0.000	0.765	1.000

Table 5.10 illustrates outcomes on utility of rosemary, parsley, thyme and garlic. Age showed a positive (0.323) and statistical significance with utility for rosemary, meaning that a unit increase goes with an increase in utility of rosemary. Similarly, being divorced also showed positive (0.966) association with utility of rosemary. The results implied that divorced consumers show improved utility of rosemary, since they make decisions solely without any influence from their married counterparts who have to rely on or consult with their partners. Education level also showed a positive (1.123) relationship with utility of rosemary and statistical significance of 0.036. In addition, gender showed a positive association (0.614) with utility for rosemary. On the other hand, religion showed a negative relationship (-0.740) with utility of rosemary. The results implied that a unit increase in religion results in a decrease in utility of rosemary, and this could be due to religious beliefs and practices. On ethnicity, being Asian showed a positive relationship (1.667) with utility of rosemary. Lastly, an increase in employment status resulted in a decrease in utility of rosemary. This was revealed by a negative association of -1.498 and statistical significance of 0.005. Results from a study conducted by Vital et al. (2018) exposed that incorporation of rosemary had a significant influence on beef acceptability and thus utility for beef.

Unlike with rosemary, utility of parsley was positively (0.134) influenced by household size and showed a positive impact on utility of parsley, implying that as the number of household members' increases, consumption of parsley will also increase, and hence an increase in the utility of parsley. On the same note, gender and ethnicity showed an association with utility of parsley. The parameters recorded a positive coefficient of 0.426 and 0.845, and p values of 0.026 and 0.022 respectively. Utility of parsley was also reported by Pobereżny et al. (2016), who indicated that factors that influence the value of parsley consumption included taste and flavour, as well as dietary utility (vitamins and minerals).

On the other hand, results for thyme and utility showed no statistical relation with utility of thyme. Lastly, for garlic, being divorced showed a negative relationship with utility of garlic, with a coefficient of 0.150 and p value of 0.060. Furthermore, an increase in household size results in an increase in utility of garlic. This is marked by a positive coefficient of 0.160 and a p value of 0.047. In their study on consumer perceptions and intake of garlic, Aston and Wickett (2018) highlighted that consumer utility for garlic was mostly derived from pre-chopped and garlic powder consumption.

Table 5.11: Regression results on consumer utility of herbs: paprika, fennel seeds, mint and celery

Parameters	Commodities											
	Paprika			Fennel seeds			Mint			Celery		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Age	0.014	0.011	0.168	-0.001	0.010	0.868	0.031**	0.014	0.027	0.017	0.013	0.198
Marital Status												
Married	0.184	0.231	0.426	-0.173	0.182	0.343	0.102	0.291	0.724	0.116	0.277	0.675
Divorced	-0.155	0.521	0.766	-0.842	0.677	0.215	-1.280**	0.480	0.009	-0.161	0.582	0.782
Household size	0.036	0.076	0.634	0.000	0.849	0.995	0.161**	0.076	0.035	0.106	0.810	0.189
Gender	-0.163	0.238	0.495	0.323	0.191	0.092	-0.144	0.295	0.625	0.070	0.281	0.804
Education level	0.134	0.335	0.689	-0.545	0.530	0.304	-0.582**	0.260	0.026	0.959	0.368	0.759
Religion	0.147	0.294	0.618	-0.124	0.270	0.646	-0.067	0.362	0.863	-0.019	0.342	0.954
Ethnicity												
White	0.184	0.426	0.665	0.402	0.506	0.428	0.677	0.468	0.149	0.065	0.475	0.891
Coloured	-0.131	0.239	0.585	-0.013	0.262	0.958	-0.287	0.262	0.276	0.176	0.251	0.482
Asian	-0.281	0.260	0.280	0.074	0.310	0.810	-0.263	0.308	0.395	-0.004	0.305	0.987
Employment status	0.470	0.479	0.327	-0.088	0.755	0.907	-0.181	0.494	0.715	-0.273	0.544	0.616
Food expenditure	0.000	0.000	0.683	9.86e-06	0.000	0.935	-1.48E-06	0.000	0.989	0.000	0.000	0.732
Constant	-0.648	0.619	0.296	0.399	0.690	0.564	-1.073	0.706	0.129	-1.265	0.724	0.082

Results from 5.11 shows utility results for paprika, fennel seeds, mint and celery. From the table, none of the parameters influenced utility for paprika. On fennel, gender recorded a positive coefficient (0.323). The results implied that a unit increase in gender will result in an increase in utility for fennel seeds. Utility of fennel seeds seed was reported by Chironi et al. (2021), who highlighted that fennel seeds provide consumers with therapeutic properties and thus has resulted in an increase in their intake. Results on mint revealed that age had a positive influence on utility of mint, which recorded a coefficient of 0.031 and p value of 0.027. The results implied that as consumers grow older, they derive more utility from consuming mint. Similarly, results on household size (0.161), education level (-0.582) and marital status (-1.280) showed positive and negative association with mint and statistical significance. The results implied that, as consumers get additional members in the household, they consume more mint and this increased utility from the consumption of the herb. In addition, a unit increase in ethnicity results in an increase in utility for mint. On the other hand, education level and marital status showed a negative relationship with utility of mint. This means that a unit increase in both education level and marital status results in a decrease in mint and this could be due to consumers opting for other herbs that match the utility derived from consuming mint. Results from studies on mint consumption revealed that utility for mint is highly influenced by consumers' interest in the nutritional properties in mint as well at its perceived health benefits Lastly, none of the socio-economic factors influenced utility of celery.

Table 5.12: Regression results on consumer utility for herbs: vanilla, star anise, basil and origanum

Parameters	Commodities											
	Vanilla			Star anise			Basil			Origanum		
	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|	Coeff	Std. Error	P>|z|
Age	0.001	0.011	0.881	0.007	0.011	0.953	0.015	0.010	0.136	0.007	0.012	0.554
Marital Status												
Married	0.208	0.277	0.453	-0.247	0.253	0.331	-0.585**	0.214	0.007	-0.135	0.246	0.582
Divorced	-0.557	0.625	0.373	-1.190**	0.564	0.035	-1.270**	0.621	0.041	-0.709	0.566	0.211
Household size	0.074	0.074	0.313	0.007	0.072	0.922	-0.093	0.072	0.194	0.035	0.070	0.612
Gender	0.141	0.307	0.646	0.247	0.252	0.922	0.236	0.221	0.287	0.294	0.252	0.245
Education level	-0.620	0.396	0.119	-0.843**	0.358	0.018	-0.905**	0.427	0.035	-0.389	0.388	0.318
Religion	-0.088	0.342	0.796	0.057	0.296	0.847	-0.719**	0.266	0.007	-0.094	0.297	0.752
Ethnicity												
White	0.887	0.510	0.083	-0.520	0.347	0.135	-0.514	0.437	0.240	0.146	0.387	0.705
Coloured	0.112	0.264	0.671	-0.398**	0.178	0.035	-0.306	0.187	0.103	-0.203	0.213	0.340
Asian	-0.189	0.311	0.544	-0.242	0.282	0.391	-0.044	0.281	0.875	-0.172	0.309	0.577
Employment status	-0.579	0.469	0.218	-0.432	0.520	0.406	-1.331**	0.472	0.005	-0.536	0.502	0.287
Food expenditure	0.000	0.000	0.773	0.000	0.000	0.812	0.000	0.000	0.603	0.000	0.000	0.443
Constant	0.034	0.633	0.957	1.000	0.645	0.120	0.983	0.637	0.124	0.128	0.661	0.847

Results on utility of vanilla, star anise, basil and origanum are displayed on table 5.12 above. Results from vanilla showed no statistical significance with utility for vanilla in the province. From the results on star anise, only three parameters, namely marital status, education level and ethnicity, showed a relationship with utility of vanilla consumption. On marital status, those who were divorced showed a negative association (-1.190) with utility for star anise while education level showed a negative association, with a coefficient of -0.843 and a p value of 0.018. The results implied that as consumers get more educated, they reduce consumption for star anise, and this could be due to change in their sources of vanilla, or opting for star anise substitutes that yield similar utility. Moreover, ethnicity showed a negative association (-0.398) with utility of star anise, and this implies that being White increased consumption and utility of vanilla. According to Martin (2018), consumer preference and utility of vanilla is influenced by its aroma in food, and to some extent its health benefit.

On the other hand, utility of basil was positively influenced by age, with a coefficient of 0.015. The results implied that as consumers age increases, also their utility of basil increases. However, on the contrary, parameters such as marital status, specifically married and divorced, education level, religion, ethnicity, and employment status reported a negative association with utility of basil and a statistical significance. The results revealed that a unit increase in each of the parameters will decrease utility of basil by the corresponding coefficient. Consumer utility of basil has been reported by Yue et al. (2020) to be a result of the taste, smell, and texture of basil.

5.6 Chapter summary

The aim of the chapter was to identify determinants of consumer utilization and utility of spices and herbs in South Africa in Gauteng Province. Results from these chapter showed that consumers' utilization for spices is influenced by sources of information such as newspapers, friends and family, radio, and health awareness campaign. On herbs, factors that influenced utilization of the majority of the herbs include sources of information such as radio, health practitioners, newspapers, television, and information from friends and family. Lastly, on utilization of herbs, lack of proper packaging influenced utilization of herbs. The second section of the results on consumer utility revealed that socio-economic factors such as food expenditure and education level influenced utility of all spices, while employment status and marital status showed an influence for at least three spices. On herbs, marital status and

education level influenced utility for the majority of herbs. The next chapter present results on socio-economic factors affecting consumer willingness to purchase spices and herbs.

CHAPTER SIX

WILLINGNESS TO PAY, DEMAND AND ELASTITY OF SPICES AND HERBS

6.1 Introduction

This chapter presents an investigation of socio-economic factors that affect consumers' willingness to purchase different spices and herbs. The chapter is divided into three sections. The first section presents multivariate analysis for willingness to pay for spices and herbs as well as the marginal effects after bivariate logit. The second section presents QUAIDS model results on demand for spices and herbs as well as elasticity results. The last section presents a summary of the chapter.

6.2 Predictors of Willingness to Pay for Spices and Herbs

Logistic regression model was used to estimate socio-economic factors influencing consumers' willingness to purchase culinary spices and herbs in South Africa. In this section, respondents' willingness to pay was coded as the dependent variable, and was regressed against the explanatory variable.

Table 6.1: Logit regression analysis in relation to consumer's willingness to pay for spices

	Logit results		Marginal effects	
Willingness to pay for spices	Coefficient	P>|z|	dy/dx	P>|z|
Socio-economic factors				
Age	-0.365	0.036	-0.911**	0.036
Marital status	0.516	0.147	0.128	0.146
Household size	-0.885	0.014	-0.216**	0.009
Gender	-0.406	0.217	-0.100	0.210
Education attainment	-0.273	0.417	-0.676	0.412
Ethnicity	0.186	0.533	0.465	0.533
Average monthly income	0.104	0.442	0.026	0.442
Number of years consuming spices	0.302	0.049	0.075**	0.049
Preference factors				
Cumin for personal use	-0.574	0.048	-0.142**	0.043
Mustard for use on meat	0.310	0.171	0.077	0.170
Turmeric for personal use	0.410	0.083	0.102*	0.081
Coriander for use on meat	-0.146	0.797	-0.036	0.797
Cinnamon for read-to-use meals	-0.007	0.981	-0.001	0.981
Ginger for use on meat	-0.567	0.064	-0.140*	0.057
Masala for personal use	1.00	0.117	0.229	0.066
Cayenne for ready-to-use meals	0.801	0.876	0.020	0.875
White pepper for personal use	0.722	0.214	0.175	0.194
Constant	-0.403	0.707		
Number of observations	385			
LR chi2 (15)	40.38			
Prob > chi^2	0.0011			
Pseudo R^2	0.0757			
Log likelihood	-246.51652			

Table 6.1 above illustrates the output of the logit regression model on willingness to pay for spices, and revealed that some socio-economic factors such as age, household size, and number of years consuming spices, had a statistical significance for willingness to pay. Age was statistically significant at 5% and showed a negative relationship (-0.911) towards willingness to pay. This implies that an increase in age would decrease consumers' willingness to pay for culinary spices. This is consistent with research by Ortmann (2014), who found a link between aging and a person's willingness to spend for functional foods. However, the results are contrary to those of Kucher et al. (2019), who also reported a positive statistical significance between age and willingness to pay, citing that an increase in age goes along with linking

nutritional health with certain food stuffs, and in return consumers increase willingness to pay more than when they were still young.

As expected, the parameter household size had a negative relationship (-0.216), with statistical significance of $p<0.05$. This suggests that the willingness to pay for spices will fall by 0.216 units for every additional household member. This is in line with a priori knowledge, that as household size increased, food intake level can be negatively affected due to budget constraints. This is contrary to results from a study conducted by Nandi et al. (2017), who found that increasing household size increases willingness to purchase organic fruits and vegetables. On the other hand, they are in agreement with results reported by Danso et al. (2017), who stated a negative relationship between household size and willingness to pay for fish, meaning that a larger household size impacts on earnings and tends to affect willingness to pay for food stuffs. According to Fritts et al. (2018) and Dougkas et al. (2019), spices can be used on a daily basis for different purposes depending on consumers' preferences. Numbers of years consuming spices showed a positive (0.302) association with willingness to pay for spice. The results inply that a unit increase in the number of years by the consumer will increase consumption of spices significantly. One of the uses highlighted by the respondents in this study was using spices for personal and health care and the parameter showed a negative association (-0.142) with willingness to pay for spices. Preference for cumin for personal use has been reported by Taghizadeh et al. (2015), as it possesses useful health benefits, some of which have been known since ancient times while other have only just been discovered.

On the same note, preference for turmeric for personal use has been reported to be useful not only in cooking but also for its personal and health care benefits (Vollono et al., 2019). Some researchers found that it can be a good skin management regime, which was reported by some of the respondents in this study. The parameter showed a positive relationship (0.102) with willingness to pay, though it was not statistically significant. Furthermore, results of willingness to pay for spices was negatively (-0.140) influenced by consumer preference for ginger for use in meat. The results imply that a unit increase in preference for ginger results in a decrease in willingness to pay for the spice. The results are contrary to those reported by Draszanowska et al. (2020), who indicated that ginger is mainly used on meat to improve its taste and also to tenderise it. The following section presents logit regression analysis results in relation to consumer willingness to pay for herbs.

Table 6.2: Logit regression analysis in relation to consumer's willingness to pay for herbs

	Logit results		Marginal effects	
Willingness to pay for herbs	Coefficient	P>|z|	dy/dx	P>|z|
Socio-economic factors				
Age	0.230	0.219	0.055	0.218
Marital status	-0.967	0.010	-0.233**	0.010
Household size	0.539	0.164	0.132	0.166
Gender	-0.013	0.970	-0.003	0.970
Education attainment	-0.095	0.788	-0.231	0.789
Ethnicity	-0497	0.126	-0.120	0.124
Average monthly income	-0.293	0.052	-0.709**	0.051
Number of years consuming herbs	-0.336	0.047	-0.810*	0.047
Preference factors				
Rosemary for meat	0.499	0.071	0.117	0.068
Parsley for meat	-0.356	0.157	-0.857	0.155
Thyme for personal use	0.465	0.511	0.115	0.515
Garlic for personal use	0.420	0.191	0.103	0.195
Paprika for ready-to-use meals	0.739	0.007	0.176**	0.006
Mint for ready-to-use meals	-1.170	0.001	-0.284***	0.001
Vanilla for ready-to-use meals	-0.563	0.085	-0.130**	0.070
Basil for use on meat	-0.991	0.001	-0.221***	0.000
Origanum for personal use	1.299	0.017	0.312**	0.007
Constant	2.541	0.040		
Number of observations	385			
LR chi2 (15)	79.35			
Prob > chi^2	0.000			
Pseudo R^2	0.1520			
Log likelihood	-221.32623			

Table 6.2 above displays logit regression analysis outcomes in relation to willingness to pay for herbs. Marital status has been found to be significantly related to dietary patterns of households by Haghjou et al. (2013). Results from the model on willingness to pay for herbs reported a negative relationship and statistical significance (-0.233) between marital status and willingness to pay for herbs. The results implied that a unit increase in being married decreases willingness to pay for herbs in the province. Marital status has been thought to contribute to more healthy living conditions due to the effect it has on demand for healthy food (Deshmukh-Taskar et al., 2007). However, some research has shown that married individuals have intakes consistent with dietary guidelines (Rafique et al., 2020), while others have reported that married individuals are less likely to adopt a healthy lifestyle/eating habits. On the contrary,

unmarried individuals have been noted to consume less healthy diets, if not altogether poor diets (Vinther et al., 2016). Hence the role of marital status on healthy food consumption is said to be an ambiguous one.

Monthly income presented a negative effect with a marginal effect coefficient of -0.709. This indicates that as income increased, willingness to pay will decrease and this could be due to a shift in the budget constraints. Results of a study conducted by Makweya and Oluwatayo (2019) reported similar results, and highlighted budget constraints as the reason why, as people earn more, they would not buy more food but rather commit the earnings to other things deemed important for the household. However, Alinda et al. (2016) reported that as income increased, willingness to purchase also increased, as people tend to have more money to spend. Number of years consuming herbs showed a negative association (-0.810) with willingness to pay for herbs in the province. The results implied that as the number of years a consumer spent consuming herbs increased, their willingness to pay tends to be negatively affected. The results are contrary to the priori expected, and this could be as a result of social trends or unavailability of some of the herbs perceived to be of importance to the consumers.

As for preference for rosemary in meat, results showed statistical significance and a positive effect (0.117) on willingness to pay for rosemary. The results indicate the importance of this parameter in consumers' willingness to consume herbs in the province and therefore must be highly considered in the marketing and inclusion in various food commodities. Research has revealed that rosemary serves as a good food preservative and can be enjoyed both fresh and processed (Al-Hijazeen and Al-Rawashdeh, 2019). Moreover, results of preference for paprika in ready-to-use meals showed a positive significance (0.176) towards willingness to pay for spices and herbs. Thus, an increase in cayenne in ready-to-use meals also increased consumers' willingness to pay for the herb. Different results were recorded by Andersen et al. *(*2017), who reported that intake of soup with added paprika showed some significant decrease when compared to sweet and fatty foods. However, Andersen et al. (2017) reported a positive significance on inclusion of paprika in meals amongst other herbs to be of great importance to the consumers.

Preference for mint in ready-to-use meals showed some statistical significance ($p<0.005$) and a negative relationship (-0.284) with willingness to pay for herbs. In this model, respondents preferred mint included in their ready-to-use products like tea, beverages, and other food products. The herb has been reported by various authors and researchers (D'Adamo et al,. 2021) to be effective for treatment and prevention of some diseases, as well as adding flavour and aroma to various food products. Also, the herb is lately being enjoyed in most of the food

products and meals meant to give various benefits. On the other hand, preference for vanilla in ready-to-use meals recorded a negative coefficient and statistical signigicance with a coefficient of -0.130. The results implied that an increase in preference for vanilla in ready-to-use meals results in decrease for willingness to pay for herbs.

Preference for basil in meat showed a negative relationship (-0.221) with willingness to pay for herbs. The results implied that a unit increase in basil will result in a decrease in willingness to pay for the herb. As a plant, basil is commonly used for flavoring. The results are similar to those reported by various scholars on usage of herbs in flavoring food (Mielnik et al., 2008; Säde et al., 2016). The results of the parameter indicate that respondents from the province chose to incorporate basil in their day-to-day usage in meals and food products that are ready to use for various purposes, and recognized it for its various benefits. On the other hand, preference for origanum for personal use also reported a positive relationship (0.312), with a statistical significance $p<0.007$ for use in personal and health care. Both herbs have been used since ancient times. The results are similar to those reported by Kaefer (2008) and Bravo et al. (2021), who mentioned that there is evidence that in recent years there is an increase in usage of herbs for their healing and nourishing benefits such as prevention of illnesses, anti-inflammatory, anti-depressant, and other benefits.

6.3 Descriptive Statistics in Relation to Demand for Spices and Herbs

The following section presents the descriptive statistics for socio-economic variables and factor variables using mean averages.

Table 6.3: Average prices for spices and herbs

SPICES					HERBS				
Variables	Mean	SD	Min	Max	Variables	Mean	SD	Min	Max
Lnprice of Hotsps	3.023	0.290	1.609	5.770	Lnprice of Medhrb	2.54	0.736	0.287	6.615
Lnprice of Hotspsexp	6.457	0.545	1.609	8.866	Lnprice of Medhrbexp	5.407	0.984	2.427	9.879
Lnprice of Hotspsexp2	42.001	6.597	2.589	78.619	Lnprice of Medhrbexp2	30.207	11.082	5.891	97.609
Lnprice of Mldsps	2.784	0.362	1.608	3.257	Lnprice of Arohrb	2.367	0.761	1.011	6.243
Lnprice of Mldspsexp	5.469	0.634	2.484	6.540	Lnprice of Arohrbexp	5.088	1.154	2.995	8.826
Lnprice of Mldspsexp2	30.321	6.383	6.174	42.779	Lnprice of Arohrbexp2	27.225	11.862	8.974	77.914
Lnprice of Arosps	2.903	0.589	0.692	6.036	Lnprice of Culhrb	2.697	0.462	1.609	5.871
Lnprice of Arospsexp	5.9299	1.032	3.226	9.228	Lnprice of Culhrbexp	6.528	0.576	4.787	9.320
Lnprice of Arospsexp2	36.228	36.228	10.409	85.173	Lnprice of Culhrbexp2	42.955	7.598	22.916	86.880
Age	37.714	6.803	27	55	Age	37.714	6.803	27	55
Age^2	1468.53	547.194	729	3025	Age^2	1468.53	547.194	729	3025

The table above presents means for average prices for both spices and herbs as computed from STATA. For the three spice categories (hot, mild and aromatic spices), average mean price for mild spices presented the lowest mean of 2.784 compared to hot spices and aromatic spices, with 3.023 and 2.903 respectively. Both hot spices and mild spices presented similar minimum mean values of 1.609. However, hot spices recorded the highest range with a maximum mean price of 5.770. On expenditure for spices, aromatic spices presented the highest mean price, with a range of minimum mean price of 3.226 and a maximum mean price of 9.228. This was followed by mild spices which presented an average mean price of 5.469 with a minimum mean of 2.848 and a maximum of 6.540. When expenditure was doubled, hot spices recorded the highest mean price of 42.001, with a range of 2.589 minimum price and 78.619 maximum price. These was then followed by aromatic spices and subsequently mild spices, with average mean prices of 37.714 and 30.321 respectively.

On herbs, the highest average mean price was recorded for culinary herbs, with an average of 2.697 and a range of 1.609 minimum and 5.871 maximum. Medicinal herbs followed, with an average mean price of 2.54 and a mean range of 0.287 to 6.615. Similarly, culinary herbs recorded the highest average mean price (6.528) on expenditure, followed by medicinal herbs and aromatic herbs. Results from squared expenditure also presented culinary herbs with the highest average mean price amongst all the herb categories, and were noted to have an average mean price of 42.955, with a minimum of 22.916 and a minimum of 86.880. Results on experience (age) were similar for both spices and herbs, with an average mean of 37.714 and a range of 27 to 55 years. When age increased, the average mean also increased, and was noted to have a mean range of 729 as the minimum and 3025 as the maximum.

6.4 Multivariate Results on Factors Influencing Demand for Spices

Table 6.5 Determinants of demand for spices

Note: ***, **, * indicate level of significance at 1%, 5% and 10% respectively. In =Logarithm;

Variable	Hot spices	Mild spices	Aromatic spices
Constant	743.10***	-28.50***	1616.71
	72.47	5.80	127.83
	Price coefficients		
In Price hot spices	40.15***		
	2.48		
In Price mild spices	15.77***	14.54***	
	2.18	0.16	
In Price aromatic spices	2.38	-0.10	44.32***
	1.49	0.12	2.81
	Expenditure and Expenditure squared		
In EXPD	-197.37***	0.48	-482.09***
	18.37	1.48	33.24
$INEXPD^2$	13.36***	-0.02	32.10***
	1.21	0.09	2.20
	Household characteristics		
Age	-0.396	0.03	-2.43
	0.689	0.05	1.33
Household size	0.74	-0.01	-2.16
	1.16	0.949	2.25
Education level	0.18	0.01	0.00
	0.56	0.05	1.09
IMR	-325.91***	5.35**	1616.71***
	32.39	2.18	127.83

InEXP=logarithm of total spices expenditure; InEXPD2 = square of logarithm of total spice expenditure

IMRS = Inverse Mills Ratios

Negative IMR implies that sub sample (hot spices) of purchasing households represents itself and excludes non-purchasers from the analysis, while the positive IMR is inclusive of all the population in the study.

The generalised least square was employed to perform seemingly unrelated regression linear approximate Almost Ideal Demand system model for spice categories, namely hot spices, mild spices, and aromatic spices. According to the results, price for hot spices was found to be positive and statistically significant ($p<0.000$) and this implies that a unit increase in the price of hot spices will increase the proportion of household expenditure on hot spices by a unit of 40.15, *ceteris paribus*. The results are in aligned with those of Ibe et al. (2020), who posited that price has a positive effect on expenditure. Results on expenditure for hot spices showed statistical significance and a negative effect (-197.37) on demand. However, on squared expenditure, the results showed a positive statistical effect (13.36) on demand. The results imply that a unit increase expenditure will result in a decreased demand for hot spices but with increased expenditure demand will increase with more than 1 percent. The results are in agreement with those reported by Ashagidigbi (2019), who reported a positive influence on

demand from an increase in expenditure. Furthermore, results on household characteristics were all insignificant and showed no influence on demand for hot spices.

Moreover, price for mild spice showed a positive effect (14.54) and statistical significance on demand for mild spices. The results imply that a unit increase in price for mild spices will result in an increase in demand for mild spices. Similar results were revealed by Obayelu et al. (2019), who indicated that price has a significant impact in influencing demand for food commodities. Results on price for aromatic spices showed a positive effect (44.32) and statistical significance on demand for aromatic spices. Expenditure results also showed statistical significance but with a negative effect (-482.09) on demand for aromatic spices. The results implied that a unit increase in expenditure for aromatic spices will see a reduction in consumption demand for aromatic spices. The results fit in to those reported by Obayelu et al. (2019), who showed that expenditure has an inverse relation with demand for vegetables. Lastly, results on squared expenditure showed a positive effect (32.10) and a statistical significance ($p<0.000$) with demand for aromatic spices. Similar results on the parameter were reported by Bundi et al. (2013) on demand for vegetables in Kenya.

Results from the three models (hot spices, mild spices and aromatic spices), price has been revealed as an influencing factor on demand for spices in South Africa, with expenditure showing a negative effect on hot and aromatic spices. However, squared expenditure showed a positive effect on both hot and aromatic spices, and with no significant effect for mild spices. Inverse Mills Ratio showed statistical significance on all the spice categories.

Estimated results for own-price and cross-price uncompensated and compensated elasticities are presented in table 6.6 below.

Table 6.6: Own – and price elasticities of Spices

Spice group	Hot spices	Mild spices	Aromatic spices
Marshallian/uncompensated elasticity			
Hot spices	-0.57	-0.28	-0.46
Mild spices	-0.45	0.10	-0.33
Aromatic spices	-0.33	-0.16	-0.19
Hicksian/compensated elasticity			
Hot spices	0.04	-0.30	-0.01
Mild spices	-0.08	0.15	-0.06
Aromatic spices	-0.01	-0.04	0.45

Table 6.6 presents results on demand elasticities on uncompensated and compensated elasticity in relation to spices. Uncompensated own price elasticity demand describes the percentage

change in the quantity demanded for a particular product with respect to a percentage change in the price of the respective product in the absence of any compensation in terms of either price or income change. As expected, own-price elasticities were found to be negative and coherent with consumer theory for hot spices and aromatic spices, but positive for mild spices. Hot spices showed -0.57, followed by aromatic spices with -0.19 then mild spices with own-price elasticities of 0.10. Hot spices and aromatic spices have inelastic demand, implying that a 1 percent increase in price will result in a less than 1 percent decrease in demand. The results imply that, if there is a 1 % increase in commodity prices, there will be a decline in commodity of 0.57 for hot spices, 0.45 for mild spices and 0.33 for aromatic spices, assuming cetris paribus. Among the three commodity groups, the most inelastic is the aromatic spices as it has the lowest own-price elasticity value which is equal to 0.33. This demonstrates the significance of spices as a seasoning option in South Africa. The results are similar to those presented by Chengappa et al. (2017), who revealed that households are mostly less responsive to variations in prices of different food commodities. The positive sign from mild spices implies that mild spices are Giffen goods (non-luxury products), for which demand increases as the price increases in South Africa.

Cross-price elasticity measures the responsiveness of the demand for one commodity to the change in the price of another, indicating whether that commodity is a substitute or a complement. A negative cross-price elasticity indicates that two commodities are complements, while a positive cross-price elasticity indicates that two commodities are substitutes. If cross-price elasticity for two commodities approaches zero, then the commodities are considered independent of each other (Maganga et al., 2014). In this study, cross-price elasticities are all negative, indicating that hot spices, mild spices and aromatic spices are complements. Own price elasticity for hot spices is -0.57 while its cross price for mild and aromatic spice are -0.45 and -0.33 respectively using the uncompensated elasticity. This is undeniably right seeing that they are all spices that possess noble nutritive value but with different flavour levels. Similarly, on mild aromatic spices, own price elasticity for is -0.46 while its cross price for mild and aromatic spices are -0.33 and -0.19 respectively using uncompensated elasticity.

The following tables presents determinants of demand for herbs

6.5 Multivariate results on factors influencing demand for herbs

Table 6.7 Determinants of demand for herbs

Variable	Medicinal herbs	Culinary herbs	Aromatic herbs
Constant	2432.55***	214.75**	897.48***
	152.40	116.45	62.30
	Price coefficients		

In Price medicinal herbs	46.06***		
	2.48		
In Price culinary herbs	1.74	8.02***	
	3.232	2.59	
In Price aromatic herbs	-88.91	-9.06**	61.37***
	5.41***	4.14	2.17
	Expenditure and Expenditure squared		
In EXPD	-640.85***	-85.46*	-270.82***
	4.74	31.13	16.68
$INEXPD^2$	48.11***	5.88**	17.79***
	2.66	2.03	1.09
	Household characteristics		
Age	-2.14	0.11	-0.83
	2.29	1.75	0.93
Household size	-3.90	-1.47	-0.74
	3.92	3.00	1.61
Education level	-0.42	1.33	0.11
	1.90	1.46	0.78
IMR	-318.16***	203.95***	-46.17***
	44.06	34.72	12.32

Note: ***, **, * indicate level of significance at 1%, 5% and 10% respectively. In =Logarithm; InEXP=logarithm of total spices expenditure; InEXPD2 = square of logarithm of total spice expenditure. IMRS = Inverse Mills Ratios

Negative IMR implies that sub sample (medicinal and aromatic) of purchasing households represents itself and excludes non-purchasers from the analysis, while the positive IMR is inclusive of all the population in the study.

Table 6.7 presents results on demand for herbs in South Africa. Results from the first model (medicinal herbs) revealed that price had a positive (46.06) and statistical significance with demand for hot spices, with $p<0.000$. The results of the study are in line with those reported by Piumsombun (2003), who also found that price has a positive effect on demand. Moreover, expenditure showed a negative effect (-640.85) on demand for medicinal herbs, and the results imply that a unit increase in expenditure will result in a decrease in demand for medicinal herbs. The results are however contrary to those reported by Oyinbo et al. (2013), who showed a positive effect of expenditure on demand. In addition, squared expenditure showed a positive effect (48.11) and statistical significance on demand for medicinal herbs. Thus, an increase in expenditure will also increase demand for medicinal herbs.

On the second model (culinary herbs), price also showed a positive effect (8.02) on demand for culinary herbs in the study area. The results imply that an increase in price will see an increase in demand for culinary herbs. The results are in similar with those pesented by Ojogho and Alugohai (2010), who also obtained similar results on demand. Furthermore, expenditure recorded a negative coefficient (-85.46) on culinary herbs but with statistical significance noted by $p<0.000$. On squared expenditure, a positive and significant relationship (5.88) was recorded, and the results imply that an increase in expenditure will also increase demand for

culinary herbs significantly. Household characteristics on both model 1 and model 2 showed no statistical significance with demand for either medicinal or culinary herbs.

Results from the third model (aromatic herbs) displayed that price influences demand for spices in a positive way (61.37), with statistical significance noted by $p<0.000$. This results indicate that a unit increase in price for aromatic herbs will increase demand for spices. However, Green et al. (2013) differed in opinion, and stated that an increase in price results in reduction in consumption and demand. Results on expenditure and expenditure squared showed that demand for spices was negatively affected (-270.82) by expenditure and positively affected by expenditure squared (17.79). Results from the three models showed that the price for medicinal herbs, culinary herbs, and aromatic herbs had a positive influence on demand for herbs. Lastly expenditure also showed an effect on demand for spices, though it showed a negative effect on medicinal herbs and a positive effect on both culinary and aromatic herbs. Squared expenditure also showed a positive effect on demand for all herb categories. Inverse Mills Ratios were statistically significant on all the three models.

Table 6.8: Own – and price elasticities of Herbs

Herb group	Medicinal herbs	Culinary herbs	Aromatic herbs
Marshallian/uncompensated elasticity			
Medicinal herbs	-0.33	-0.29	-0.14
Culinary herbs	-0.20	-1.17	0.07
Aromatic herbs	-0.44	-0.95	-1.10
Hicksian/compensated elasticity			
Medicinal herbs	-0.17	0.18	-0.00
Culinary herbs	0.05	-0.36	0.305
Aromatic herbs	-0.00	1.07	-1.06

Table 6.8 presents results on demand elasticities on uncompensated and compensated elasticity in relation to herbs. Own-price elasticities were found to be negative and coherent with consumer theory for medicinal herbs, culinary herbs and aromatic herbs. Culinary herbs showed -1.17 followed by aromatic herbs with -1.06 and lastly medicinal herbs with -0.33. All the herbs showed inelastic demand, and this implies that a 1 percent increase in their price will result in a decrease in their demand. The results imply that, if there is a 1 % increase in commodity prices, there will be a decline in commodity of 0.33 for medicinal herbs, 0.20 for culinary herbs and 0.44 for aromatic herbs, assuming cetris paribus. Among the three commodity groups, the most inelastic is the culinary herbs as it has the lowest own-price elasticity value which is equal to 0.20.

Negative cross-price elasticities denote that relevant items tend to be complementary, while positive elasticities imply that they tend to be substitutes (Maganga et al., 2014). In this study, cross-price elasticities for herbs are negative and this implies that medicinal, culinary and aromatic herbs are complementary herbs.

6.6 Summary of the chapter

The chapter investigated willingnesss, demand and elastity of spices and herbs. Results from the logistic regression approach in the study found that some socio-economic factors, such as age, marital status, household size, and household monthly income influence willingness to pay for spices and herbs. Some preferred uses of spices and herbs for personal and health care, and use in ready-to-eat meals, as well as inclusion in meat and meat products showed some statistical significance and influence on willingness to pay for spices and herbs.

Results from the demand model showed that price and expenditure influenced demand for spices amongst respondents in the province. Furthermore, uncompensated demand elasticity for spices revealed that hot and aromatic spices had an inelastic demand, meaning that an increase in their prices resulted in a less than 1 percent decrease in their demand. Moreover, results from the demand model on herbs also highlighted price and expenditure as the main factors influencing demand. Elasticity results were all negative, meaning that a unit increase in the price for medicinal, culinary and aromatic herbs results in a decrease in their demand. A negative cross-price elasticity means that all the herbs are complementary. The study presented results on factors influencing deemandfor spices and herbs in South Africa and also demand elasticities for spices and herbs. The next chapter presents a summary and recommendations based on the findings of the study.

CHAPTER SEVEN
SUMMARY, CONCLUSION AND RECOMMENDATION

7.1 Introduction

This chapter presents the summary of the findings, conclusions, recommendations, policy implications, and suggestions for further research based on the study findings.

7.2 Summary of Findings

The study sought to establish factors that influence consumers' preference and consumers' utilization for spices and herbs, willingness to pay for spices and herbs, and demand for culinary spices and herbs in South Africa, in Gauteng Province. In order to accomplish the above, the succeeding objectives were set; to analyse determinants of consumers' preferences for source of spices and herbs, to analyse determinants of consumption and utility choices for spices and herbs, to identify the socio-economic factors influencing consumers' willingness to purchase culinary spices and herbs, and lastly to determine factors influencing household demand for selected culinary spices and herbs. The data for the five objectives were analysed using the multinomial logit model, principal component analysis, logistic regression model, and AIDS (Almost Ideal Demand System).

The sub-sections below present the highlights of the issues covered;

7.2.1 Socio-economic and consumer preference for sources of spices and herbs

The overall results of this section revealed that the majority of spice, herbs consumers were of an average age of thirty-two years, married, and from a household that consisted of three members. Moreover, a majority of the consumers were female, held a tertiary qualification, and were from a Christian background. In addition, the Black ethnic group dominated the spice and herb consumers, were formally employed, and earned an average monthly income of R23000, with a monthly food expenditure of R1500. The majority of the consumers have been consuming spices and herbs for at least five years and more, and preferred purchasing their supply from grocery stores. From the preferred forms of spices and herbs, the data revealed that the majority of the consumers preferred their spices in a dry, crushed, and seed form, while majority preferred their herbs in a fresh, dried, and crushed form. For the origin of spices, the results on age showed that the majority (49%) of the respondents who preferred local spices were between the age of thirty-seven and forty-seven. Of those that preferred imported spices, the majority (94%) were aged between twenty-seven and thirty-seven. Consumers who were

not particular about the origin of the spices also showed a majority within the age group of twenty-seven to thirty-seven, and recorded 46%.

On marital status, the majority (64%) of the consumers who preferred local spices were those who were married, while those who preferred imported spices were single, with a recording of 90%. Respondents who were not particular about the origin of the spices were 69% and were from the married group. Local spices were also preferred by the majority of consumers with a household size of between two and four members of the family, who recorded 75%. Similarly, a majority (87%) of the respondents preferred imported spices and were from a household size of between two and four members, while those who were not particular about the origin of spices made 60% from the same household size group.

On gender, females showed more preference for local spices, with the highest record of 76% while their male counterparts showed more preference for local spices with a recording of 90%. On respondents who were not particular about origin of spices, female recorded 85%, more than their male counterparts. Furthermore, on education level, respondents with a tertiary qualification showed more preference for local spices, with a recording of 55%. Imported spices reported similar results, with respondents recording 84% of the population. A similar pattern was noticed for those who were not particular about the origin of spices, as those who held a tertiary qualification recorded the highest, 70%, against the other groupings. Results from religion revealed that Christians dominated the three categories, with recordings of 92%, 100% and 75% respectively on preference for local spices and imported spices as well as those that were not particular about the origin of spices. Ethnicity, on the other hand, revealed that the majority (74%) with a preference for local spices were from the Black consumers. However, on imported spices, 94% of the consumers from the White group showed dominance over the other ethnic groups. Lastly, on ethnicity, the majority of the consumers who were not particular about the origin of spices was recorded from the White group, with a recording of 41%.

Consumers who were formally employed showed more preference for local spices, with a recording of 62%, and an average of 70% of imported spices and not particular about origin of spices. Respondents who earned R23 500 on a monthly basis showed more preference for local and imported spices, with recordings of 31% and 94% respectively. However, from the group that was not particular about the origin of spices, respondents who earned an average of R16 000 recorded the highest (31%). Lastly, on food expenditure, preference for local spices was highest amongst respondents who spent an average of R1500 on food on a monthly basis. From

the last group of consumers who were not particular about origin of spices, respondents who spent an average of R2500 showed the most preference.

On origin of herbs, the results of the model are also categorised into three groups, namely local, imported, and not particular about the origin of herbs. Results from age revealed that preference for local herbs was high in respondents aged between thirty-seven and forty-seven, with a recording of 47%. On imported herbs, the most preference for the category was recorded from respondents aged between twenty-seven and thirty-seven. Respondents who were not particular about the origin of herbs made a majority from the age group of twenty-seven to thirty-seven. On marital status, preference for local spices was high among the respondents who are married, with a recording of 64%. On imported herbs, preference was high among respondents who are single, who recorded 90%. Subsequently, respondents who were not particular about the origin of herbs were female, with a recording of 85%. In addition, preference for local herbs was high in households with an average of three members, who recorded 46%, while on imported herbs it was also high also in households with an average of three members in the family, with a recording of 72%. Respondents who were not particular about the origin of herbs recorded 60%, and were from the second group, of household size of an average of three members. Moreover, females showed more (77%) preference on local herbs than their male counterparts. On the other hand, males showed more preference on imported herbs with a recording of 55%. Results from education level revealed that respondents who held a tertiary education preferred both local and imported herbs, with recordings of 56% and 85% respectively.

Results from religion and preference for herbs showed that Christians preferred both local and imported herbs, and recorded 90% and 86% respectively. Respondents who were not particular about the origin of herbs were also from the Christian group, with a recording of 76%. From the ethnicity groups, preference for local herbs was highest amongst the Black group with a recording of 72%, while for imported herbs, preference was highest amongst the White group, who recorded 69%. The majority (40%) of the respondents from the White ethnic group were not particular about the origin of herbs. Employment status also showed that local herbs were preferred mostly by the formally employed, with a recording of 62%, and 67 % for imported herbs. Moreover, formally-employed respondents were the majority (71%) in the category of those who were not particular about the origin of the herbs. On monthly income, respondents who showed the most –30% and 62% preference for local and imported herbs – were those who earned an average of R 23000 on a monthly basis. Those who also showed preference but were not particular about the origin of the herbs earned an average of R16000 on a monthly basis. Respondents who spent an average of R1500 on food showed preference for local herbs,

while those who spent R2500 showed more preference for imported herbs. A majority (46%) of the respondents who showed preference for herbs were not particular about the origin of the herbs they purchased and consumed.

7.2.2 Consumer preference for sources of spices and herbs

Empirical results from logit regression analysis in relation to consumer preference for local spices showed that some socio-economic factors such as marital status positively (0.288) influenced preference for spices, while household size and gender influenced preference for local spices negatively, with coefficients of -0.076 and -0.318 respectively. Furthermore, attractiveness, health attributes and packaging showed a negative (-0.151) and positive (0.083 and 0.067) influence on preference for local spices respectively. On imported spices relative to no preference, marital status, household size and gender showed a negative influence on imported spices, with coefficients of -0.094, -0.010 and -0.114 respectively.

In relation to consumer preference for local herbs in the study, empirical results revealed that age (-0.008), household size (-0.105) gender (-0.014), and product attributes such as attractiveness (-0.187) showed a negative effect on preference for local herbs. On the other hand, marital status (0.436), and product attributes such as packaging (0.144) showed a positive effect on preference for local herbs. On imported herbs versus no preference, empirical results revealed that marital status (-0.090,) household size (-0.012), product attractiveness (-0.045), had a negative effect on preference for imported herbs. The preference for imported herbs, however, was positively impacted by product packaging (0.021), with a minor positive impact from the same feature also recorded for imported herbs.

7.2.3 Factors influencing consumer utilization for spices and herbs

Utilization indices for spices and herbs were computed using Principal Component Analysis (PCA). The interpretation of PCA was founded on discovering variables that were intensely associated to each component, and in this study a level of correlation above 0.5 was deemed significant. The results from the principal component analysis revealed that the majority of the spices were correlated with a measure of health, weight management, aroma, and medicinal benefits. Similarly, results from the principal component analysis of herbs revealed that the majority of the herbs were correlated with taste, aroma, health, and weight management benefits.

Furthermore, results from these sections showed that consumers' utilization for spices is influenced by sources of information such as newspapers, friends and family, radio, and health awareness campaigns. On herbs, factors that influenced utilization of majority of the herbs

include sources of information such as radio, health practitioners, newspapers, television, and information from friends and family. Lastly, on utilization of herbs, lack of proper packaging influenced utilization for herbs. The second section of the results on consumer utility revealed that socio-economic factors such as food expenditure and education level influenced utility for all spices, while employment status and marital status showed influence for at least three spices. On herbs, marital status and education level influenced utility for the majority of herbs.

7.2.4 Factors influencing willingness to pay for spices and herbs

The overall results of these section revealed that there were some dissimilarities on respondents' willingness to pay for spices and herbs. However, some matches were realised on variables such as religion, education level, and average monthly income, where respondents showed high willingness to pay for both spices and herbs.

The logistic regression model results of the correlates of willingness to pay for spices highlighted that age (-0.911) and household size (-0.216) showed statistical significance and negative association with willingness to pay for spices while number of years consuming spices showed a positive (0.075) association with willingness to pay for spices. Furthermore, preference factors such as using cumin for personal and health care (-0.142) and turmeric for personal use (0.102), as well as using ginger on meat and meat products (-0.140) also showed some association with willingness to pay for spices.

Also from the herbs model, marital status (-0.233), monthly income (-0.709) and number of years consuming hers (-0.810) showed some statistical significance and association with consumer willingness to pay for herbs. Similarly, some preference factors such as use of paprika, mint and vanilla in ready to use meals showed some association with willingness to pay for herbs with a coefficient of 0.176, 90.284 and -0.130 respectively. Furthermore, basil and origanum also showed some association with willingness to pay for herbs with marginal effect coefficient values of -00.221 and 0.312 respectively.

7.2.5 Demand factors for spices and herbs

Socio-economic attributes of the factors related to demand of spices and herbs presented in mean averages revealed that spices overall had the highest mean average compared to herbs. Multivariate results on demand for spices showed that price of all the three groups –hot, mild and aromatic spices – influenced demand for spices. Results of expenditure and squared expenditure also showed some association with demand for spices in the study. Elasticity results revealed that uncompensated demand elasticity for hot and aromatic spices had an inelastic demand, meaning that an increase in their prices resulted in a less than 1 percent decrease in their demand. Moreover, results from the demand model on herbs also highlighted price and expenditure as the main factors influencing demand for herbs. Elasticity results were

all negative, meaning that a unit increase in the price for medicinal, culinary, and aromatic herbs results in a decrease in their demand. A negative cross-price elasticity means that all the herbs are complementary.

7.3 Conclusions

The study had six objectives, namely to analyse the determinants of consumer preference for sources of spices and herbs; to analyse the determinants of consumption utility choices for spices and herbs; to analyse the determinants of consumer utilization choices for spices and herbs. Also, to estimate the socio-economic factors influencing consumer willingness to purchase culinary spices and herbs, examine the factors influencing households demand for selected culinary spices and herbs, and lastly to compute the price and income elasticities of a household's demand for culinary spices and herbs. As a result, three alternative models were used to satisfy these objectives: multinomial logit regression, principal component analysis, logistic regression model, and quadratic almost ideal demand system (QUAIDS) models. In summary, the study pointed out various findings and contributions to the body of knowledge.

7.3.1 Preference

1) Socio-economic factors marital status positively influence preference for local spices while household size and gender had a negative influence.
2) Products attributes such as product attractiveness negatively influence preference while health attribute and packaging positively influence preference for local spices.
3) Socio economic factors such as marital status, household size and gender influence preference for imported spices negatively.
4) Product attribute such as product attractiveness and product availability in the market also negatively influence preference for imported spices.
5) Preference for local herbs is negatively influenced by age, household size and gender while marital status positively influence preference.
6) Product attributes such as attractiveness negatively influence preference for local herbs and product packaging positively influence preference.
7) On preference for imported herbs, marital status, household size and gender negatively influence preference.
8) Product attractiveness negatively influence preference for imported herbs while product packaging shows a positive association.

7.3.2 Utilization for spices and herbs

1) Socio-economic factors such as age, marital status, household size, gender, and employment status influenced utilization of both spices and herbs

2) Sources of information such as television, newspapers, radio, the internet, friends and family, health practitioners and health campaigns also played a significant role in influencing utilization of spices and herbs.
3) Challenges when purchasing spices and herbs such as unknown benefits, proper packaging, difficulty with storing, unavailability on the shelves, and unknown brands influenced utilization of spices and herbs.
4) Quality and quantity attributes also influenced utilization of spices and herbs. Socio-economic factors such as age, marital status, household size, gender, education level, religion, ethnicity, employment status, and food expenditure influenced utility for spices and herbs respectively.

7.3.3 Willingness to pay for spices and herbs

1) Age and household size are socioeconomic factors that have a beneficial impact on willingness to pay for spices.
2) On herbs, marital status, average monthly income and number of year consuming herbs showed a negative effect on willingness to pay.
3) Preference factors that affect willingness to pay for spices and herbs are usage for personal and health care for cumin and turmeric and also ginger for use on meat
4) Preference factors that affect willingness to pay for spices are paprika, mint and vanilla for ready-to-use meals while basil is preferred for use on meat and lastly origanum for personal use.

7.3.4 Demand for spices and herbs

1) Price and expenditure emerged as the major determinants influencing demand for spices and herbs
2) Demand for hot spices and aromatic spices was affected by price, showing negative elasticities
3) A positive sign from mild spices implies that mild spices are non-luxurious products for which demand increased as price increased.
4) Cross-price elasticities for all spice groups were noted with a positive sign, implying that all groups are substitutes of one another
5) Own-price elasticities for all herbs was found to be negative
6) Negative cross-price elasticities for all herb groups imply that they are complementary to each other.

7.4 Recommendations

7.4.1 Consumer preference for spices and herbs

a) In view of socio-economic factors influencing preference for spices and herbs, there is a need to provide awareness on the importance of consuming spices and herbs across all age groups, and place emphasis of such amongst all the gender groups, as consumption of herbs and spices is beneficial to everyone regardless of their age, gender, marital status, and consumers' household size. Furthermore, growing of herbs at a household level can also be encouraged so as to minimise costs of purchasing of food products, especially for households with a lot of members. This can be done through engaging agricultural advisors and various agricultural-related parastatals to promote home gardens for production of crops that do not need huge pieces of land for production.

b) Since health therapy is also at the forefront of some of the benefits deemed important in influencing preference of spices, more advertisement of spices and herbs must be done on all social platforms in order to inform consumers of the health benefits of different spices and herbs in the country.

c) Product attractiveness of spices and herbs also played an important role in influencing preferences. The parameter showed a negative effect on preference of both spices and herbs. It can therefore be recommended that improved production in order to obtain good quality and large quantities be emphasised to achieve maximum supply of the commodities to satisfy local supply.

d) On preferences, availability of products in the market showed an effect on preference for spices and herbs. In order to maintain availability, more research must be conducted to establish specific herbs and spices that respond positively to consumer preference. Furthermore, increased production of spices and herbs in areas with conducive climatic conditions, and with producers who can produce under controlled conditions must be emphasized, in order to keep up with the demand in the province.

e) Product attractiveness should be over emphasized as it has the ability to improve consumer preference and therefore increase returns to the farmers.

7.4.2 Utilization for spices and herbs

a) On the socio-economic factors influencing utilization and utility of spices and herbs, promotion of utilization of spices and herbs should consider the socio-economic

conditions of the consumers. Any promotion and policy formulations should be tailor-made to suit specific areas

b) Sources of information also played a significant role in influencing utilization of spices and herbs, therefore the study recommends that promotion of utilization of spices and herbs be done on various platforms like television, radio, and the internet, etc.
c) On challenges encountered by consumers when purchasing spices and herbs, the study recommends that policies around production and selling of spices and herbs enforces proper packaging, proper labelling of brands, display of all the necessary and helpful information regarding products in order to make the product consumer-friendly.
d) Lastly, the study recommends that production of spices and herbs places more focus on improvement of quality and quantity of spices and herbs, which will in return improve the health of the consumers and returns for the producers.

7.4.3 Factors influencing willingness to pay for spices and herbs

To address the issues of socio-economic factors influencing willingness to pay for spices and herbs, the following recommendations are proposed:

a) On age, spices and herbs education and promotion must be carried out across all ages in order to introduce their health benefits at an early age. In this manner, younger consumers can acquire their taste and continue using even later in life.
b) Household size also plays a vital part in influencing willingness to pay. In order to sustain usage and consumption of spices and herbs, the study recommends that packaging of spices and herbs be made in a manner that can accommodate different household sizes, and at a reasonable price that can be afforded by the majority of the consumers, thus packaging could be made in combos where a consumer gets a variety of products in a single purchase.
c) On marital status, monthly income, the study recommends that further education be made available to all consumers regardless of their marital and income position. Also, to cater for monthly income that has barely increased as the price of food increased, the government must consider subsidising health-related food commodities across the entire value chain.
d) The study also recommends that the relevant preference factors be prioritized when marketing spices and herbs, and more education be directed towards educating the consumers about other uses for the same spices and herbs, and others that were not significant in the study, to uplift their usage and willingness to pay.

7.4.4 Demand factors for spices and herbs

The study concluded that price has an effect on demand and recommends that a reduction of prices of spices and herbs can be effective strategy, for it will uplift consumers' relative purchasing power. This in turn will positively influence spice and herb consumption patterns and have improvement in the nutritional status of the consumers. Furthermore, because mild spices emerged as Giffen goods, maximised production must be aimed at to ensure their consistent availability. The positive cross-price elasticities for all spices implies that all spice groups are substitutes, therefore their promotion and development should be aimed at improving quantities, quality, and variety.

Cross-price elasticities for all herb groups were negative, implying that they are complementary to each other. The study therefore recommends that marketing of the different groups be done parallel to boost both their consumption and sales.

7.5 Policy Directions

An increase in spice and herb production is necessary in parallel to the reduction in production and trading costs, which, in turn, may eventually translate into reduction in sale prices and into an increase of spice and herb product consumption. Some advanced countries have a common national label, and recognition of such labels is usually high. To break free from niche status, explicit recognition of the spice and herb labelling is a prerequisite. In South Africa, efficient government actions need to be directed towards a stricter control system that is better coordinated between consumers and private organizations, as well as long-term planning for the organic sector. Considering consumers' concerns about the health benefits of spices and herbs, and their link to preferences, it is possible to calibrate strategies that consider specific consumer segments, and increasing consumers' awareness and knowledge of spice and herb products by maintaining customer satisfaction and pleasure.

Furthermore, by targeting the right socio-economic segment groups, increasing the availability and range of spices and herbs may prove most effective to enlarge the market share. Taking into consideration consumers' preference for spices and herbs, that reflects willingness to pay for the commodities and given proper institutional framework, spice and herb farming will gain appreciable market share.

Furthermore, fostering well-designed promotional campaigns could help deal with issues of improved consumption of spices and herbs. In all, this study may be of great assistance to a variety of stakeholders, including the government, social organizations, marketers, and others. It may act as a guideline and provide insightful inputs to related parties in planning for current market trends, and implementing strategies to boost the spice and herb industry.

As government focuses on increasing spice and herb productivity, consumer concerns should be similarly given due consideration. Spice and herb development strategies must thus be adjusted to the ever-changing consumer demands, and confront any marketing inefficiencies that may prevent the transmission of productivity gains into consumer gains. Some spices and herbs in this study exhibited inelastic demand. Thus, policies that are directed at prices alone would have a marginal effect on their demand. However, a combination of price and income policies would have a positive effect on the consumption of these commodities. Mild spices behave like a Giffen commodity among the households of Gauteng. Were the prices of mild spices to increase, it would increase their demand as well. These policy interventions should be geared towards improving production and distribution of spices and herbs; in addition, maintaining stable food prices would have a direct effect on the demand for these commodities.

7.6 Future Research

The study investigated preference and demand for spices and herbs in Gauteng using primary data collected from spice and herb consumers in the province. Therefore, based on this study, the following areas of research are suggested:

- It will be of great importance for more research to be conducted on different spices and herbs across the entire county, and most significantly, in areas where climatic conditions are desirable for cultivation of spices and herbs.
- A comparative analysis between rural and urban areas on consumption and awareness of spices and herbs should be made in order to direct promotional needs for the commodities.
- Further research can also be conducted on product development on how to pair difference spices and herbs to make either tea, or beverages that are infused with spices and herbs for refreshment, prevention, treatment, and management of different illnesses/diseases
- Extensive mapping of spices and herbs so that an atlas of usage of different spices and herbs can be documented for consumer reference
- A similar study to the current one can be done but looking at institutional and behaviours of sellers and consumers in the spice and herbs industry.

ABSTRACT

Spices and herbs are plant materials primarily used for therapeutic, aromatic and culinary purposes, in cosmetics, pharmaceutical, and food industries. Currently, growing knowledge on the health-enhancing properties of spices and herbs have resulted in increase in their consumption. This study sought to achieve the determinants of consumers' preferences for the sources of spices and herbs, to analyze the determinants of consumption and utility choices for spices and herbs, to identify the socio-economic factors influencing consumers' willingness to purchase culinary spices and herbs, to determine the factors influencing households' demand for selected culinary spices and herbs, and to compute the price and income elasticities of households' demand for culinary spices and herbs.

Primary data from 385 respondents were collected from the Gauteng province through administration of questionnaires. The multinomial logistic regression results showed being married and concern for packaging increased the preference for local spices, while household size, gender, concern for product's labelling and product's attractiveness showed a negative influence on preference for local spices. Also preference for imported spices was negatively influenced by being married, household size, gender, concern for product's attractiveness, and product's availability. Conversely, age, gender, household size and product's attractiveness negatively influenced the preference for local herbs. Being married, household size, gender negatively and product's attractiveness showed negative influenced imported herbs.

Principal component analysis (PCA) results showed that majority of the spices and herbs were viewed from their medicinal, aroma, weight management and health benefits. Furthermore, consumer utility from spices was influenced by age, marital status, education level, gender, ethnicity, employment status as well as food expenditure. Similarly, herbs utility was also influenced by age, marital status, household size, ethnicity, gender, religion, food expenditure and employment status. Consumers' utilization index for spices and herbs was influenced by sources of information such as newspapers, friends and family, radio and health awareness campaign influenced utilization for spices. Willingness to pay for spices was significantly influenced by age, household size, use of cumin and turmeric for personal use and the use of ginger in cooking meats. Willingness to pay for herbs was significantly influenced by marital status, average monthly income, number of years consuming herbs, the use of paprika, mint and vanilla in ready to use meals, the use of basil for meat and the use of origanum for personal use.

The results of the QUAIDS model on the demand for spices and herbs showed that price and expenditure influenced demand for spices and herbs. Hot spices (-0.57) and aromatic spices (-0.19) emerged as price inelastic, while mild spices showed a positive but inelastic parameter

(0.10) implying that it is a non-luxury good. Own-price elasticities for all herbs were negative, and cross-price elasticities revealed that all herb groups were complements.

Based on these findings, the study recommends that policies that will improve production of spices and herbs in the country be developed to facilitate issues of consumption and marketing of spices and herbs.

Keywords: consumer, preference, utility, utilization, spices, herbs, willingness to pay, demand, South Africa.

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APPENDIX A
PCA, Heteroscedasticity and multicollinearity results for spices and herbs

PCA RESULTS FOR SPICES

1. Cumin

```
Principal components/correlation                  Number of obs    =       385
                                                  Number of comp.  =         5
                                                  Trace            =         5
    Rotation: (unrotated = principal)             Rho              =    1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.69451      .478806             0.3389       0.3389
           Comp2 |      1.21571      .310818             0.2431       0.5820
           Comp3 |       .90489      .296187             0.1810       0.7630
           Comp4 |      .608703     .0325169             0.1217       0.8848
           Comp5 |      .576186            .             0.1152       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5 | Unexplained
    -------------+----------------------------------------------------+-------------
    inc_cumin_~a |   0.3490    0.4636   -0.6672   -0.3421    0.3179 |           0
    inc_cumin_~e |   0.5239    0.1844    0.5095   -0.5473   -0.3638 |           0
    inc_cumin_~h |   0.5706   -0.1563   -0.3261    0.5305   -0.5121 |           0
    inc_cumin_~t |   0.0375    0.7648    0.3450    0.5260    0.1336 |           0
    inc_cumin_~l |   0.5260   -0.3763    0.2644    0.1592    0.6975 |           0
    ------------------------------------------------------------------------------
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

         Ho: Constant variance
         Variables: fitted values of cuminutilty

         chi2(1)      =    11.82
         Prob > chi2  =   0.0006
```

2. Mustard seeds

```
Principal components/correlation                  Number of obs    =       385
                                                  Number of comp.  =         6
                                                  Trace            =         6
    Rotation: (unrotated = principal)             Rho              =    1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      2.12757      .847211             0.3546       0.3546
           Comp2 |      1.28036       .27617             0.2134       0.5680
           Comp3 |      1.00419        .1419             0.1674       0.7354
           Comp4 |      .862293       .33308             0.1437       0.8791
           Comp5 |      .529213      .332852             0.0882       0.9673
           Comp6 |      .196361            .             0.0327       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)
    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+--------------------------------------------------------------+-------------
    inc_mustse~e |  -0.2133    0.5583   -0.2225    0.7082    0.1090    0.2827 |           0
    inc_mustse~a |   0.5352    0.1937    0.0938   -0.1988    0.7281    0.3124 |           0
    inc_mustse~h |   0.4311    0.6212    0.0609   -0.0634   -0.2505   -0.5982 |           0
    inc_mustse~n |   0.3662   -0.5014   -0.1067    0.6075    0.2271   -0.4271 |           0
    inc_mustse~l |   0.5853   -0.1158   -0.0207    0.1396   -0.5859    0.5299 |           0
    inc_mustse~r |  -0.0755    0.0128    0.9624    0.2575   -0.0174    0.0368 |           0
    ------------------------------------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of mustardutility

         chi2(1)      =    45.71
```

```
         Prob > chi2  =   0.0000
```

3. Turmeric

```
Principal components/correlation                 Number of obs    =        385
                                                 Number of comp.  =          6
                                                 Trace            =          6
    Rotation: (unrotated = principal)            Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.83468       .44904             0.3058       0.3058
           Comp2 |      1.38564       .37238             0.2309       0.5367
           Comp3 |      1.01326      .250356             0.1689       0.7056
           Comp4 |      .762907      .149058             0.1272       0.8327
           Comp5 |      .613849      .224193             0.1023       0.9351
           Comp6 |      .389656            .             0.0649       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+----------------------------------------------------------------+-----------
    inc_tumeri~a |   0.2288    0.6180   -0.1815   -0.5771    0.2055   -0.3969 |           0
    inc_tumer~st |   0.0084    0.4361    0.8011    0.1131    0.2657    0.2908 |           0
    inc_tumeri~h |  -0.1157    0.6127   -0.4850    0.4130   -0.1736    0.4186 |           0
    inc_tumer~nt |   0.5244   -0.0879   -0.1750    0.5121    0.6278   -0.1741 |           0
    inc_tumeri~l |   0.5467    0.1310    0.2268    0.2638   -0.6788   -0.3196 |           0
    inc_tumeri~r |   0.6003   -0.1661   -0.0893   -0.3896   -0.0457    0.6709 |           0
    ------------------------------------------------------------------------------------------


Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of tumericutility

         chi2(1)      =   108.20
         Prob > chi2  =   0.0000
```

4. Red chilli

```
Principal components/correlation                 Number of obs    =        385
                                                 Number of comp.  =          6
                                                 Trace            =          6
    Rotation: (unrotated = principal)            Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.44857        .3565             0.2414       0.2414
           Comp2 |      1.09207     .0972587             0.1820       0.4234
           Comp3 |      .994812     .0249406             0.1658       0.5892
           Comp4 |      .969871     .0651821             0.1616       0.7509
           Comp5 |      .904689      .314701             0.1508       0.9017
           Comp6 |      .589988            .             0.0983       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+----------------------------------------------------------------+-----------
    inc_redchi~a |   0.5591    0.1098    0.1260   -0.5665   -0.1513    0.5618 |           0
    inc_redch~st |   0.6695   -0.1537    0.0905    0.0056   -0.1776   -0.6988 |           0
    inc_redchi~h |   0.1591    0.6843    0.1245   -0.0194    0.6829   -0.1557 |           0
    inc_redch~nt |   0.4339    0.0232   -0.1194    0.7986    0.0111    0.3988 |           0
    inc_redchi~l |  -0.0252   -0.4279    0.8379    0.0966    0.3076    0.1011 |           0
    inc_redchl~r |  -0.1578    0.5590    0.4940    0.1775   -0.6201   -0.0511 |           0
    ------------------------------------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of redchilliutility

         chi2(1)      =     2.07
         Prob > chi2  =   0.1501
```

5. Coriander

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          6
                                                  Trace            =          6
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.63799      .535857             0.2730       0.2730
           Comp2 |      1.10214     .0794887             0.1837       0.4567
           Comp3 |      1.02265     .0887458             0.1704       0.6271
           Comp4 |      .933902      .255081             0.1557       0.7828
           Comp5 |      .678821     .0543209             0.1131       0.8959
           Comp6 |        .6245            .             0.1041       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+----------------------------------------------------------------+-----------
    inc_corian~a |   0.5697   -0.1086   -0.1095   -0.3347   -0.1631    0.7162 |           0
    inc_corian~e |   0.3453    0.3858    0.4061   -0.6130    0.1759   -0.4005 |           0
    inc_corian~h |   0.5421   -0.1842    0.0933    0.3511   -0.6042   -0.4184 |           0
    inc_corian~t |   0.5118    0.0865   -0.2418    0.4291    0.6948   -0.0722 |           0
    inc_corian~l |  -0.0194    0.7708    0.3072    0.4089   -0.1934    0.3263 |           0
    inc_corian~r |   0.0017   -0.4515    0.8134    0.1938    0.2391    0.1996 |           0
    ------------------------------------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of corianderutility

         chi2(1)      =    39.29
         Prob > chi2  =   0.0000
```

6. Black pepper

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          5
                                                  Trace            =          5
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.43077      .161771             0.2862       0.2862
           Comp2 |        1.269      .227624             0.2538       0.5400
           Comp3 |      1.04137       .24474             0.2083       0.7482
           Comp4 |      .796634      .334407             0.1593       0.9076
           Comp5 |      .462227            .             0.0924       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5 | Unexplained
    -------------+--------------------------------------------------+-----------
    inc_blpper~a |  -0.2175    0.1059    0.9054   -0.1558   -0.3121 |           0
    inc_blpper~e |  -0.2756    0.7260    0.0884    0.3206    0.5350 |           0
    inc_blpper~h |   0.5736   -0.3533    0.4144    0.2382    0.5637 |           0
    inc_blpppe~t |   0.5855    0.4087   -0.0097    0.4605   -0.5272 |           0
    inc_blpper~l |   0.4526    0.4121   -0.0237   -0.7773    0.1436 |           0
    ------------------------------------------------------------------------------



Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of Blackpepperutility

         chi2(1)      =   186.72
         Prob > chi2  =   0.0000
```

7. Cinnamon

```
Principal components/correlation                  Number of obs    =       385
                                                  Number of comp.  =         6
                                                  Trace            =         6
    Rotation: (unrotated = principal)             Rho              =    1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.37534      .204116             0.2292       0.2292
           Comp2 |      1.17123     .0764293             0.1952       0.4244
           Comp3 |       1.0948     .0512146             0.1825       0.6069
           Comp4 |      1.04358      .174921             0.1739       0.7808
           Comp5 |      .868661      .422271             0.1448       0.9256
           Comp6 |      .446391            .             0.0744       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+----------------------------------------------------------+-------------
    inc_cinna_~a |   0.2036   -0.1833   -0.1202    0.8686   -0.2703    0.2882 |           0
    inc_cinna_~e |   0.6847    0.0021   -0.1710   -0.2414    0.3902    0.5398 |           0
    inc_cinna_~h |   0.1906    0.6958   -0.3789    0.2767    0.2669   -0.4337 |           0
    inc_cinna_~t |   0.0731    0.6597    0.4632   -0.0751   -0.4634    0.3528 |           0
    inc_cinna_~l |  -0.6683    0.2167   -0.3076    0.0709    0.3089    0.5580 |           0
    inc_cinna_~r |  -0.0362    0.0044    0.7096    0.3164    0.6271   -0.0412 |           0
    ------------------------------------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of cinnamonutility

         chi2(1)      =     2.38
         Prob > chi2  =   0.1230
```

8. Ginger

```
Principal components/correlation                  Number of obs    =       385
Number of comp.  =         6
Trace            =         6
Rotation: (unrotated = principal)             Rho              =    1.0000

--------------------------------------------------------------------------
Component    Eigenvalue   Difference         Proportion   Cumulative
-------------+------------------------------------------------------------
Comp1       1.80422      .132495             0.3007       0.3007
Comp2       1.67172      .512379             0.2786       0.5793
Comp3       1.15935       .61984             0.1932       0.7725
Comp4       .539506     .0234373             0.0899       0.8625
Comp5       .516068      .206933             0.0860       0.9485
Comp6       .309136            .             0.0515       1.0000
--------------------------------------------------------------------------

Principal components (eigenvectors)

------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
-------------+----------------------------------------------------------+-------------
inc_ginger~a |   0.0303    0.6513    0.0451   -0.0130    0.7282    0.2059 |           0
inc_ginger~e |  -0.2770    0.5625    0.1508    0.5493   -0.5209    0.1054 |           0
inc_ginge~lt |   0.6235    0.1724    0.1368   -0.3441   -0.3544    0.5646 |           0
inc_ginge~nt |   0.2618   -0.1161   -0.7788    0.4810    0.0724    0.2736 |           0
inc_ginger~l |  -0.6335   -0.2496   -0.0152   -0.1535    0.0457    0.7145 |           0
inc_ginger~r |   0.2526   -0.3923    0.5914    0.5699    0.2558    0.2055 |           0
------------------------------------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of gingerutility
```

```
         chi2(1)      =     0.23
         Prob > chi2  =   0.6338
```

9. Masala

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          6
                                                  Trace            =          6
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.51802      .301566             0.2530       0.2530
           Comp2 |      1.21646      .206162             0.2027       0.4557
           Comp3 |       1.0103     .0342423             0.1684       0.6241
           Comp4 |      .976054      .209129             0.1627       0.7868
           Comp5 |      .766925      .254681             0.1278       0.9146
           Comp6 |      .512244            .             0.0854       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+----------------------------------------------------------------+-----------
    inc_masala~a |   0.5306    0.3573   -0.0946    0.2247   -0.5838    0.4365 |           0
    inc_masala~e |   0.6770   -0.1754    0.0107    0.1040    0.0177   -0.7069 |           0
    inc_masala~h |   0.3122   -0.6739   -0.2248    0.1745    0.3467    0.4972 |           0
    inc_masala~t |  -0.0663   -0.0834    0.7946    0.5940    0.0315    0.0574 |           0
    inc_masala~l |   0.3550    0.5338    0.2061   -0.2159    0.6794    0.1959 |           0
    inc_masala~r |  -0.1796    0.3090   -0.5162    0.7132    0.2760   -0.1446 |           0
    ------------------------------------------------------------------------------------------
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of masalautility

         chi2(1)      =     6.07
         Prob > chi2  =   0.0138
```

10. Clove

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          6
                                                  Trace            =          6
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.52456      .260729             0.2541       0.2541
           Comp2 |      1.26383      .218136             0.2106       0.4647
           Comp3 |      1.04569     .0773426             0.1743       0.6390
           Comp4 |      .968351       .12373             0.1614       0.8004
           Comp5 |      .844621      .491673             0.1408       0.9412
           Comp6 |      .352948            .             0.0588       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+----------------------------------------------------------------+-----------
    inc_clove_~a |   0.1339    0.6235    0.2367   -0.0179    0.6883    0.2515 |           0
    inc_clove_~e |   0.7214   -0.1036    0.0714    0.1278    0.1688   -0.6473 |           0
    inc_clove_~h |   0.1833   -0.7086    0.3627    0.1299    0.3149    0.4654 |           0
    inc_clove_~t |  -0.1099   -0.1029   -0.7059    0.5888    0.3628    0.0270 |           0
    inc_clove_~l |   0.6268    0.2227   -0.2408    0.1113   -0.4368    0.5444 |           0
    inc_clove_~r |  -0.1523    0.1954    0.5010    0.7794   -0.2761   -0.0638 |           0
    ------------------------------------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of cloveutility

         chi2(1)      =    44.47
```

```
         Prob > chi2  =   0.0000
```

11. Cayenne pepper

```
Principal components/correlation                  Number of obs    =       385
                                                  Number of comp.  =         6
                                                  Trace            =         6
    Rotation: (unrotated = principal)             Rho              =    1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.56793     .0900084             0.2613       0.2613
           Comp2 |      1.47793      .187679             0.2463       0.5076
           Comp3 |      1.29025      .508475             0.2150       0.7227
           Comp4 |      .781771      .220408             0.1303       0.8530
           Comp5 |      .561363      .240601             0.0936       0.9465
           Comp6 |      .320762            .             0.0535       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+----------------------------------------------------------+-------------
    inc_cayenn~a |  -0.0849    0.5872   -0.5259    0.0303    0.1044    0.5996 |           0
    inc_cayenn~e |  -0.1024    0.7427    0.1163    0.1130   -0.1910   -0.6124 |           0
    inc_cayenn~h |   0.4383   -0.1360   -0.4706    0.6328    0.2801   -0.2983 |           0
    inc_cayenn~t |   0.5082    0.2603    0.3633   -0.3056    0.6688    0.0347 |           0
    inc_cayenn~l |   0.5934    0.1227    0.3346    0.2785   -0.5710    0.3426 |           0
    inc_cayenn~r |  -0.4240    0.0461    0.4944    0.6442    0.3175    0.2406 |           0
    ------------------------------------------------------------------------------------------


Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of cayenneutility

         chi2(1)      =     9.08
         Prob > chi2  =   0.0026
```

12. White pepper

```
Principal components/correlation                  Number of obs    =       385
                                                  Number of comp.  =         4
                                                  Trace            =         4
    Rotation: (unrotated = principal)             Rho              =    1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |       1.6569      .518697             0.4142       0.4142
           Comp2 |       1.1382      .351449             0.2846       0.6988
           Comp3 |      .786753      .368608             0.1967       0.8955
           Comp4 |      .418145            .             0.1045       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4 | Unexplained
    -------------+--------------------------------------+-------------
    inc_whtppe~a |   0.6828   -0.0542   -0.0788   -0.7244 |           0
    inc_whtppe~e |   0.6421    0.1238   -0.4036    0.6399 |           0
    inc_whtppe~h |   0.2774   -0.6926    0.6187    0.2460 |           0
    inc_whtppe~l |   0.2111    0.7085    0.6694    0.0733 |           0
    ------------------------------------------------------------------------


Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of Whitepepperutility

         chi2(1)      =     1.61
         Prob > chi2  =   0.2052
```

PCA RESULTS FOR HERBS

13. Rosemary

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          6
                                                  Trace            =          6
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.86889       .57473             0.3115       0.3115
           Comp2 |      1.29416      .305382             0.2157       0.5272
           Comp3 |      .988774     .0420076             0.1648       0.6920
           Comp4 |      .946766       .20947             0.1578       0.8498
           Comp5 |      .737297      .573176             0.1229       0.9726
           Comp6 |      .164121            .             0.0274       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+----------------------------------------------------------------+-------------
    inc_rosemr~a |   0.3192    0.4168    0.0287    0.5311   -0.6532   -0.1222 |           0
    inc_rosemr~e |   0.2407    0.5661   -0.1739    0.2753    0.7121   -0.0916 |           0
    inc_rosemr~h |   0.0905   -0.5737    0.1454    0.7197    0.2181    0.2759 |           0
    inc_rosemr~t |   0.6212   -0.3635    0.0922   -0.1538    0.0752   -0.6665 |           0
    inc_rosemr~l |   0.6671    0.0231   -0.0082   -0.3110   -0.0388    0.6754 |           0
    inc_rosemr~r |  -0.0332    0.2100    0.9691   -0.0623    0.1069    0.0150 |           0
    ------------------------------------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of rosemaryutility

         chi2(1)      =   154.86
         Prob > chi2  =   0.0000
```

14. Parsley

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          5
                                                  Trace            =          5
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.33637     .0463185             0.2673       0.2673
           Comp2 |      1.29005      .369597             0.2580       0.5253
           Comp3 |      .920456      .125524             0.1841       0.7094
           Comp4 |      .794932      .136745             0.1590       0.8684
           Comp5 |      .658187            .             0.1316       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5 | Unexplained
    -------------+--------------------------------------------------+-------------
    inc_parsl_~a |  -0.5082    0.4727    0.3043   -0.0924    0.6458 |           0
    inc_parsl_~e |   0.5519    0.2650   -0.4358   -0.5481    0.3672 |           0
    inc_parsl_~h |   0.2460    0.5951    0.5174   -0.2228   -0.5177 |           0
    inc_parsl_~t |   0.6134   -0.0656    0.4191    0.5263    0.4084 |           0
    inc_parl_m~l |  -0.0206    0.5898   -0.5236    0.6036   -0.1149 |           0
    ------------------------------------------------------------------------------

  Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
```

```
         Variables: fitted values of parsleyutility

         chi2(1)      =    17.14
         Prob > chi2  =   0.0000
```

15. Thyme

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          6
                                                  Trace            =          6
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      2.72411      1.58587             0.4540       0.4540
           Comp2 |      1.13824       .20942             0.1897       0.6437
           Comp3 |      .928823      .143179             0.1548       0.7985
           Comp4 |      .785644      .392849             0.1309       0.9295
           Comp5 |      .392795      .362409             0.0655       0.9949
           Comp6 |     .0303853            .             0.0051       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+----------------------------------------------------------------+-----------
    inc_thyme_~a |  -0.1342    0.7452    0.3357    0.4813    0.2865   -0.0172 |           0
    inc_thyme_~e |   0.2171   -0.2604    0.9124   -0.0377   -0.2258    0.0120 |           0
    inc_thyme_~h |   0.2732    0.6130   -0.0150   -0.6241   -0.3996    0.0147 |           0
    inc_thyme_~t |   0.4907   -0.0321    0.0589   -0.3319    0.8028    0.0116 |           0
    inc_thyme_~l |   0.5606   -0.0009   -0.1540    0.3456   -0.1782   -0.7147 |           0
    inc_thyme_~r |   0.5524    0.0096   -0.1657    0.3845   -0.1763    0.6989 |           0
    ------------------------------------------------------------------------------------------


Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of thymeutility

         chi2(1)      =    65.43
         Prob > chi2  =   0.0000
```

16. Garlic

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          6
                                                  Trace            =          6
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      2.07525         .642             0.3459       0.3459
           Comp2 |      1.43325      .597784             0.2389       0.5847
           Comp3 |      .835466     .0837537             0.1392       0.7240
           Comp4 |      .751712       .10819             0.1253       0.8493
           Comp5 |      .643522      .382722             0.1073       0.9565
           Comp6 |        .2608            .             0.0435       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+----------------------------------------------------------------+-----------
    inc_garlic~a |   0.1955    0.5863    0.5378    0.4528   -0.0007    0.3519 |           0
    inc_garlic~e |   0.4369   -0.0099    0.3919   -0.7773    0.1433    0.1754 |           0
    inc_garlic~h |  -0.4280    0.3437   -0.1800   -0.1579    0.7877    0.1447 |           0
    inc_garlic~t |   0.5899    0.1260   -0.1013    0.2070    0.4031   -0.6485 |           0
    inc_garlic~l |  -0.4137   -0.3194    0.7173    0.0691    0.1700   -0.4228 |           0
    inc_garlic~r |   0.2617   -0.6482    0.0119    0.3440    0.4095    0.4746 |           0
    ------------------------------------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
```

```
         Ho: Constant variance
         Variables: fitted values of garlicutility

         chi2(1)      =     1.62
         Prob > chi2  =   0.2031
```

17. Paprika

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          5
                                                  Trace            =          5
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.77206      .733965             0.3544       0.3544
           Comp2 |      1.03809     .0908327             0.2076       0.5620
           Comp3 |      .947262     .0802088             0.1895       0.7515
           Comp4 |      .867053      .491523             0.1734       0.9249
           Comp5 |       .37553            .             0.0751       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5 | Unexplained
    -------------+----------------------------------------------------+-------------
    inc_paprik~a |   0.5946   -0.1940   -0.0923    0.4530    0.6285 |           0
    inc_paprik~e |   0.4802    0.5196   -0.4096    0.2370   -0.5248 |           0
    inc_paprik~h |  -0.4589    0.5141   -0.5208    0.0179    0.5036 |           0
    inc_paprik~t |  -0.3622    0.1893    0.4239    0.8003   -0.1134 |           0
    inc_paprik~r |   0.2720    0.6263    0.6106   -0.3129    0.2512 |           0
    ------------------------------------------------------------------------------


Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of paprikautility

         chi2(1)      =     0.89
         Prob > chi2  =   0.3445
```

18. Fennel seeds

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          6
                                                  Trace            =          6
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      2.24893      1.12489             0.3748       0.3748
           Comp2 |      1.12404      .109421             0.1873       0.5622
           Comp3 |      1.01462      .153113             0.1691       0.7313
           Comp4 |      .861504      .387831             0.1436       0.8748
           Comp5 |      .473673      .196431             0.0789       0.9538
           Comp6 |      .277242            .             0.0462       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5     Comp6 | Unexplained
    -------------+--------------------------------------------------------------+-------------
    inc_fennel ~a |   0.5204    0.3721    0.0348   -0.2661   -0.3855   -0.6083 |           0
    inc_fennel ~e |   0.5056   -0.3024   -0.0746    0.2753    0.6881   -0.3132 |           0
    inc_fennel ~h |   0.4372   -0.3581    0.1295    0.5322   -0.5506    0.2784 |           0
    inc_fennel ~t |   0.0722    0.7899   -0.0693    0.5482    0.1586    0.2007 |           0
    inc_fennel ~l |   0.5264    0.1095   -0.0871   -0.5172    0.1514    0.6427 |           0
    inc_fennel ~r |   0.0141    0.0765    0.9819   -0.0470    0.1632    0.0322 |           0
    ------------------------------------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
```

```
         Variables: fitted values of fennel seedsutility

         chi2(1)      =    71.40
         Prob > chi2  =   0.0000
```

19. Mint

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          4
                                                  Trace            =          5
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
Component    Eigenvalue   Difference         Proportion   Cumulative
-------------+------------------------------------------------------------------
Comp1       1.37721      .128683             0.3443       0.3443
Comp2       1.24852      .268918             0.3121       0.6564
Comp3       .979604      .584936             0.2449       0.9013
Comp4       .394668            .             0.0987       1.0000
--------------------------------------------------------------------------------

Principal components (eigenvectors)


Variable     Comp1     Comp2     Comp3     Comp4  Unexplained
-------------+--------------------------------------+-------------
inc_mint_a~a   -0.2537    0.7955    0.0552    0.5475            0
inc_mint_t~e    0.5680    0.5678    0.1493   -0.5768            0
inc_mint_h~h   -0.2276   -0.0939    0.9669   -0.0664            0
inc_mint_w~t    0.7491   -0.1897    0.1993    0.6026            0
----------------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of mintutility

         chi2(1)      =     4.89
         Prob > chi2  =   0.0271
```

20. Celery

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          3
                                                  Trace            =          3
    Rotation: (unrotated = principal)             Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      2.11004      1.52532             0.7033       0.7033
           Comp2 |      .584724      .279491             0.1949       0.8983
           Comp3 |      .305233            .             0.1017       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3 | Unexplained
    -------------+------------------------------+-------------
    inc_celery~a |   0.6204   -0.0115   -0.7842 |           0
    inc_celery~e |   0.5563   -0.6984    0.4504 |           0
    inc_celery~h |   0.5529    0.7156    0.4269 |           0
    ------------------------------------------------------
```

21. Vanilla

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          5
                                                  Trace            =          5
    Rotation: (unrotated = principal)             Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.84929	.127219	0.3699	0.3699
Comp2	1.72207	.853696	0.3444	0.7143
Comp3	.868372	.44223	0.1737	0.8879
Comp4	.426143	.292013	0.0852	0.9732
Comp5	.13413	.	0.0268	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
inc_vanill~a	0.4489	0.4955	-0.2824	0.4958	0.4768	0
inc_vanill~e	0.5857	0.3133	-0.2418	-0.5189	-0.4807	0
inc_vanill~h	0.4555	-0.5385	0.0812	-0.3912	0.5856	0
inc_vanill~t	0.4431	-0.5207	0.0489	0.5758	-0.4456	0
inc_vanill~r	0.2271	0.3085	0.9235	0.0197	-0.0079	0

22. Star anise

```
Principal components/correlation                  Number of obs    =        385
                                                  Number of comp.  =          5
                                                  Trace            =          5
    Rotation: (unrotated = principal)             Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.70523	.484956	0.3410	0.3410
Comp2	1.22028	.300426	0.2441	0.5851
Comp3	.91985	.274787	0.1840	0.7691
Comp4	.645063	.135486	0.1290	0.8981
Comp5	.509577	.	0.1019	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
inc_starni~a	0.5567	0.2282	-0.2047	-0.6963	-0.3336	0
inc_starni~e	0.3601	0.6074	-0.3673	0.3628	0.4846	0
inc_starni~h	0.5671	-0.2864	0.0142	0.5925	-0.4951	0
inc_stanis~l	0.4764	-0.4989	0.3041	-0.1753	0.6331	0
inc_stanis~r	0.1092	0.4980	0.8547	0.0417	-0.0887	0

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of starutility

         chi2(1)      =    11.59
         Prob > chi2  =   0.0007
```

23. Basil

```
Principal components/correlation                  Number of obs    =       385
                                                  Number of comp.  =         5
                                                  Trace            =         5
    Rotation: (unrotated = principal)             Rho              =    1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.56956      .294337             0.3139       0.3139
           Comp2 |      1.27523      .299696             0.2550       0.5690
           Comp3 |      .975531      .269031             0.1951       0.7641
           Comp4 |        .7065      .233323             0.1413       0.9054
           Comp5 |      .473177            .             0.0946       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5 | Unexplained
    -------------+--------------------------------------------------+-------------
    inc_basil_~a |   0.5540   -0.2833   -0.0241    0.7337   -0.2718 |           0
    inc_basil_~e |   0.5703    0.3709   -0.0890   -0.4897   -0.5381 |           0
    inc_basil_~h |   0.2352    0.7153   -0.2709    0.2851    0.5276 |           0
    inc_basil_~t |   0.5561   -0.4307    0.1320   -0.3602    0.5984 |           0
    inc_basil_~l |   0.0573    0.2916    0.9491    0.1042    0.0100 |           0
    ------------------------------------------------------------------------------



Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of basilutility

         chi2(1)      =    42.77
         Prob > chi2  =   0.0000
```

24. Origanum

```
Principal components/correlation                  Number of obs    =       385
                                                  Number of comp.  =         3
                                                  Trace            =         3
    Rotation: (unrotated = principal)             Rho              =    1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      1.57741      .706385             0.5258       0.5258
           Comp2 |      .871025       .31946             0.2903       0.8161
           Comp3 |      .551565            .             0.1839       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3 | Unexplained
    -------------+------------------------------+-------------
    inc_oregan~a |   0.6612   -0.0057   -0.7502 |           0
    inc_oregan~e |   0.5338   -0.6991    0.4757 |           0
    inc_oregan~h |   0.5272    0.7150    0.4592 |           0
    ------------------------------------------------------------

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
```

```
Variables: fitted values of origanumutility

chi2(1)      =     8.07
Prob > chi2  =   0.0045
```

APPENDIX B

Questionnaire

CONSUMERS' PREFERENCES AND DEMAND FOR CULINARY SPICES AND HERBS IN GAUTENG PROVINCE, SOUTH AFRICA

Thank you for taking your time to participate in this survey. The survey should take not more than 15 minutes to complete and please be assured that all answers will be kept in the strictest confidentiality and answers will remain anonymous. The aim of the survey is to get an insight into consumption of spices and herbs consumed in Gauteng so as to make a proper analysis of what is consumed how much is consumed; how much is still needed to fulfil needs of consumers. Your participation is voluntary and you may withdraw from this research any time you wish.

Questionnaire Number		**Date**	

SECTION A: ***SOCIO-ECONOMIC AND DEMOGRAPHICS***

A1. Age of respondent:

A2. Marital status:

A3. Household size:

A.4 Gender:

A5. Education level:

A.6 Religious affiliation:

A7. Ethnic group:

A9. Average monthly income with sources

Source	Amount (ZAR)
Formal employment	
Informal employment	
Remittance	
Pension	
Grants	
Others	

A10. How much is your monthly food Expenditure? (R)….

A8. Employment status:

A11. Do you consume spices and herbs and when did you start consuming them?

Commodity	Yes	No	Year
Spices			
Herbs			

A12. Number of household members using spices[……] and Herbs [……]

A13. How much is the household's monthly expenditure? (ZAR)……

A14. How much is the household's monthly expenditure? (ZAR)…….

SECTION B: ***CONSUMER PREFERENCES AND CONSUMPTION OF SELECTED SPICES AND HERBS***

B1. Are you aware of ***health benefits*** of spices and herbs?

Spices	Yes	No
Herbs		

B2. What type of spices and herbs do you prefer?

	Locally produced	Imported	Not particular
Spices			
Herbs			

B3. Where do you purchase your spices and herbs?

Outlet	Spices	Herbs
Grocery stores		
Spice shops		
Farmers market		
Other(specify)		

B4. How do you perceive the price for spices? Cheap ☐ Generally acceptable ☐ Generally expensive ☐

B5. How do you perceive the price for herbs? Cheap ☐ Generally acceptable ☐ Generally expensive ☐

B6. In what form do you purchase/prefer your spices and herbs (tick as many as applicable?

Commodity	Fresh leaves	Whole	Dried	Crushed	Seeds	Essential oil
Spices						
Herbs						

B7. What are the ***general factors*** you consider before buying spices and herbs?

Factor	Most likely	Likely	Less likely
Labelling with nutritive value			
Visual attractiveness			
Household dietary patterns			
Household size			
Health attributes			
Income/salary			
Beliefs			
Packaging			
Taste			
Price			
Ease of preparation			
Freshness			
Consistent availability in retail/market outlets			
Other (specify)……			

B8. Reason for including the following spices and herbs in your meals

SPICES	Aroma	Taste	Health attributes	Weight management	Medical reason	Other
Cumin						
Mustard seeds						
Turmeric						
Red chilli						
Coriander seed						
Black pepper						
Cinnamon						
Ginger						
Masala						
Clove						
Cayenne pepper						
White pepper						
HERBS	**Aroma**	**Taste**	**Health attributes**	**Weight management**	**Medical reason**	**Other**
Rosemary						
Parsley						
Thyme						
Garlic						
Paprika						
Fennel seeds						
Mint						
Celery						
Vanilla						
Star anise						
Basil						
Origanum						

B9. Reasons for non-consumption of other spices

List	**Reason (tick at least two):** 1. High prices, 2. Not available in the market 3. Don't know how to use them 4. Don't like the smell	**Willing to consume (Y/N)**	**What should be done for you to consume the spice/herb?**
Spices			
Herbs			

SECTION C: ***Willingness to pay for spices and herbs***

C1. Are you willing to pay for spices? Yes……. No…….

C2. Are you willing to pay for herbs? Yes……. No ……

C3. What determines/influences your willingness to pay for spices and herbs?

	SPICES			**HERBS**		
	Most likely	Likely	Less likely	Most likely	Likely	Less likely
Improved characteristics						
Longer-shelf life						
Lower use of pesticides						
Traceability						
Good quality						
Brand						
Support organic concept						
Other (specify)……						

C4. How much more are you willing to pay for your spices and herbs (**Tick**)

SPICES	Current Price per Unit (ZAR) (Specify)	Amount Willing to Pay	How much more are you willing to pay for spices and herbs? (Tick)		
			Nothing more	5 per cent more	More than 5 percent more
Cumin					
Mustard seeds					
Turmeric					
Red chilli					
Coriander seed					
Black pepper					
Cinnamon					
Ginger					
Masala					
Clove					
Cayenne pepper					
White pepper					
HERBS					
Rosemary					
Parsley					
Thyme					
Garlic					
Paprika					
Fennel seeds					
Mint					
Celery					
Vanilla					
Star anise					
Basil					
Origanum					

C6. What do you prefer using spices and herbs for?

Commodity	Sauces & dips	Snacks & convenience food	Meat & poultry products	Soups & noodles	Beverages	Ready to eat meals	Personal care	Other specify
SPICES								
Cumin								
Mustard seeds								
Turmeric								
Red chilli								
Coriander seed								
Black pepper								
Cinnamon								
Ginger								
Masala								
Clove								
Cayenne pepper								
White pepper								
HERBS								
Rosemary								
Parsley								
Thyme								
Garlic								
Paprika								
Fennel seeds								

Mint								
Celery								
Vanilla								
Star anise								
Basil								
Origanum								

SECTION D: *DEMAND FOR CULINARY SPICES AND HERBS*

D1. What is your source of information regarding spices and herbs?

Source of information	**Spices**	**Herbs**
Television		
Newspaper		
Radio		
Internet		
Friends/family		
Health practitioner		
Awareness on healthy lifestyle		
Other		

D2. Do you always find the ***right quantities*** of spices and herbs?

Spices	Yes		No	
Herbs				

D3. Do you always find the ***right quality*** for spices and herbs?

Spices	Yes		No	
Herbs				

D4. What quality attributes do you consider important when buying spices and herbs?

Attributes	**Spices**	**Herbs**
Organic		
Strong aroma		
Freshness		
Colour		
Texture		
Other (specify)……		

D5. What would you like to see change about spices and herbs in general?

	Spices	**Herbs**
Price reduction		
Point of sales		
Quantity		
Packaging		
Variety		
Other (specify)…….		

D6. When and how do you consume spices and herbs?

Commodity	When do you consume (morning/during the day/afternoon/evening/other-specify)	How do you consume (cooked/uncooked/other-specify)	What specific health benefit do they possess

D7. What challenges do you experience with purchasing of spices and herbs?

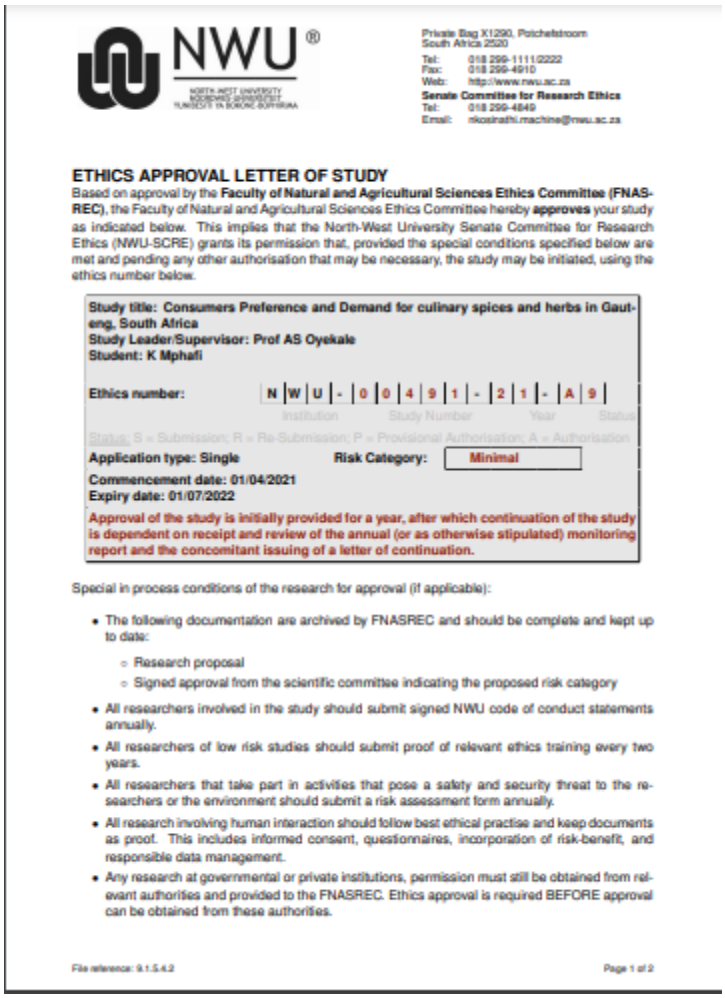
Challenge	**Spices**	**Herbs**
Uncertainty about some of the health properties of spices and herbs		
Lack of proper processing and packaging to encourage consumption		
Difficulty keeping/storing spices and herbs		
Unavailability on the shelves		
Brand (quality and safety attributes)		
Other (specify)……..		

D8. What are the average prices you paid for spices and herbs recently?

Commodity	**Consumption freq (daily, weekly, occasionally)**	**Frequency of purchase**	**Expenditure per month (ZAR)**	**Quantity**	**Since you started using spices/ and herbs, has the quantity demanded changed? (Yes/ No**	**Has the quantity consumed increased; remained the same; or decreased?**	**Reason for change in quantity demanded**	**Fresh or powder**
SPICES								
Cumin								
Mustard seeds								
Turmeric								
Red chilli								
Coriander seed								
Black pepper								
Cinnamon								
Ginger								
Masala								
Clove								
Cayenne pepper								
White pepper								
HERBS								
Rosemary								
Parsley								
Thyme								
Garlic								
Paprika								
Fennel seeds								
Mint								
Celery								
Vanilla								
Star anise								
Basil								
Origanum								

APPENDIX C

Ethical clearance certificate



Private Bag X1290, Potchefstroom
South Africa 2520
Tel: 018 299-1111/2222
Fax: 018 299-4910
Web: http://www.nwu.ac.za
Senate Committee for Research Ethics
Tel: 018 299-4849
Email: nkosinathi.machine@nwu.ac.za

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the **Faculty of Natural and Agricultural Sciences Ethics Committee (FNAS-REC)**, the Faculty of Natural and Agricultural Sciences Ethics Committee hereby **approves** your study as indicated below. This implies that the North-West University Senate Committee for Research Ethics (NWU-SCRE) grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: Consumers Preference and Demand for culinary spices and herbs in Gauteng, South Africa
Study Leader/Supervisor: Prof AS Oyekale
Student: K Mphafi

Ethics number: N|W|U|-|0|0|4|9|1|-|2|1|-|A|9|
Institution Study Number Year Status

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Application type: Single **Risk Category:** Minimal

Commencement date: 01/04/2021
Expiry date: 01/07/2022

Approval of the study is initially provided for a year, after which continuation of the study is dependent on receipt and review of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation.

Special in process conditions of the research for approval (if applicable):

- The following documentation are archived by FNASREC and should be complete and kept up to date:
  - Research proposal
  - Signed approval from the scientific committee indicating the proposed risk category
- All researchers involved in the study should submit signed NWU code of conduct statements annually.
- All researchers of low risk studies should submit proof of relevant ethics training every two years.
- All researchers that take part in activities that pose a safety and security threat to the researchers or the environment should submit a risk assessment form annually.
- All research involving human interaction should follow best ethical practise and keep documents as proof. This includes informed consent, questionnaires, incorporation of risk-benefit, and responsible data management.
- Any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the FNASREC. Ethics approval is required BEFORE approval can be obtained from these authorities.

File reference: 9.1.5.4.2 Page 1 of 2

General conditions:
While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:

- *The study leader/supervisor (principle investigator)/researcher must report in the prescribed format to the FNASREC:*
  - *annually (or as otherwise requested) on the monitoring of the study, whereby a letter of continuation will be provided, and upon completion of the study; and*
  - *without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.*
- *The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the study leader/researcher must apply for approval of these amendments at the FNASREC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.*
- *Annually a number of studies may be randomly selected for an external audit.*
- *The date of approval indicates the first date that the study may be started.*
- *In the interest of ethical responsibility, the NWU-SCRE and FNASREC reserves the right to:*
  - *request access to any information or data at any time during the course or after completion of the study;*
  - *to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;*
  - *withdraw or postpone approval if:*
    - *any unethical principles or practices of the study are revealed or suspected;*
    - *it becomes apparent that any relevant information was withheld from the FNASREC or that information has been false or misrepresented;*
    - *submission of the annual (or otherwise stipulated) monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and / or*
    - *new institutional rules, national legislation or international conventions deem it.*
- *FNAS-REC can be contacted for further information or any report templates via Roelof.Burger@nwu.ac.za 018 299 4269*

The FNASREC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the FNASREC or the NWU-SCRE for any further enquiries or requests for assistance.

Yours sincerely,

Prof Roelof Burger
Chairperson Faculty of Natural and Agricultural Sciences Ethics Committee (FNASREC)