KNOWLEDGE, AWARENESS AND ATTITUDES OF OPTOMETRISTS IN TRINIDAD TOWARDS TELE-OPTOMETRY

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Abstract

Background: Tele- health has been in existence for a few decades and it has undergone many modifications. The introduction of tele-health was based on the hopes of it making health care services available and accessible to more people.

Purpose: To determine the knowledge, awareness and attitude of optometrists in Trinidad towards the use of tele-optometry.

Method: Online structured questionnaires were sent to 114 registered optometrists in Trinidad through emails and WhatsApp to assess their level of knowledge, awareness and attitude towards the use of tele-optometry in Trinidad. The Data collected was analysed using tools in the Statistical Package for Social Sciences (SPSS).

Results: A total of 31 optometrists participated in the study, 71% were females and most were aged 25 to 30 (54.8%). A very few (12.9%) utilized tele-optometry in their workplace. Only 5 (16.1%) had a good understanding and (22.6%) had a negative attitude towards it's use in Trinidad. Gender, ethnicity, age, region of employment, and qualification were found not to be statistically associated with knowledge, awareness and attitude because all p-values were more than 0.05. However, employment status was indeed significantly associated with knowledge ($p<0.05$) but not with awareness and attitude. The major influencing factor to the use of tele-optometry was the ability to build patient-optometrist relationships and the need for special security was the major, barrier to use.

Conclusion: The majority of participants had already heard of tele-optometry prior to the survey but the level of understanding was low and the attitudes were mostly negative.

Definition of terms

- **Tele-health:** is defined as the delivery of health care, health education, and health information services via remote technologies.[1]
- **Tele-optometry**: is defined as remote eyecare services by an optometrist to their patients.
- **Optometrist:** A primary health care provider who deals with vision by performing vision testing activities as well as treatment and management of patient's vision problems.
- **Pandemic:** An outbreak of a disease all over the world.
- **Dehumanization:** the act of stripping away a person/s positive human qualities.
- Barrier: an obstacle which prevents a certain action or access to something.
- **Diabetic retinopathy**: is an association of diabetes as a result of high blood sugar, leading to the damaging of the back of the eye.
- **Glaucoma:** id defined as a gradual loss of sight as a result of an increasing pressure within the eyes.
- **Low vision:** a vision problem that makes it almost impossible to perform daily activities which cannot be fixed with spectacles and contact lenses.
- **Paediatric:** this is a branch of medical services which deals with children.
- **Confidentiality:** in a healthcare setting, this is defined as the state of secured or private from others.
- **Demographics:** data that is related to a population and certain groups that may be within this population.

- **Refraction:** a test conducted by an optometrist in order to determine the optical prescription that a patient may need to improve vision.

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CHAPTER ONE: INTRODUCTION

1.0 Introduction

Telehealth has played major roles in the past including helping health care professionals attend to their patient who might be needing advice or are not physically able to come to the clinic. It has also been previously used for attending to patients in rural settings or as part of a disaster relief efforts. However, the COVID-19 pandemic made the use of telehealth very relevant as people were afraid to leave their homes due to a fear of coming in contact or being in proximity to others who could be having the diseases. Telehealth services have been used in medicine, dentistry, ophthalmology and optometry. Although tele-optometry has been reported to be used in some countries, there is no record of the use of tele-optometry in the Caribbean especially in Trinidad. This study was therefore aimed to determine the knowledge, awareness, and attitude of optometrists in Trinidad towards the use of tele- optometry. This chapter explained the basic outline of the study including the aim, objectives, rationale, significance, and limitations.

1.1 Background of the Study:

Telemedicine has been in existence for the past 40 decades and it was first introduced for the purpose of health care delivery in the early 1960s to satisfy the needs of NASA and the Nebraska Psychiatric Institute.[2] From this introduction, many of the health care providers have adopted and modified tele-health according to their own field of work, giving birth to tele-ophthalmology, tele-optometry, tele-pharmacology, tele-radiology etc.

1.1.1 Forms of Telemedicine

Rossow[3] broke tele-optometry into 4 distinct forms namely:

1. Asynchronous Tele-medicine – this is where health care providers forward/share patients' documents such as lab reports, photos and videos to specialists such as a radiologist for further examination. This method has strict security in order to uphold patient confidentiality. This allows for patient diagnoses and treatment plans.
2. Remote patient monitoring- this is a method by which a patient vital signs can be monitored from a remote location and instantly seen by the health care provider. This method is especially convenient for patients with chronic diseases as well as patients who have just been released from hospitals and need careful monitoring.
3. Real Time Tele-medicine - this is where health care providers and patients make use of video call platforms to hear and see each other. This method is great for monitoring chronic illnesses, follow up visits, urgent visits and whenever the patient is not physically able to make it to the clinician's office but needs consulting.
4. Live video conferencing- this is the most popular of the 4 types. It is simply a live video call between a patient and their healthcare provider.

1.1.2 Tele-optometry

Tele-optometry is where patients can be provided with eye care services by an optometrist from a remote location.[4] It is also a branch of tele-medicine/health which deals with a wide range of eye care and ocular problems presented by patients to the Optometrist. The patient's problems and needs are satisfied with medical digital equipment and telecommunications by the use of platforms which allow stable video calling services. This method allows for good patient

diagnoses, prescription verification and monitoring. A number of studies have been done on tele-health in the past, most of which looked at the use of tele-health from different aspects and obtained necessary information.

Patel et al[5] did a study in Chicago to make a comparison between the feedback received from tele-health patients and patients who receive face to face medical assistance. Most of the patients rated the tele-health services and care they received to be satisfactory. After analysing the results of the research, it was concluded that there were negligible differences in the patients' satisfaction of both face to face and tele-health treatment.

Also, Monaghesh and Hijizadeh[6] conducted a study in Tabriz, Iran. This study focussed on the role that tele-health can play in the prevention and management of diseases during the COVID-19 pandemic. After a thorough investigation and analysis of the results obtained, they concluded that tele-health implementation during the pandemic plays a role in keeping both the patients and health care providers safe as they will not be in the same location at once while the patients can still receive their medical assistance. This has proven to be very important as it can help slow the rate at which the virus is spreading.

In addition, Rothschild[7] did a study in order to make the public aware of how beneficial the implementation of tele-health can be especially during the pandemic. The author described importance of making use of tele-optometry especially now that the need is high due to the pandemic and he further stated that it will even become more popular in the future. There is a limited number of studies done in tele-optometry and most of the studies were done outside the Caribbean and they focused more on the pros and cons of tele-optometry. No study has been done to check the level of awareness, knowledge and how people perceive tele-optometry in the Caribbean especially in Trinidad and Tobago. This study was aimed to determine the level

of awareness, knowledge and attitude of optometrists towards tele-optometry in Trinidad. The findings will be compared with findings from other places.

1.2 Problem Statement

Bennet[8] and Evisit[9] showed that some optometrists and patients are sceptical about the efficiency of tele-optometry due to its limitations with the type of exams you can do. Also, due to the fact, that it is new, more expensive and insurance does not cover the exams made it difficult for patients to sign up for that. Trinidad just like most countries was also affected severely by the pandemic. Tele-optometry though very important in this period is not popular in Trinidad. This study will determine the awareness, knowledge and attitude of optometrists in Trinidad towards the use of tele- optometry. Findings of which can be used to compare with findings from other countries.

1.3 Aim of the Study

The purpose of this study is to determine the knowledge, awareness and attitude of optometrists in Trinidad towards the use of tele-optometry.

1.4 Objectives

1. To assess the knowledge, Awareness and Attitudes of Optometrists in Trinidad towards the use of tele-optometry based on their demographical profile
2. To ascertain the number of optometrists in Trinidad that use tele-optometry
3. To determine factors that could influence the use of tele optometry among optometrists in Trinidad.
4. To evaluate barriers to the use of tele-optometry among optometrists in Trinidad.

1.5 Significance of Study

Benefits of the study to the participants include:

1. The opportunity to be part of a movement for improved eye care in Trinidad, as well as the stimulation of further discussion on implementation of tele-optometry within their various practices.
2. A benefit to the community and public health would be the possibility of implementation of tele- optometry improving access to eye care by individuals that either live in areas that do not have optometry practices or are required to stay at home or social distance for reasons such as the current global pandemic.
3. The benefit to research in general is that it will add to the already existing literature since there is no record of any study from Trinidad.

1.6 Delimitation of the Study

This study was delimited to registered Optometrists who practice Optometry in Trinidad and Tobago.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

In this chapter, a total of 22 different studies conducted on telemedicine, telehealth, telenursing, tele-ophthalmology and tele optometry in different parts of the world were reviewed.

2.1 Global Studies

Neville[10] study in the USA reviewed different uses of telehealth, such as, teleradiology, telesurgery, teleconsultations, remote patient monitoring and remote retinal imaging. Benefits outlined included cost reduction, access to healthcare professionals, service and improved care. The author also explained the existence of some potential barriers to telehealth, such as, the raise of concern with legal and ethical issues including fraud, privacy and malpractice liability, licensure and standards, high initial cost of implementation and the fear of dehumanization. They concluded that the benefits of telehealth outweigh these possible barriers.

Romanick-Schmiedl and Raghu[11] study in the USA mentioned the many benefits offered by telemedicine like convenience, lower cost, and quick exchanges of digital information, and various limitations that may also arise, such as, the limitation of observation that guides diagnosis and treatment, and the presentation of a physical barrier (the screen) which inhibits an atmosphere of trust between the patient and physician. The authors highlighted the importance of telemedicine in rural areas and its effectiveness during times where social distancing is required as during this current pandemic, COVID-19.

Shachar et al[12] study in the USA described how the global pandemic is one of the determining factors that increased the rate at which telehealth is being considered, it was stated that the proportion of telehealth visits increased from 10% before the pandemic to more than 90% during the pandemic. The authors also described changes in regulations that may need to occur

for long-term implementation of telehealth after the pandemic in relation to payment, privacy and licensing.

Mohammadpour et al[13] did a study in Iran where they reviewed 105 studies in relation to telemedicine and Vision 2020. The authors highlighted how the increased distribution and availability of smartphones in developing countries can aid in the development of telemedicine and teleophthalmology practices by taking high resolution photos and sending them to an expert for interpretation. The authors emphasized on the points that teleophthalmology using smartphones can aid in early detection of ocular conditions and that regular follow-ups have significant roles in preventing blindness.

Monaghesh and Hajizadeh[6] in Iran did a systematic review of secondary data using eight studies from five online databases. The authors explained how telehealth is effective in the maintenance of healthcare provision while minimizing the risk of transmission of COVID-19 by avoiding direct physical contact. Other benefits outlined include the improved access to care and affordability, while it was stated that barriers to implementing these programs depend on accreditation, payment systems, insurance, concern for technical, clinical quality, safety, privacy and accountability.

Villines[14] study in the USA described telemedicine with explanations of the benefits and disadvantages as it relates to patients and healthcare providers. Benefits outlined included lower costs, improved access to care, preventative care, convenience, slowed spread of infection, and patient satisfaction, and the disadvantages outlined were drawback due to insurance coverage, protecting medical data, care delays, licensing issues, technological concerns and an inability to examine the patients. The author states that remote care may be the difference between prompt treatment and no treatment at all.

Nelson[15] study in the USA described some tele health challenges and methods to overcome the challenges. The author reported that telehealth services were operational in only one department or program in 61.4% of the facilities that offer them and in two or more departments or programs in 38.6% and that rural hospitals were less likely to have multiple services than urban hospitals, (35.2% compared to 42.1%). Some challenges outlined were the lack of standardization of provider education in telehealth and lack of development of industry-wide competencies. It was stated that telehealth may prevent hospitalization, reduce costs and stress for the patient.

Prathiba and Rema[16] did a study to describe the application of teleophthalmology in rural and underserved areas of India. The authors highlighted the importance of tele ophthalmology and its benefits which included detecting, screening and diagnosing diabetic retinopathy, anterior segment imaging, glaucoma screening, low vision consultation and tele mentoring, especially for those in rural areas. The study stated that a screening was done in rural South India using telehealth facilities on 511 diabetics at 6 screening camps. Diabetic retinopathy was found in 189 eyes (19.1%) and 73.6% of patients (376 people) had never undergone an eye exam. This proves that teleophthalmology increased the accessibility of eye care to individuals in rural areas.

Zayapragassarazan and Kumar[17] did a study in India on awareness, knowledge, attitude and skills of telemedicine among health professional faculty working in teaching hospitals in which a total of 120 teaching faculties and practitioners from the preclinical, para-clinical and clinical departments responded to a questionnaire. The authors reported that 76% had high awareness of telemedicine, 41% of respondents had a good knowledge of telemedicine, 39% had high attitude and 19% were highly skilled. 61% of respondents were male and 48% were between the ages of 30-40 years.

Biruk and Abetu[18] did a study in Africa on knowledge and attitude of health professionals toward telemedicine in resource-limited settings in which a total of 298 health professionals from different hospitals responded to a questionnaire. The authors reported that 65.4% of respondents were male, 66.1% were between the ages of 20-29 years, 75% held a bachelor's degree. They also reported that 37.6% had good knowledge and 64% had good attitude towards tele-optometry.

Sim et al[19] study in the UK examined six (6) teleophthalmology programs that are currently operating in the UK as they relate to diabetic eye care, glaucoma, emergency eye care and other retinal diseases, and three (3) studies about randomised controlled trials in Tele-ophthalmology with a collective sample size of 676. The authors also outlined challenges/ disadvantages to tele-ophthalmology which include the lack of access to data, lack of tools and capabilities to drive change, lack of leadership culture and organisational infrastructure to support change, decreased human interaction, and the reading of retinal images being a skilled process. Benefits of tele-ophthalmology mentioned were the screening and detection of retinal diseases, cost-effectiveness and accuracy.

Harvey[20] study in the UK described tele-optometry and the various parts of a tele-optometric exam, including remote consultation and remote testing, mainly focusing on acuity testing, refraction, tonometry, visual fields and image capture and viewing. The authors also mentioned that 45478 health related apps exist on the IOS app store, and much more when counting those on the android app store, that can be used for tele-optometry, such as, a colour vision testing app, Hess chart app, electronic Amsler app and dry eye toolkit app.

Patel et al[5] did a study on thirty (30) college students in the USA on tele-optometry. The authors expressed that 96.67% of the participants believed that the tele-optometric exam addressed their concerns while the remaining 3.33% remained neutral on the matter, 80% were satisfied

with their care while 20% were neutral and 0% were dissatisfied, and 73.3% rated the quality of the exam as positive while 23.3% were neutral and 3.3% rated it as negative. It was determined that tele-optometry may be used for disease management in rural areas as well as for comprehensive eye examinations as it provided positive experiences for the patients.

Rothschild[21] in the USA described tele-optometry and outlined useful steps for the implementation of this into an optometry practice. The author stated that it is essential to properly communicate with the patient the proceedings of a virtual-at home office visit, as well as, the importance of remembering the rules for clinical judgement.

Vargas et al[22] in Colombia described the telemedicine projects that have been implemented in Colombia. The authors also described the techniques, platforms and tools used as well as gave a timeline showing the evolution of telemedicine in Colombia. The authors concluded that telemedicine is a versatile tool which allows for the provision of remote medical services facilitating patient doctor connections.

2.2 Regional Studies

Toffoletto and Tello[23] in Chile did an integrative review of twelve (12) articles in scientific databases from Latin America and the Caribbean for the years 2009 to 2019, in which they explored the importance of telehealth and the general knowledge available on the topic of telenursing in Europe, the United States, Latin America and the Caribbean. The authors concluded that there were very few intervention studies that effectively produced knowledge that could be implemented in nursing practices and expressed the need to conduct more studies that would generate change.

Erskine[24] in Jamaica described innovations in medicine based on interviews and observation of some professors and doctors in the Caribbean as it relates to telehealth and paediatric care and a telehealth model that could be implemented in Jamaica. The author also highlighted some

benefits of the University of the West Indies (UWI) telehealth program and stated the mission statement of "The Jamaica Project", which relates to telemedicine. The benefits included improved access to high quality paediatric healthcare, elimination of the need to travel overseas for treatment and enhancement of information sharing.

Lawrence[25] in Jamaica did an observational based study in which he described the key areas required to facilitate good patient experience. The author also discussed factors that need to be improved to better facilitate telehealth in Jamaica when compared to USA and UK, such as, the 90% internet penetration available in developed countries, which is useful in facilitating the success of telemedicine, compared to Jamaica's 60%.

2.3 National Studies

Peters[26] did an interview-based report on three (3) doctors in Trinidad and Tobago which described telemedicine during the COVID-19 pandemic with example of a satisfied patient's experience. The author also stated benefits, such as, convenience, reduced travelling time, reducing the need to leave home and the reduced spread of COVID-19, and challenges associated with telemedicine such as the fact that most individual do not understand the concept of telemedicine.

Manik[27] in Trinidad did a secondary analysis in which he stated that doctors have conformed to the challenges brought on by COVID-19 by utilizing telemedical practices. The author made reference to the UWI Telehealth program that has been in action since 2004 which enabled consultations for paediatric cases with international specialists and the Digital Divide Survey in 2013 by the Telecommunication Association of Trinidad and Tobago (TATT) which outlined some challenges of telecommunication, such as, the fact that only 44.6% of households had access to internet service and that the older people who are more likely to benefit from the consultations are less likely to be comfortable with the technology.

Dixon[28] did an online research in Trinidad and Tobago that described how the COVID-19 pandemic encouraged the advancement of telemedicine. The author also outlined benefits, such as, cost effectiveness, sharing of real-time information and significant decrease in time waiting for an appointment, and some disadvantages associated with the implementation of telemedicine, such as, costly and time-consuming implementation of this system for the health care provider, unpredictability of technology and the risk of compromised patient confidentiality.

Dowrich-Phillips[29] in Trinidad and Tobago described a Caribbean telehealth platform created by a Trinidadian doctor in an effort to make healthcare more accessible and affordable. It was stated that the platform was available in the Bahamas, St Lucia, the Cayman Islands, Trinidad and Tobago, the British Virgin Islands Antigua and Barbados. It was proven to be beneficial with the onslaught of COVID-19 but there are still some challenges with regards to acceptance of health insurance forms and e-subscriptions of doctor's letters.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter outlined the research design, study size, study population, sample size, sampling procedure, inclusion and exclusion criteria, test and instrument used, data collection procedure, data analysis, legal and ethical considerations.

3.1 Ethical consideration

- Ethical approval was received from the UWI Campus Research Ethics Committee.
- Information document was sent to all participants in order to explain what the study entails, reason for the study and why they should participate in the study.
- Consent was obtained first from all participants before completing the questionnaire
- Confidentiality of the participant was maintained since none of them were required to state their names in the survey to be completed.
- The data collected from the participants was kept in a safe place, one which is only accessible to the hosts of this study. These data sheets are to be destroyed in 5 years after the study has come to pass.

3.2 Research design

This study was a survey of Trinidad and Tobago optometrists regarding their level of awareness and attitude towards tele-optometry.

3.3 Study population

The study population included all 114 Optometrists in Trinidad.

3.3.1 Study site or area of study

Trinidad is the larger of the twin-island country of Trinidad and Tobago in the West Indies. Trinidad, with an area of roughly 1,850 square miles, and its sister island Tobago, with an area of roughly 115 square miles, have a collective estimated population of 1.4 million people.[30] Trinidad and Tobago has only one optometry school at the University of the West Indies (UWI) Saint Augustine campus. The optometry training started in 2009 and the school has graduated more than 150 optometrists who are currently working in different parts of the country.

To legally practice optometry in Trinidad and Tobago an individual must register with the Ministry of Health appointed board called the Trinidad and Tobago Opticians Registration Council (TTORC). About one hundred and fourteen (114) optometrists operate in Trinidad and Tobago in various practices mainly distributed in the area of Trinidad's capital, Port-of-Spain, and environs and southern areas of Chaguanas and environs.[31]

3.3.2 Inclusion Criteria

- All registered Optometrists in Trinidad who gave their consent to participate in the study were included.

3.3.3 Exclusion Criteria

- Registered optometrists who have worked less than 2 years in Trinidad were excluded.
- Registered optometrists who are not currently working in any clinic were excluded.

3.4 Sample size

Sample size determination

The sample size used was 114 which was the total number of registered optometrists in Trinidad.

3.5 Tests and instrument/Equipment

The data was collected using a structured questionnaire.

3.6 Data collection procedures

The list of all the registered optometrists in Trinidad including their emails addresses and contact numbers were obtained from the relevant authority. Information document, invitation to participate in the research and consent forms were sent to all registered optometrists. A link to the questionnaire developed with google forms were sent to all those that gave their consent to participate in the study via emails and WhatsApp.

Knowledge

Knowledge was defined as having a general understanding on what tele-optometry is all about.

Good knowledge was defined as those responses that were high and very high only.

Awareness

Awareness was defined as being aware or knowing of tele-optometry.

The persons that answered yes to this question was considered to be aware.

Attitude

Attitude was defined by how the participants feel towards tele-optometry and their motivation.

A positive attitude was defined as those responses that were high and very high only.

3.7 Data analysis

The data collected from the questionnaires were first exported to Statistical Package for Social Sciences (SPSS) and analysed with descriptive statistics. Chi-square was used to

determine the association with the variables and p-value less than 0.05 was considered to be statistically significant.

CHAPTER FOUR: RESULTS

4.0. Introduction

This chapter presents results obtained from the research and presented according to each objective.

4.1 Demographical profile of the participants

A total of 31 optometrists participated in this study, of which 22 (71%) were females and majority 17 (54.8%) of them were under the age of thirty (Table 4.1). Fourteen (45%) of the responders were of South East India descent, covering almost half of the total number of participants followed by Africans 7(22.6%). Over 85% (27) of the participants had permanent employment and 83.9% (26) of the responders had a bachelor's degree. Also, most (29%) of them work in the central and northern region of the country (25.8%).

Table 4.1: Demographical profile of the respondents

Variables	Frequency (N)	Percentage frequency (%)
Gender		
Males	9	29
Females	22	71
Age		
25-30	17	54.8
31-35	3	9.7
36-40	1	3.2
41-45	1	3.2
46-50	2	6.5
50+	4	12.9
No response	3	9.7
Ethnicity		
African	7	22.6
South east Indian	14	45.2
Mixed	5	16.1
No response	5	16.1
Employment status		
Permanent	27	87.1
Temporary	4	12.9

Region of employment		
North	8	25.8
South	4	12.9
Central	9	29
East	6	19.4
West	1	3.2
No response	3	9.7
Qualification		
B.Sc.	26	83.9
M.Sc.	2	6.5
PhD	1	3.2
No response	2	6.5

4.2 Objective 1: To assess the knowledge, Awareness and Attitudes of Optometrists towards the use of tele-optometry

Knowledge

Out of the 31 respondents, only 5 (16.1%) have a good knowledge of tele-optometry and only 1 (3.2%) respondent is very familiar with its tools (Table 4.2).

Awareness

A good number 22 (71%) of the respondents are aware of the use of tele-optometry, although 5 (16.1%) did not believing in the feasibility of tele-optometry in Trinidad (Table 4.2).

Attitude

Based on the responses, only 4 (12.9 %) of the respondents feel highly motivated towards tele-optometry, while 7 (22.6%) has little to no motivation and 6 (19.4%) do not believe that tele-optometry will improve patient care. Also, 12 (38.7%) respondents believe there is a need for more optometrists to adopt tele-optometry in Trinidad.

Table 4.2: Knowledge, Awareness and attitude of the optometrists towards tele-optometry.

Variables	Frequency (N)	Percentage frequency (%)
(1). Awareness		
Have you ever heard of tele-optometry?		
Yes	22	71.0
No	9	29.0
Is your workplace currently making use of tele-optometry?		
Yes	4	12.9
No	27	87.1
If yes, to the above question, do you think it's beneficial?		
Yes	2	6.5
No	2	6.5
(2). Knowledge		
To what extent are you familiar with the tools of tele-optometry?		
Very low	4	12.9
low	14	45.2

Average	11	35.5
High	1	3.2
No response	1	3.2
What would you rate your level of understanding of tele-optometry?		
Very low	3	9.7
Low	9	29
Average	14	45.2
High	4	12.9
Very high	1	3.2
How high is the probability that you will be using tele-optometry in the future?		
Very low	2	6.5
Low	6	19.4
Average	17	54.8
High	4	12.9
Very high	1	3.2
No response	1	3.2
To what extent are you familiar with the benefits of tele-optometry?		
Very low	2	6.5
Low	10	32.3
Average	16	51.6
High	1	3.2
Very high	1	3.2
No response	1	3.2
(3). Attitude		
How would you rate your level of motivation towards tele-optometry?		
Very low	1	3.2
Low	6	19.4
Average	19	61.3
High	4	12.9
Very high	0	0
No response	1	3.2
How would you rate the ability of tele-optometry in improving patient care?		
Very low	2	6.5
Low	4	12.9
Average	17	54.8
High	3	9.7
Very high	0	0
No response	5	16.1
Do you agree that tele-optometry is great for business?		
Strongly disagree	2	6.5
Disagree	3	9.7
Neutral	13	41.9
Agree	12	38.7

Strongly agree	0	0
No response	1	3.2
Do you agree that more people should adopt the use of tele-optometry?		
Strongly disagree	0	0
Disagree	3	9.7
Neutral	13	41.9
Agree	11	35.5
Strongly agree	1	3.2
No response	3	9.7
Do you agree that the pros outweigh the cons?		
Strongly disagree	0	0
Disagree	6	19.4
Neutral	18	58.1
Agree	6	19.4
Strongly agree	0	0
No response	1	3.2
Do you agree that tele-optometry is feasible in Trinidad?		
Strongly disagree	1	3.2
Disagree	4	12.9
Neutral	20	64.5
Agree	5	16.1
Strongly agree	0	0
No response	1	3.2
Do you agree that tele-optometry is a good idea to improve business?		
Strongly disagree	1	3.2
Disagree	3	9.7
Neutral	17	54.8
Agree	9	29
Strongly agree	0	0
No response	1	3.2
In your opinion, is tele-optometry a safe and convenient way of managing patients?		
Strongly disagree	2	6.5
Disagree	6	19.4
Neutral	12	38.7
Agree	10	32.3
Strongly agree	0	0
No response	1	3.2

Using a range of 1-5 for ranged question (1= very low, 2= low, 3= average, 4= high, 5= very high) and (1= strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree).

Good was classified as the responses that are high and very high. Therefore, this definition of Good was used to determine how many of the responders had a good knowledge of tele-optometry.

4.3 Objective 2: To determine the demographical distribution of those with good knowledge, awareness and positive attitude

Of the 31 participants, only 5 (16.1%) had good knowledge of which 2 (6.4%) were male and 3 (9.7%) were females and between the ages of 25-40. With respect to awareness, 22 (71%) are aware, of which 6 (19.4%) were males, 16 (51.6%) were females and the majority were between the ages of 25-30 with a total of 11 (35.5%) out of the 22. 4 (12.9%) of the 31 participants had a positive attitude towards tele-optometry of which 1 (3.2%) was a male, 3 (9.7%) were females and most of them were between the ages of 25-30 with a total of 3 (9.7%) out of the 4. The majority, with respect to knowledge and attitude were of African descent 2 (6.5%), but for awareness, the majority were south east Indians 10 (32.3%). From the table, it can also be seen that for all three factors, most of the responders were qualified with their bachelor's degree with a total of 4 (12.9%) for both knowledge and attitude and 19 (61.3%) for awareness.

Gender, ethnicity, age, region of employment, and qualification were found not to be statistically associated with knowledge, awareness and attitude because all p-values were more than 0.05. However, employment status was found to be significantly associated with knowledge ($p<0.05$) but not with awareness and attitude (Table 4.3).

Table 4.3: Demographical profile of participants with good knowledge, awareness and positive attitude towards tele-optometry

Variables	Knowledge of tele-optometry (frequency)	Awareness of tele-optometry (frequency)	Attitude to tele-optometry (frequency)	p-value for knowledge	p-value for awareness	p-value for attitude
Gender				0.735785	0.735785	0.55368
				$X^2 = 0.114$	$X^2 = 0.114$	$X^2 = 0.351$
Males	2	6	1			
Females	3	16	3			
Age				0.218544	0.660001	0.898778
				$X^2 = 5.751$	$X^2 = 3.260$	$X^2 = 1.071$
25-30	1	11	3			
31-35	1	2	0			
36-40	1	1	0			
41-45	0	0	0			
46-50	0	1	0			
50+	0	5	0			
No response	2	2	1			
Ethnicity				0.778764	0.502134	0.149747
				$X^2 = 0.500$	$X^2 = 1.378$	$X^2 = 3.798$
African	2	4	2			
South east Indian	1	10	2			
Mixed	0	3	0			
Others	2	5	0			
Employment status				0.029987	0.901312	1.00
				$X^2 = 4.710$	$X^2 = 4.710$	$X^2 = 0.00$
Permanent	5	21	4			
Temporary	0	1	0			
Region of employment				0.43973	0.749551	0.866471
				$X^2 = 3.500$	$X^2 = 3.500$	$X^2 = 1.270$
North	1	6	1			
South	0	3	1			
Central	3	5	1			
East	0	4	0			
West	0	1	0			
No response	1	3	1			
Qualification				0.843434	0.4919580	1.00
				$X^2 = 0.492$	$X^2 = 0.587$	$X^2 = 0.00$
Bsc	4	19	4			
Msc	1	2	0			
PhD	0	1	0			

4.4 Objective 3: To ascertain number of optometrists that uses tele-optometry and factors that influence the use of tele-optometry.

Of the 31 participants only 4 (12.9%) stated that they use tele-optometry in Trinidad. The most (41.9%) influencing factor recorded were the ability of tele-optometry to build optometrist-patient relationship and use of tele-optometry instead of cancelling appointments (38.7%). Other responses are listed in table 4.4.

Table 4.4: Factors that influence the use of tele-optometry. The table below shows how many of the participants believe that the aspects are true about tele-optometry.

Factors that influence the use of tele-optometry	Frequency (N)	Percentage frequency (%)
Impacts of Covid-19 on the individuals' workplace	11	35.5
The convenience of using tele-optometry instead of cancelling appointments	12	38.7
Conservation of time	10	32.3
Ability of tele-optometry to build optometrist-patient relationships	13	41.9
Patient confidentiality	7	22.6

4.5 Objective 4: To evaluate barriers to the use of tele-optometry among optometrists in Trinidad.

The major (64.5%) barrier reported were the need for special security to protect patient forms and the inefficiency of tele-optometry due to poor technological quality (48.4%). Other responses are listed in table 4.5.

Table 4.5: Barriers to the use of tele-optometry recorded in this study. The table below shows how many of the participants believe that the aspects are true about tele-optometry.

Barriers to use of tele-optometry	Frequency (N)	Percentage frequency (%)
Inefficiency due to poor technological quality	15	48.4
High initial costs	10	32.3
The need for authorized access for its use.	14	45.2
The need for special security for the protection of patient records	20	64.5
The need for consent forms.	15	48.4

CHAPTER FIVE: DISCUSSION, CONCLUSION and RECOMMENDATIONS

5.0 Introduction

This chapter discussed the results presented in chapter four as it relates to the study objectives and research questions. A total of 31 (27.2%) out of 114 optometrists in Trinidad participated in the study. Approximately 16.1% (5) have good knowledge of tele-optometry, 71% (22) have good awareness of tele-optometry and 12.9% (4) have good attitude towards its use. The major factor that could influence the use of tele-optometry was the ability of tele-optometry to build optometrist-patient relationships and the major barrier was the need for special security for the protection of patient records.

5.1 Discussion

5.1.1 Demographical Profile

Less than 50% of the registered optometrists participated in this study, 22 (71%) of them were females and 9 (29%) were males. Contrary to this, Zayapragassarazan and Kumar[17] reported that 73 (61%) of the health professionals that participated in their study to determine awareness, knowledge, attitude and skills of telemedicine among health professional faculty working in teaching hospitals in India were males and 47 (39%) were females. Also, Biruk and Abetu[18] reported that 195 (65.4%) of their respondents were males and 103 (34.6%) were females in their study to determine knowledge and attitude of health professionals toward telemedicine in resource-limited settings in Africa. The difference in the findings could be due to the difference in roles of the healthcare professional as this study focused on only optometrists and the other two studies included various health professionals from different teaching hospitals.

The ages of the optometrists that participated in this study ranged from 25 to 56 years with a mean age of 34.6 ± 11.6. The majority of respondents (54.8%) were between the ages of 25 to 30 years old followed by 50 years and above (12.9%). Similarly, majority (66.1%) of the respondents in the Biruk and Abetu[18] study were under the age of 30 (20-29 years). However, Zayapragassarazan and Kumar[17] study reported that most of the respondents were between the ages of 30-40 years (48%) followed by 41-50 years (36%). The difference in the result could be due to difference in sample size. This study had a sample size of 31 while [18;17] had a sample size of 298 and 120 respectively.

A good number (45.2%) of the participants in this study were of Indian descents when compared with other races. This could be a reflection of more people of Indian descent in optometry profession in Trinidad. Also, most (87.1%) of the participants had permanent employment compared to those temporarily employed. This could be due to the fact that optometry profession is relatively new in Trinidad and there are still opportunities for permanent jobs.

Most (83.9%) of the respondents had a Bachelor's Degree compared to those with a Master's Degree (6.5%) or a PhD (3.2%). This could be a reflection of most people in Trinidad being registered as an optometrist upon completion of their Bachelor's Degree before seeking further qualification via Master's Degree or PhD. Also, there is currently no postgraduate program in optometry in the Caribbean. Similar findings were reported in a study in Africa[18] as majority (75.1%) of the respondents in their study were Bachelor's degree holders.

5.1.2 Objective 1: To assess the Knowledge, Awareness and Attitudes of Optometrists in Trinidad towards Tele-optometry.

5.1.2.1 Knowledge

Good Knowledge of tele-optometry in this study was low (16.1%) when compared with the findings from Zayapragassarazan and Kumar[17] and Biruk and Abetu[18] who reported 41% and 37.6% respectively. Poor internet access, leadership culture and organizational structure to support changes as expressed by Sim et al[19] could also be the reason for the differences in the findings. Also, there is a need for intervention studies to create awareness in order to encourage people embrace change as expressed in a study in Chile.[23]

5.1.2.2 Awareness

Majority (71%) of the respondents have heard of tele-optometry indicating that majority of the optometrists in Trinidad are aware of tele-optometry. Similar findings were reported in a study in India[17] study where 76% of participants had a high level of awareness of telemedicine. This could be due to the COVID-19 pandemic which had brought to light telemedicine in all spheres of health.

5.1.2.3 Attitude

There was a poor (12.9 %) or negative attitude towards tele-optometry in this study. This could be a reflection of the low accessibility of internet service in Trinidad as it was mentioned by Manik[27] in a secondary analysis about the COVID-19 pandemic being a catalyst for telemedicine in Trinidad and Tobago that only 44.6% of households had access to internet service. Another reason could be the internet penetration as expressed by Lawrence[25] who compared the 90% internet penetration available in developed countries, which is useful in facilitating the success of telemedicine, to the 60% available in Jamaica which could be comparable to Trinidad.

5.1.3 Objective 2: To determine the demographical distribution of those with good knowledge, awareness and positive attitude

5.1.3.1 Knowledge

Of the 5 (16.1%) respondents with good knowledge of tele-optometry, most (60%) were females, 20% were within the age groups 25-30, 31-35 and 36-40 each. A good number (40%) of them were of African descent, majority (60%) worked in Central Trinidad, and almost all (80%) held a Bachelor's Degree and were permanently employed. The distribution of demographics of those with good knowledge reflect mostly on the demographical proportions of the participants in this study. Similar distribution was observed in the Biruk and Abetu[18] study.

5.1.3.2 Awareness

Of the 71% of respondents with good awareness of tele-optometry, majority (72.7%) were females, a good number (50%) were within the age group of 25-30, most (45.5%) were of South East Indian descent, very few (27.3%) worked in North Trinidad, majority (86.4%) held a Bachelor's Degree and almost all (95.5%) were permanently employed. This again reflects on the demographical proportions of the participants in this study.

5.1.3.3 Attitude

There was a poor or negative attitude towards the use of tele-optometry in this study. Similar findings were recorded in other studies [18; 17]. This could be due to poor knowledge as noted in this study. More works need on the area of tele-optometry are highly advised.

5.1.4 Objective 3: To ascertain number of optometrists that uses tele-optometry and factors that influence the use of tele-optometry.

The use of tele-optometry recorded in this study was very low as only 4 (13%) respondents used tele-optometry in their workplaces. This could be due to poor knowledge of tools or

capability to drive change as explained by Sim et al[19]. Use of tele-optometry in the workplace is beneficial. Contrary to our findings, Zayapragassarazan and Kumar[17] reported that 50% of the respondents in their study in India used telemedicine.

The major factor that could influence the use of tele-optometry in Trinidad was the ability of tele-optometry to build optometrist-patient relationships and convenience of use as opposed to cancelling appointments. Similar findings were reported by Villines[14] and Peters[26] in the USA and Trinidad and Tobago respectively. Contrary to this, Romanick-Schmiedl and Raghu[11] in the USA expressed that the presentation of a physical barrier (the screen) may inhibit an atmosphere of trust between the patient and physician.

5.1.5 Objective 4: To evaluate barriers to the use of tele-optometry among optometrists in Trinidad.

The major barrier to the use of tele-optometry was the need for special security for the protection of patient records and need for consent forms. These concerns were expressed in other studies [6; 10; 12; 14; 28]. Concern for technical quality and the unpredictability of technology was the major barriers recorded in other studies in Iran, USA and Trinidad and Tobago [6; 14; 28].

5.2 Conclusion

Majority of the respondents had good awareness of tele-optometry, however, few had good knowledge of it and very few had positive attitude towards it. Majority of the optometrists with good knowledge, awareness and attitude toward tele-optometry were females of African or South East Indian descent within the age group of 25-30 years who held a Bachelor's Degree and were permanently employed. Very few optometrists were making use of tele-optometry in their workplace. The major factor that could influence the use of tele-optometry in Trinidad

was the ability of tele-optometry to build optometrist-patient relationships and the major barrier was the need for special security for the protection of patient records.

COVID-19 has had an average to very high negative effect on the businesses of majority of the optometrists. The information from this study is important to optometrists in Trinidad to keep them updated on the available options to improve accessibility of eye care to patients, especially now with the onset of the COVID-19 pandemic.

5.3 Limitations and Recommendations

5.3.1 Limitations

- Findings from this study cannot be generalized as only 31 out of 114 registered optometrists in Trinidad participated in the study.
- The inability to physically or personally connect with research subjects due to the current pandemic.
- Lack of previous research on this topic in this region.
- Limited availability of information.
- Time constraints as this study is required to be completed as a part of a course and not over a prolonged period of time.
- Questionnaires do not allow researcher to follow up ideas and clarify issues.
- This study was susceptible to information bias or questionnaire bias as participants skipped some questions.
- Differences in understanding and interpretation of questions on the questionnaire may lead to skewed results.

5.3.2 Recommendations

- Similar studies that focus on the barriers and benefits of tele-optometry should be done.
- Future studies to include the general public and optometrists in Tobago as well.
- Similar studies should be done in other Caribbean countries
- Studies focusing on the success of already implemented tele-optometry services should be done.

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APPENDIX

Appendices 1: Exemption Letter

THE UNIVERSITY OF THE WEST INDIES
ST. AUGUSTINE, TRINIDAD AND TOBAGO, WEST INDIES
CAMPUS RESEARCH ETHICS COMMITTEE
TELEPHONE: (1-868) 662-2002 ext. 82755 E-mail: campusethics@sta.uwi.edu

November, 13 2020

Ngozi Ezinne
Aliah James, Kureem Phillip
Department of Clinical Surgical Sciences, Faculty of Medical Sciences
Email: ngozika.ezinne@sta.uwi.edu

Dear Ngozi Ezinne,

Ref: CREC-SA.0633/11/2020

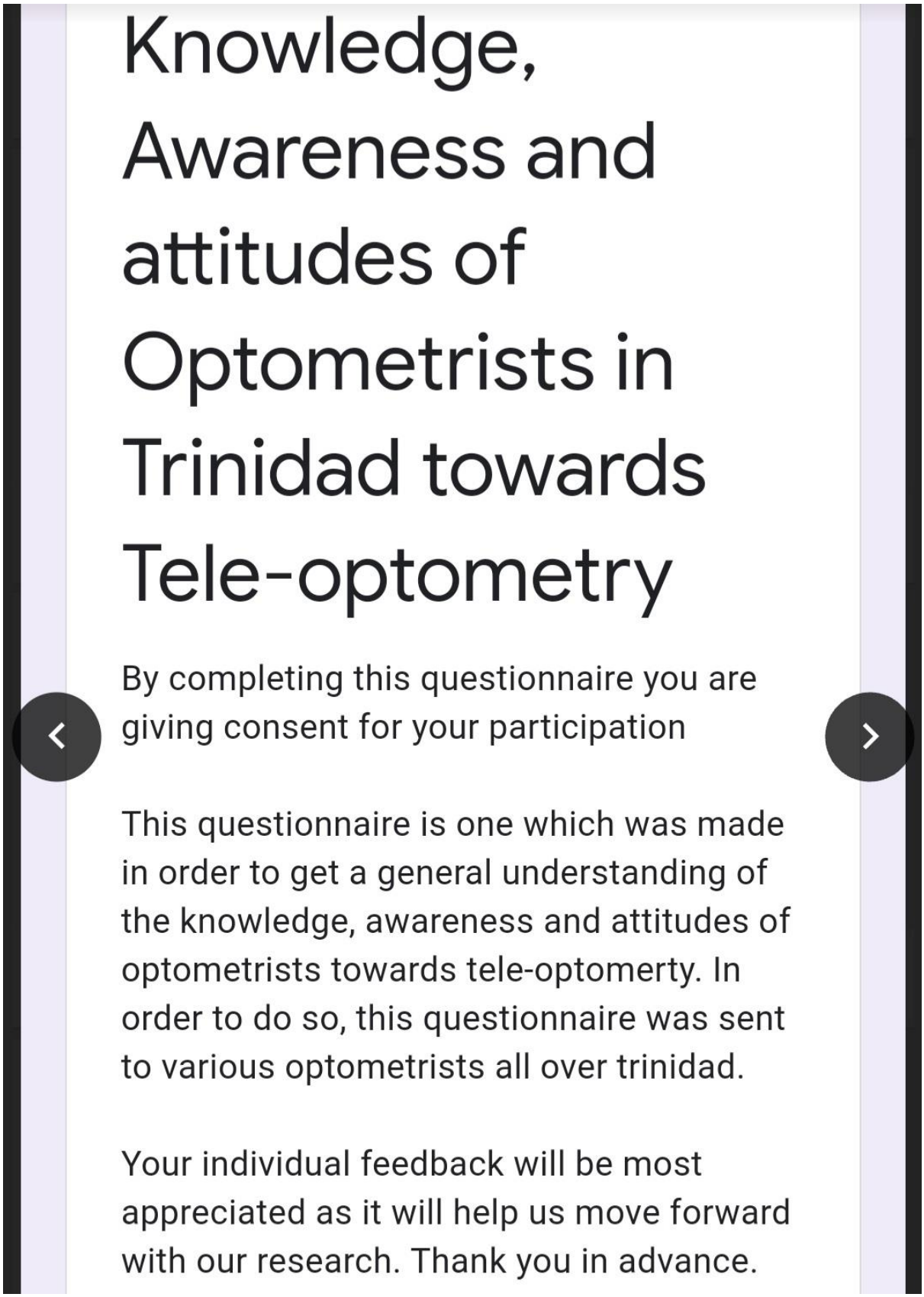
Title: Knowledge, Awareness and Attitudes of optometrists in Trinidad towards tele optometry.

I am pleased to advise that your application for research on the above captioned topic has met the criteria for Exemption from Review from the Campus Research Ethics Committee, St. Augustine.

Sincerely,

Professor Jerome De Lisle
Chair
Campus Research Ethics Committee

Appendices 2: Invitation to participate in survey and consent forms.



Appendices 3: Questionnaire

1). Gender: Male ☐ Female ☐

2) Age:

3). Ethnicity:

4). Type of employment:

Permanent ☐ temporary ☐

5). Educational qualifications:

Bachelor's degree ☐ Master's degree ☐ PhD ☐

6). What part of Trinidad is your workplace located?

7). Have you ever heard of tele-optometry?

Yes ☐ No ☐

8). Is your workplace currently making use of tele-optometry?

Yes ☐ No ☐

9). If yes, is it beneficial?

Yes ☐ No ☐

Section 2: Identifying level of understanding of tele-optometry

No.	Questions	Very low	low	average	high	Very high	
1	What would you rate your level of understanding of tele-optometry?						
2	To what extent are you familiar with the tools of tele-optometry?						
3	How would you rate your level of motivation towards tele-optometry						
4	How high is the probability that you will be using tele-optometry in the future						
5	To what extent has Covid-19 negatively affected your business?						
6	To what extent are you familiar with the benefits of tele-optometry?						
7	How would you rate the ability of tele-optometry in improving patient care?						

Section 3: Identifying optometrist's attitude towards tele-optometry

No.	questions	Strongly disagree	disagree	Neutral	Agree	Strongly disagree
1	Do you agree that tele-optometry is great for business?					
2	Do you agree that more people should adopt the use of tele-optometry?					
3	Do you agree that the pros outweigh the cons?					
4	Do you agree that tele-optometry is feasible in Trinidad?					
5	Do you agree that tele-optometry is a good idea to improve business?					
6	In your opinion, is tele-optometry a safe and convenient way of managing patients?					
7	In your opinion, is tele-optometry a good alternative for not having to cancel appointments due to the pandemic?					
8	Do you think that tele-optometry saves clinicians a lot of time?					
9	Do you agree that tele-optometry reduces the quality of patient care?					
10	Do you agree that tele-optometry will build optometrist-patient relationship?					
11	Do you think that tele-optometry					

	endangers patient confidentiality					
12	Do you think that tele-optometry will be inefficient due to poor technological quality?					
13	Do you agree that high initial cost are the reasons that some practices do not offer tele-optometry?					

Section 4: Optometrists views on the security and confidentiality of patients with the use of tele-optometry.

No.	questions	Very low	low	average	high	Very high
1	To what extent do you believe that authorized access is necessary for the use of tele-optometry?					
2	To what extent do you think that tele-optometry needs special security and policies to secure patients records and prevent any breaching?					
3	To what extent do you think that patients need to legally agree by the use of consent forms?					

Appendices 4: Questionnaire responses

Raw Data

1	Gender?	Age:	Ethnicity:	Type of employment?	Educational qualification:
2	Female	34		Permanent	Bachelor's degree
3	Female	54	East Indian Heritage	Permanent	Bachelor's degree
4	Male	29	Mixed	Permanent	Bachelor's degree
5	Female	50+	Mixed	Permanent	Bachelor's degree
6	Female	56	African	Permanent	Master's degree
7	Female	53	Indian	Permanent	Bachelor's degree
8	Male		African	Permanent	Bachelor's degree
9	Male			Permanent	Bachelor's degree
10	Female	50	Indo-Trinidadian	Permanent	Bachelor's degree
11	Female	35	Indo Trinidadian	Permanent	Bachelor's degree
12	Female	25	Afro-Trinidadian	Permanent	Bachelor's degree
13	Female	38	Africa	Permanent	Master's degree
14	Female	25	East Indian	Temporary	Bachelor's degree
15	Male	Retired	Indian	Temporary	PhD
16	Male	26		Permanent	Bachelor's degree
17	Female	28	East Indian	Permanent	Bachelor's degree
18	Female	25	Indian	Temporary	Bachelor's degree
19	Female	29	East Indian	Permanent	Bachelor's degree
20	Female	28	Indian	Permanent	Bachelor's degree
21	Female	27	East Indian	Permanent	Bachelor's degree
22	Female	33		Permanent	Bachelor's degree
23	Female	27	East Indian	Permanent	Bachelor's degree
24	Female	30	Indian	Temporary	Bachelor's degree
25	Female	25	Mixed	Permanent	Bachelor's degree
26	Female	25	Afro-Trinidadian	Permanent	Bachelor's degree
27	Male	26	East Indian	Permanent	Bachelor's degree
28	Female		African	Permanent	

28	Male	26	Mixed	Permanent	Bachelor's degree
29	Male	26	Mixed	Permanent	Bachelor's degree
30	Male	50yrs	Black	Permanent	
31	Female	29		Permanent	Bachelor's degree

1		What part of Trinidad is your work place located?	Have you ever heard of tele-optometry?	Is your work place currently making use of tele-optometry?	If yes, to the above question, do you think it's beneficial?	(1). What would you rate your level of understanding of tele-optometry? [Row 1]
2		North	Yes	No	Yes	high
3		Trincity	Yes	Yes	No	average
4		Sangre Grande	Yes	No	No response	average
5		West	Yes	No	No response	average
6		Port of Spain	Yes	No	No response	low
7		Point Lisas	Yes	Yes	Yes	average
8			Yes	No	No response	high
9		Central	Yes	No	No	very high
10		North	Yes	No	No response	low
11		Sangre Grande	No	No	Yes	low
12		Port of Spain	No	No	No	very low
13		Couva	Yes	No	Yes	high
14		Couva	No	No	No response	low
15		North	Yes	No	No response	average
16		Chaguanas, Curepe, Arouca	Yes	No	No response	average
17		East	Yes	No	No response	low
18		South	No	No	No response	low
19		Penal	Yes	Yes	Yes	average
20		Siparia	Yes	No	No response	very low
21		Central	Yes	No	No response	high
22			Yes	No	No response	average
23		San Fernando	Yes	No	Yes	average
24		Eat West corridor	No	No	Yes	low
25		East, Arima	Yes	Yes	Yes	average
26		POS	Yes	No	No response	average
27		Port of Spain	Yes	No	No response	average
28		No response	No	No	No response	very low
28		Central	No	No	No response	low
29		Central	No	No	No response	low
30		East	No	No	No response	average
31		Chaguanas	Yes	No	No response	average

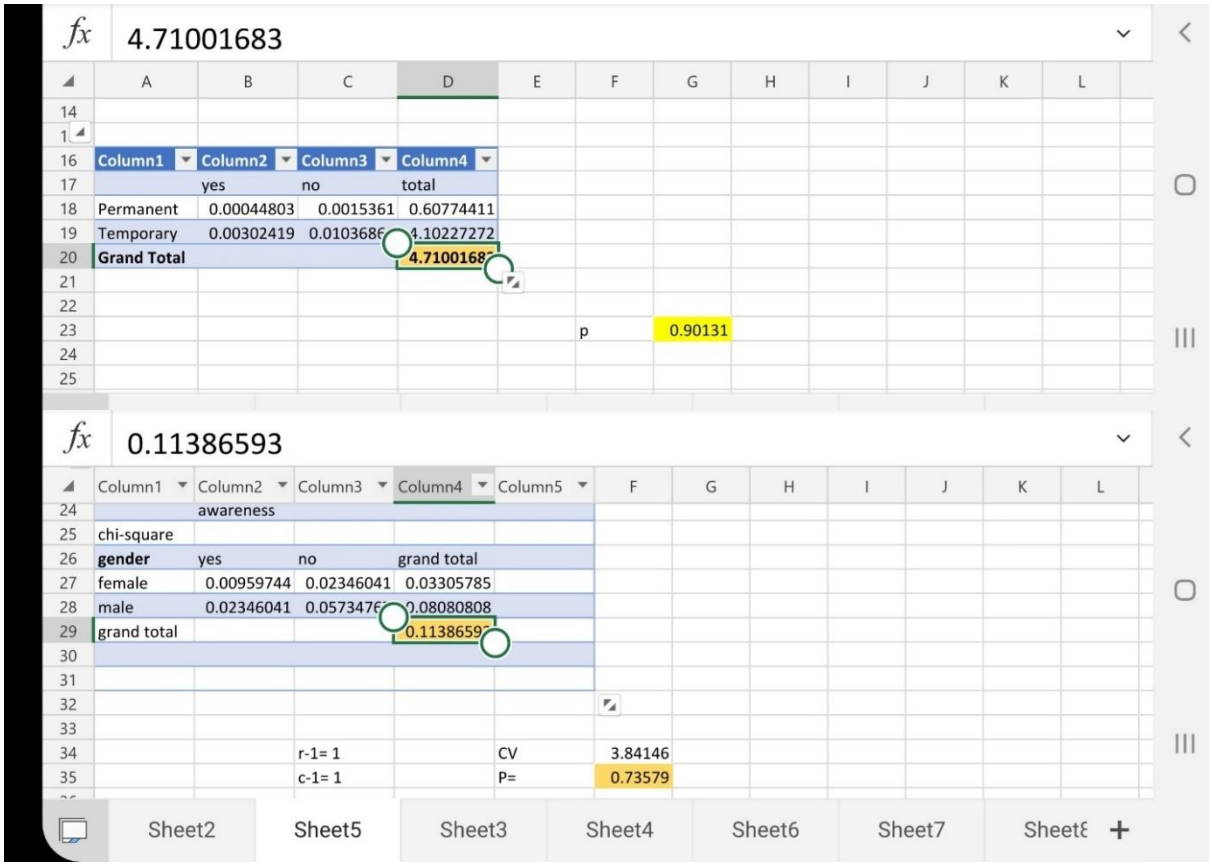
1		(2). To what extent are you familiar with the tools of tele-optometry? [Row 1]	(3). How would you rate your level of motivation towards tele-optometry [Row 1]	(4). How high is the probability that you will be using tele-optometry in the future [Row 1]	(5). To what extent has Covid-19 negatively affected your business? [Row 1]	(6). To what extent are you familiar with the benefits of tele-optometry? [Row 1]	(7). How would you rate the ability of tele-optometry in improving patient care? [Row 1]
2		average	average	high	high	average	average
3		average	average	low	average	average	
4		average	low	average	average	low	average
5		low	low	average	high	average	average
6		low	average	average	low	low	average
7		average	average	average	average	high	high
8		average	high	high	high	average	average
9		low	average	very low	low	average	very low
10		very low	low	low	high	average	average
11		low	average	average	average	average	average
12		very low	very low	very low	average	very low	very low
13		average	average	average	average	average	low
14		low	average	average	high	low	average
15		average	average	low	average	average	average
16		average	average	high	very high	low	average
17		low	average	average	high	low	low
18		low	average	average	average	average	average
19		average	average	average	low	average	
20		very low	low	low	high	low	average
21		high	high	low	average	average	low
22		low	average	average	average	average	average
23		average	high	high	very high	average	average
24		very low	average	average	average	very low	average
25		average	average	very high	average	very high	high
26		low	high	average	average	average	high
27		low	average	average	high	average	average
28		No response	No response	No response	No response	No response	No response
28		low	low	average	average	low	
29		low	low	average	average	low	
30		low	average	low	average	low	low
31		low	average	average	high	low	average

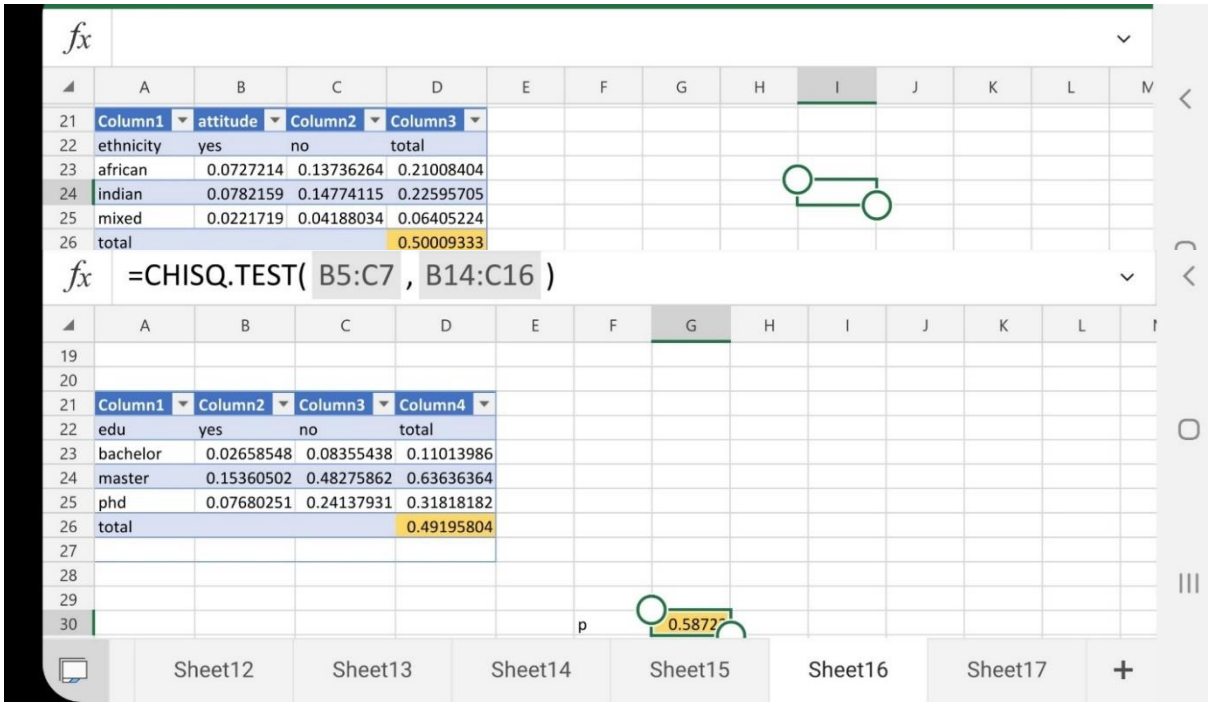
1		(1). Do you agree that tele-optometry is great for business? [Row 1]	(2). Do you agree that more people should adopt the use of tele-optometry? [Row 1]	(3). Do you agree that the pros outweigh the cons? [Row 1]	(4). Do you agree that tele-optometry is feasible in Trinidad? [Row 1]	(5). Do you agree that tele-optometry is a good idea to improve business? [Row 1]	(6). In your opinion, is tele-optometry a safe and convenient way of managing patients? [Row 1]
2		agree	agree	neutral	neutral	agree	agree
3		neutral	neutral	neutral	neutral	disagree	neutral
4		neutral	agree	neutral	neutral	neutral	neutral
5		disagree	disagree	disagree	disagree	neutral	disagree
6		agree	agree	agree	neutral	neutral	neutral
7		agree	agree	agree	agree	agree	agree
8		agree	agree	neutral	agree	agree	agree
9		strongly disagree	disagree	disagree	neutral	strongly disagree	strongly disagree
10		agree	neutral	disagree	disagree	agree	agree
11		neutral	neutral	neutral	neutral	neutral	neutral
12		neutral	neutral	neutral	neutral	neutral	neutral
13		disagree	disagree	disagree	strongly disagree	disagree	neutral
14		neutral	neutral	disagree	neutral	neutral	disagree
15		agree	neutral	neutral	neutral	neutral	agree
16		agree	neutral	neutral	neutral	neutral	neutral
17		disagree	neutral	neutral	neutral	neutral	disagree
18		agree	agree	neutral	agree	agree	neutral
19		agree	agree	neutral	neutral	agree	agree
20		neutral	agree	neutral	neutral	neutral	agree
21		strongly disagree	agree	disagree	disagree	disagree	disagree
22		agree	agree	agree	agree	agree	neutral
23		agree	strongly agree	agree	agree	agree	agree
24		neutral	neutral	neutral	neutral	neutral	strongly disagree
25		neutral	neutral	agree	neutral	neutral	disagree
26		agree	agree	agree	neutral	agree	agree
27		neutral	neutral	neutral	neutral	neutral	neutral
28		No response	No response	No response	No response	No response	No response
28		neutral		neutral	neutral	neutral	neutral
29		neutral		neutral	neutral	neutral	neutral
30		neutral	neutral	neutral	neutral	neutral	disagree
31		neutral	neutral	neutral	disagree	neutral	agree

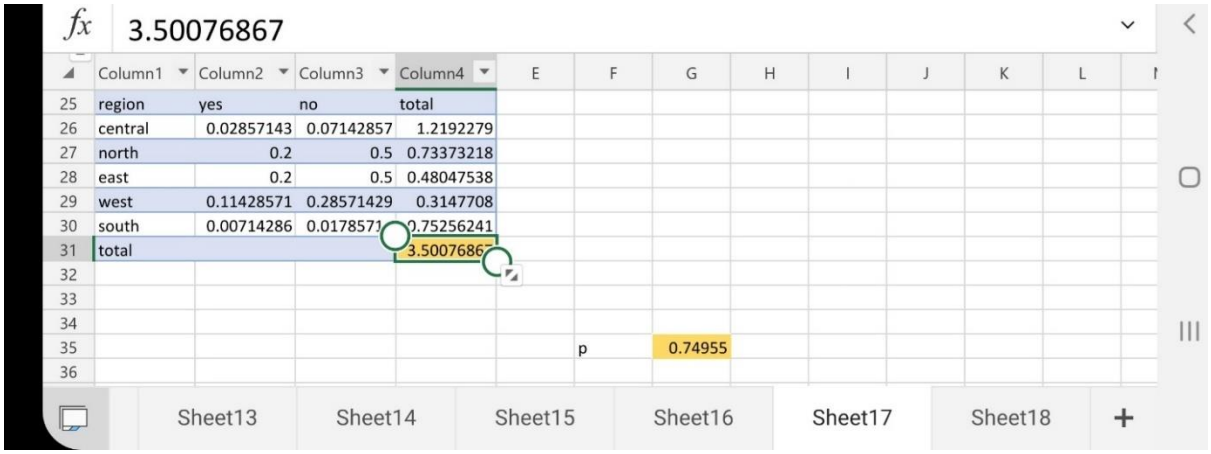
1		**(7). In your opinion, is tele-optometry a good alternative for not having to cancel appointments due to the pandemic? [Row 1]**	**(8). Do you think that tele-optometry saves clinicians a lot of time? [Row 1]**	**(9). Do you agree that tele-optometry reduces the quality of patient care? [Row 1]**	**(10). Do you agree that tele-optometry will build optometrist-patient relationship? [Row 1]**	**(11). Do you think that tele-optometry endangers patient confidentiality [Row 1]**	**(12). Do you think that tele-optometry will be inefficient due to poor technological quality? [Row 1]**
2		agree	agree	neutral	agree	disagree	disagree
3		neutral	strongly disagree	neutral	strongly disagree	neutral	strongly agree
4		agree	disagree	disagree	agree	strongly disagree	strongly agree
5		disagree	disagree	agree	agree	disagree	neutral
6		disagree	neutral	agree	agree	neutral	agree
7		disagree	agree	agree	neutral	agree	agree
8		agree	neutral	neutral	disagree	disagree	neutral
9		agree	strongly disagree	strongly agree	neutral	strongly disagree	neutral
10		agree	agree	disagree	agree	neutral	strongly agree
11		neutral	neutral	neutral	neutral	neutral	neutral
12		neutral	neutral	neutral	neutral	neutral	neutral
13		agree	neutral	agree	neutral	agree	agree
14		neutral	neutral	neutral	neutral	disagree	agree
15		neutral	disagree	agree	neutral	neutral	agree
16		disagree	strongly disagree	strongly agree	neutral	neutral	disagree
17		neutral	agree	agree	strongly disagree	agree	agree
18		agree	agree	neutral	agree	agree	agree
19		disagree	agree	disagree	agree	disagree	disagree
20		agree	agree	neutral	agree	neutral	neutral
21		agree	agree	agree	disagree	agree	agree
22		neutral	neutral	neutral	agree	neutral	agree
23		agree	agree	disagree	agree	disagree	strongly agree
24		neutral	neutral	agree	neutral	agree	agree
25		disagree	neutral	neutral	agree	neutral	neutral
26		agree	agree	neutral	agree	neutral	agree
27		neutral	neutral	neutral	neutral	neutral	neutral
28		No response	No response	No response	No response	No response	No response
28		neutral	neutral	neutral	neutral	neutral	neutral
29		neutral	neutral	neutral	neutral	neutral	neutral
30		neutral	disagree	agree	neutral	agree	neutral
31		agree	neutral	agree	agree	strongly disagree	disagree

1		(13). Do you agree that high initial cost are the reasons that some practices do not offer tele-optometry? [Row 1]	(1). To what extent do you believe that authorized access is necessary for the use of tele-optometry? [Row 1]	(2). To what extent do you think that tele-optometry needs special security and policies to secure patients records and prevent any breaching? [Row 1]	(3). To what extent do you think that patients need to legally agree by the use of consent forms? [Row 1]
2		disagree	average	high	high
3		strongly agree	very high	very high	very high
4		agree	high	high	high
5		disagree	high	very high	very high
6		disagree	average	high	average
7		neutral	high	high	high
8		agree	high	high	high
9		agree	high	very high	high
10		strongly agree	high	high	high
11		neutral	average	average	average
12		neutral	average	average	average
13		agree	average	high	high
14		neutral	average	average	high
15		agree	high	high	high
16		disagree	high	average	high
17		neutral	average	high	average
18		disagree	average	high	average
19		strongly disagree	average	average	average
20		neutral	average	average	average
21		agree	high	high	high
22		agree	high	high	average
23		strongly agree	high	very high	very high
24		neutral	low	low	low
25		neutral	very high	very high	average
26		neutral	high	high	average
27		neutral	average	average	average
28		No response	No response	No response	No response
28		neutral	average	high	average
29		neutral	average	high	average
30		neutral	average	average	average
31		neutral	average	average	high

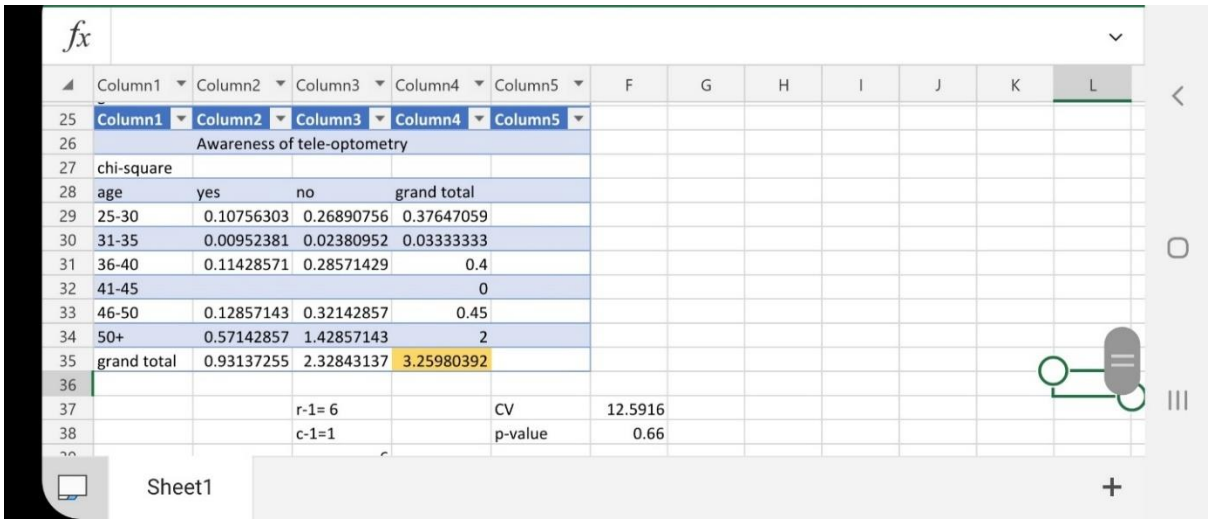
Awareness


4.71001683
Column1 Column2 Column3 Column4
yes no total
Permanent 0.00044803 0.0015361 0.60774411
Temporary 0.00302419 0.0103686 4.10227272
Grand Total 4.71001683
p 0.90131
0.11386593
awareness
chi-square
gender yes no grand total
female 0.00959744 0.02346041 0.03305785
male 0.02346041 0.0573476 0.08080808
grand total 0.1138659
r-1= 1 CV 3.84146
c-1= 1 P= 0.73579
Sheet2 Sheet5 Sheet3 Sheet4 Sheet6 Sheet7


Column1 attitude Column2 Column3
ethnicity yes no total
african 0.0727214 0.13736264 0.21008404
indian 0.0782159 0.14774115 0.22595705
mixed 0.0221719 0.04188034 0.06405224
total 0.50009333
=CHISQ.TEST(B5:C7 , B14:C16)
Column1 Column2 Column3 Column4
edu yes no total
bachelor 0.02658548 0.08355438 0.11013986
master 0.15360502 0.48275862 0.63636364
phd 0.07680251 0.24137931 0.31818182
total 0.49195804
p 0.5872
Sheet12 Sheet13 Sheet14 Sheet15 Sheet16 Sheet17

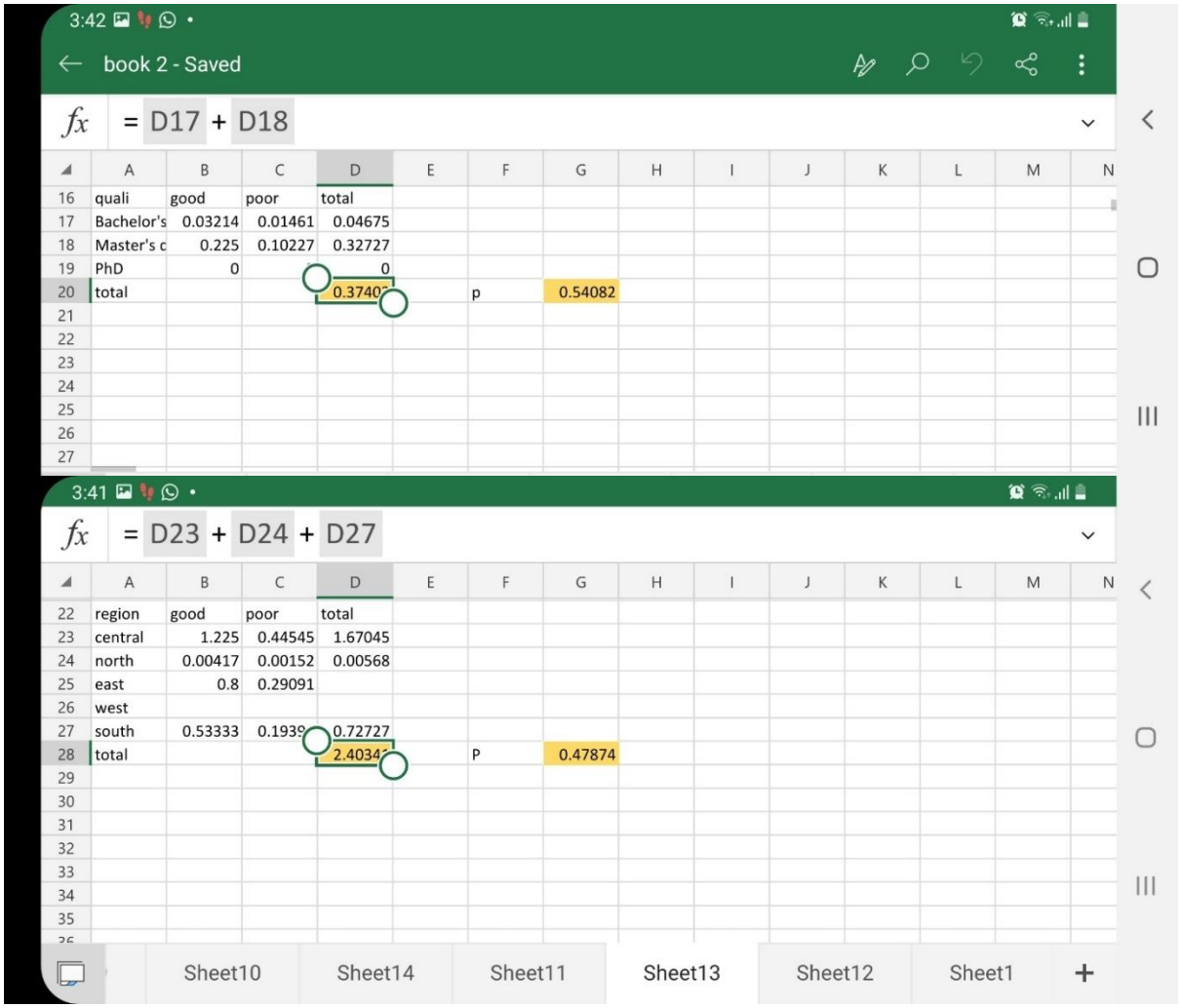


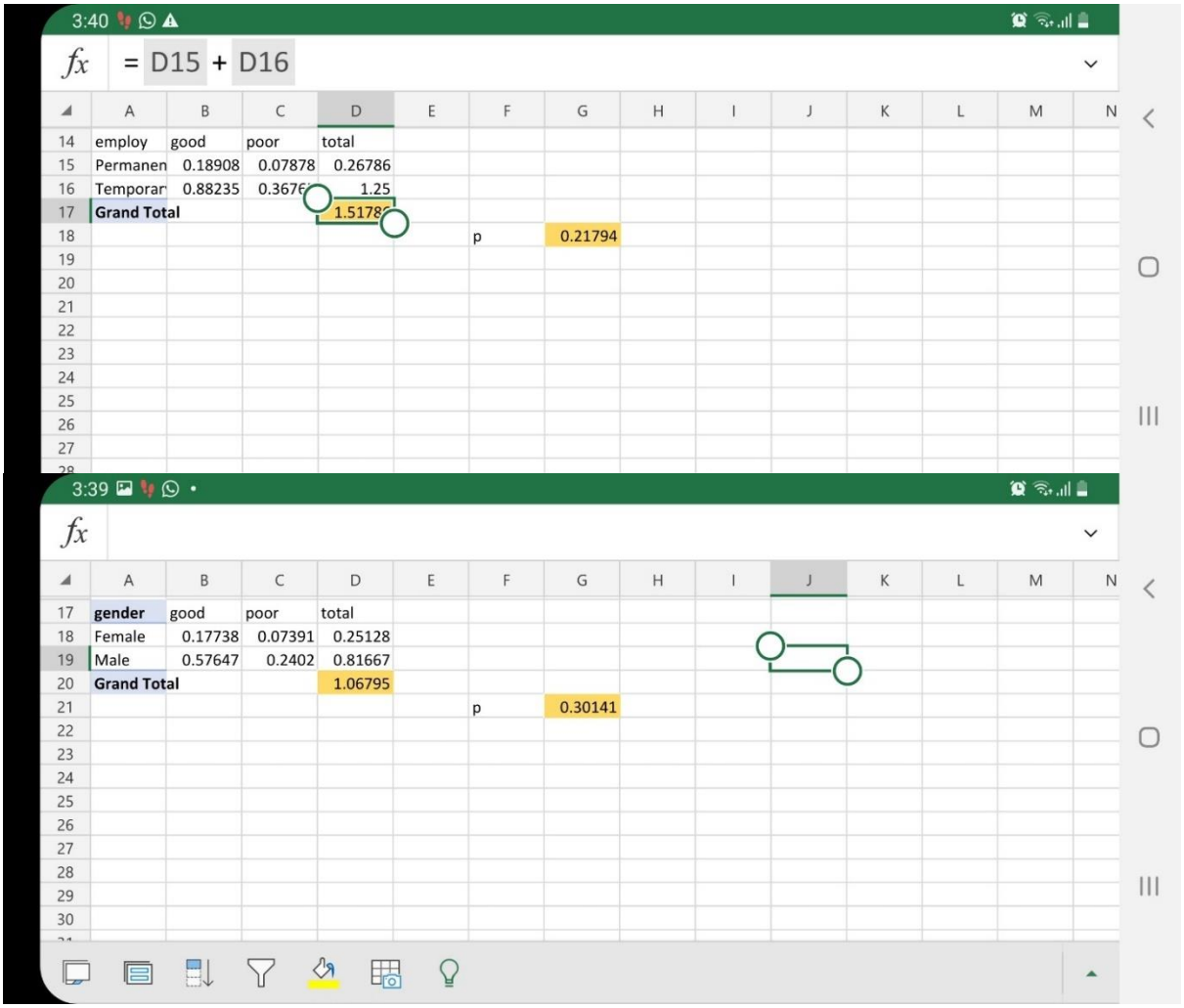
	Column1	Column2	Column3	Column4
25	region	yes	no	total
26	central	0.02857143	0.07142857	1.2192279
27	north	0.2	0.5	0.73373218
28	east	0.2	0.5	0.48047538
29	west	0.11428571	0.28571429	0.3147708
30	south	0.00714286	0.0178571	0.75256241
31	total			3.5007686
32				
33				
34				
35			p	0.74955
36				

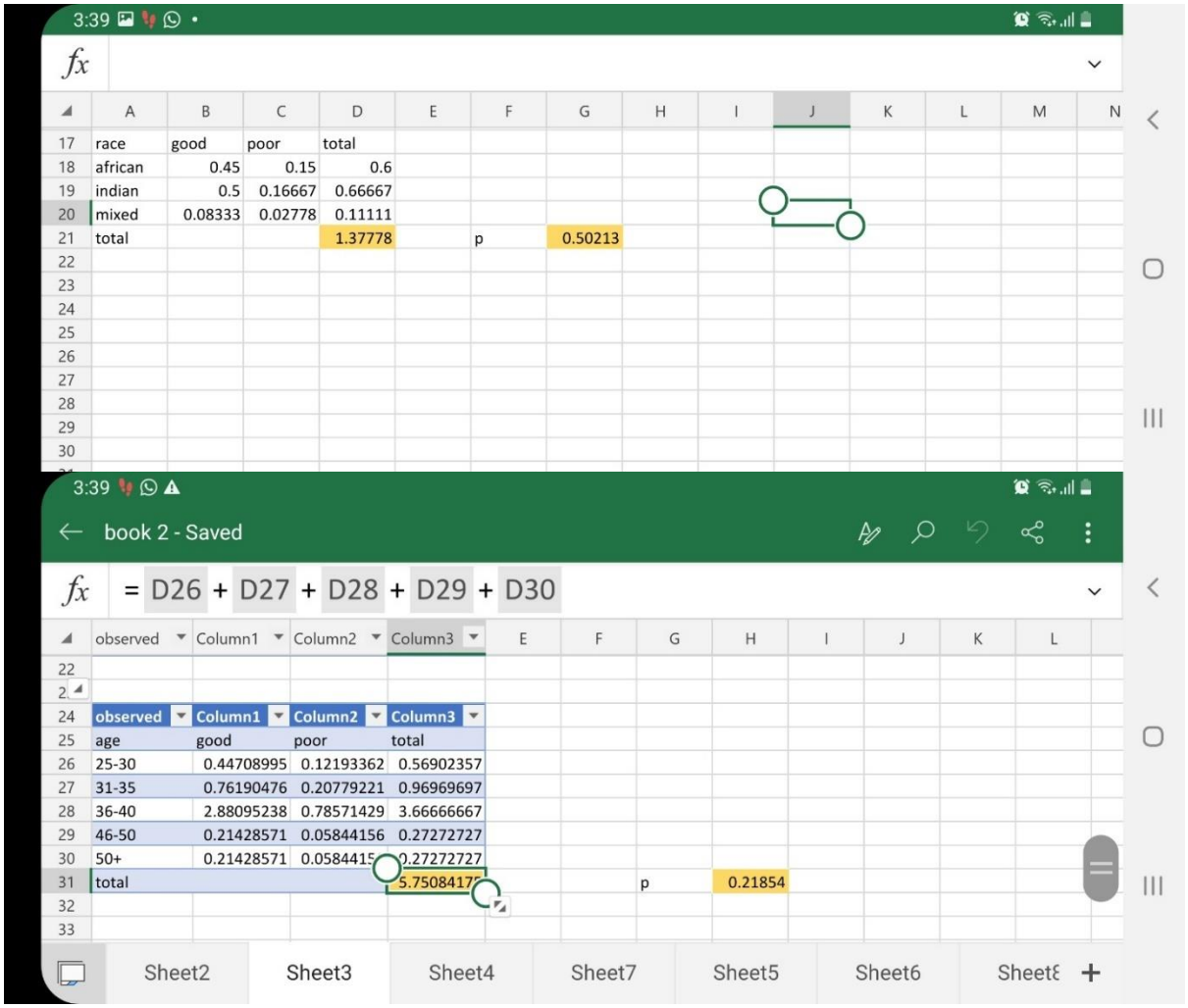


	Column1	Column2	Column3	Column4	Column5	F
25	Column1	Column2	Column3	Column4	Column5	
26		Awareness of tele-optometry				
27	chi-square					
28	age	yes	no	grand total		
29	25-30	0.10756303	0.26890756	0.37647059		
30	31-35	0.00952381	0.02380952	0.03333333		
31	36-40	0.11428571	0.28571429	0.4		
32	41-45			0		
33	46-50	0.12857143	0.32142857	0.45		
34	50+	0.57142857	1.42857143	2		
35	grand total	0.93137255	2.32843137	3.25980392		
36						
37			r-1= 6		CV	12.5916
38			c-1=1		p-value	0.66

Knowledge


3:42
book 2 - Saved
= D17 + D18
quali good poor total
Bachelor's 0.03214 0.01461 0.04675
Master's c 0.225 0.10227 0.32727
PhD 0 0
total
p 0.54082
3:41
= D23 + D24 + D27
region good poor total
central 1.225 0.44545 1.67045
north 0.00417 0.00152 0.00568
east 0.8 0.29091
west
south 0.53333 0.72727
total
P 0.47874
Sheet10 Sheet14 Sheet11 Sheet13 Sheet12 Sheet1


3:40
= D15 + D16
employ good poor total
Permanen 0.18908 0.07878 0.26786
Temporar 0.88235 0.3676 1.25
Grand Total 1.51786
p 0.21794
3:39
gender good poor total
Female 0.17738 0.07391 0.25128
Male 0.57647 0.2402 0.81667
Grand Total 1.06795
p 0.30141



	A	B	C	D	E	F	G
17	race	good	poor	total			
18	african	0.45	0.15	0.6			
19	indian	0.5	0.16667	0.66667			
20	mixed	0.08333	0.02778	0.11111			
21	total			1.37778		p	0.50213

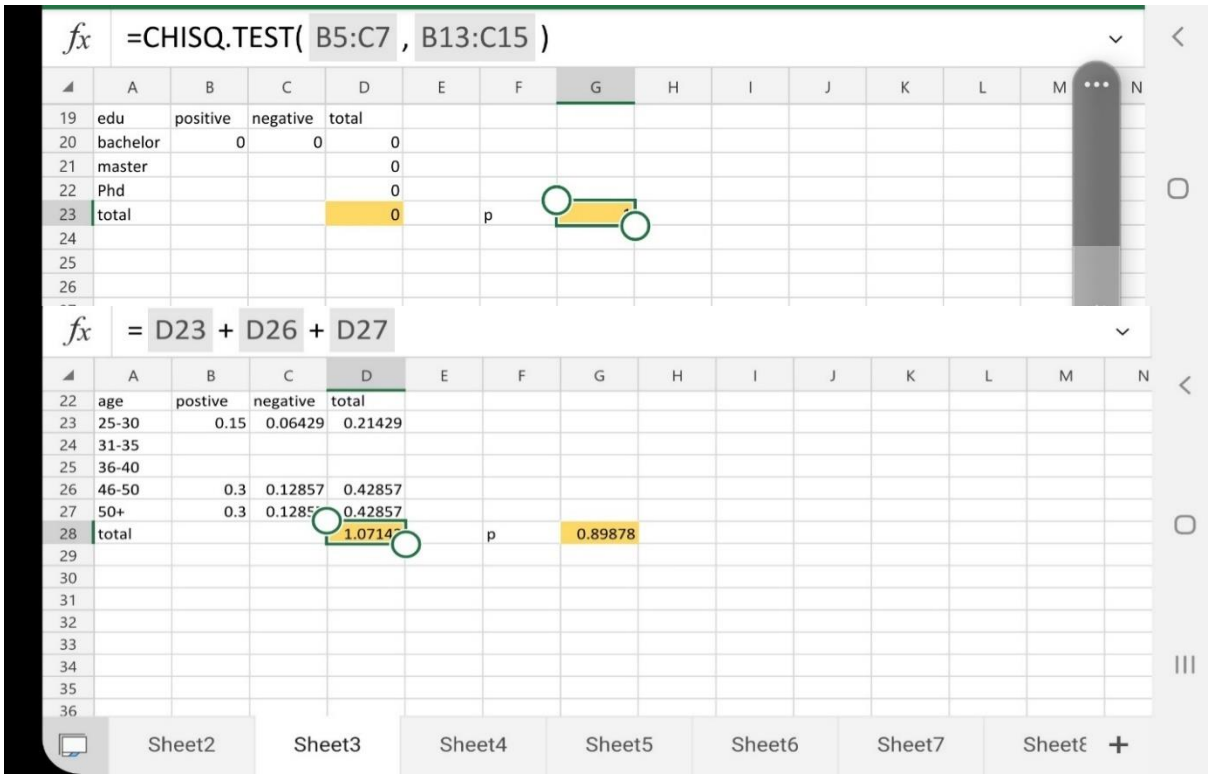
book 2 - Saved

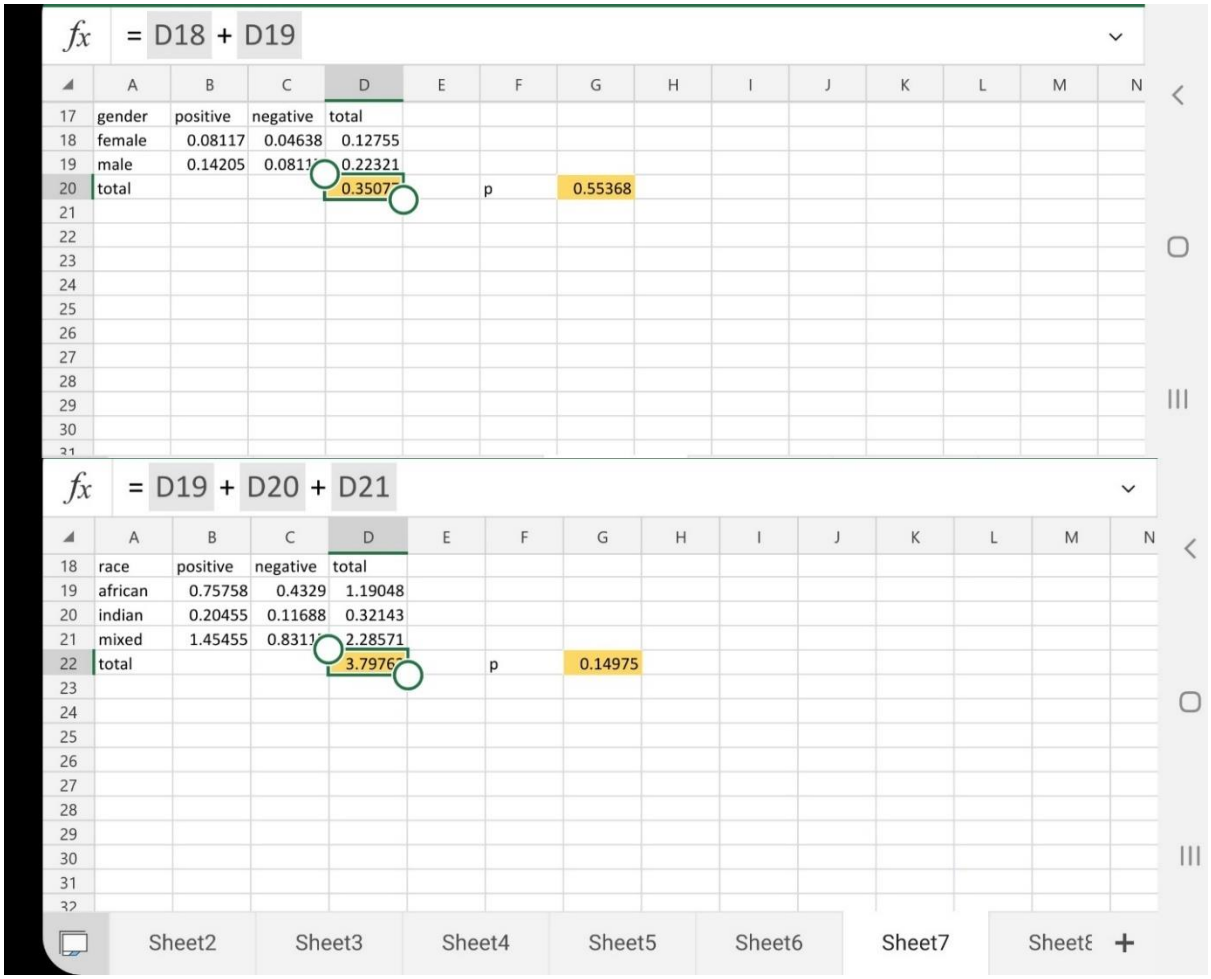
= D26 + D27 + D28 + D29 + D30

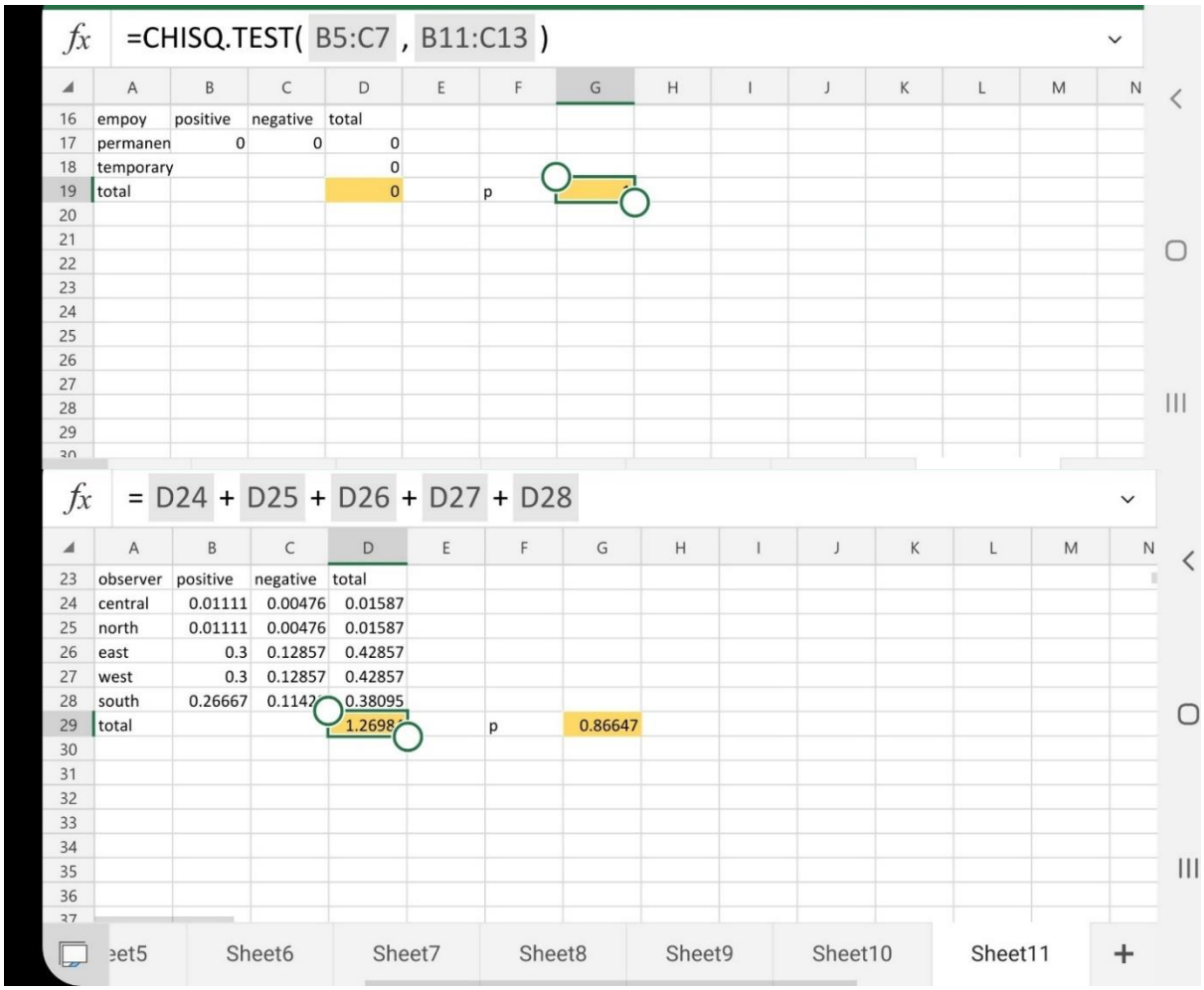
	observed	Column1	Column2	Column3	E	F	G	H
24	observed	Column1	Column2	Column3				
25	age	good	poor	total				
26	25-30	0.44708995	0.12193362	0.56902357				
27	31-35	0.76190476	0.20779221	0.96969697				
28	36-40	2.88095238	0.78571429	3.66666667				
29	46-50	0.21428571	0.05844156	0.27272727				
30	50+	0.21428571	0.0584415	0.27272727				
31	total			5.7508417			p	0.21854

Sheet2 Sheet3 Sheet4 Sheet7 Sheet5 Sheet6 Sheet8

Attitude


=CHISQ.TEST(B5:C7 , B13:C15)
edu positive negative total
bachelor 0 0 0
master 0
Phd 0
total 0
p
= D23 + D26 + D27
age postive negative total
25-30 0.15 0.06429 0.21429
31-35
36-40
46-50 0.3 0.12857 0.42857
50+ 0.3 0.42857
total 1.0714
p 0.89878
Sheet2
Sheet3
Sheet4
Sheet5
Sheet6
Sheet7


= D18 + D19
gender positive negative total
female 0.08117 0.04638 0.12755
male 0.14205 0.0811 0.22321
total 0.35077
p 0.55368
= D19 + D20 + D21
race positive negative total
african 0.75758 0.4329 1.19048
indian 0.20455 0.11688 0.32143
mixed 1.45455 0.8311 2.28571
total 3.79767
p 0.14975
Sheet2 Sheet3 Sheet4 Sheet5 Sheet6 Sheet7 Sheet8


=CHISQ.TEST(B5:C7 , B11:C13)
empoy positive negative total
permanen 0 0 0
temporary 0
total 0 p
= D24 + D25 + D26 + D27 + D28
observer positive negative total
central 0.01111 0.00476 0.01587
north 0.01111 0.00476 0.01587
east 0.3 0.12857 0.42857
west 0.3 0.12857 0.42857
south 0.26667 0.38095
total p 0.86647
Sheet6
Sheet7
Sheet8
Sheet9
Sheet10
Sheet11