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Knowledge, beliefs, perceptions, and behavior related to the corona (COVID-19) pandemic among university students in Malawi[1]

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Abstract

This study is based on a survey of 764 students at the Lilongwe University of Agriculture and Natural Resources (LUANAR), Lilongwe, Malawi. It aims to provide evidence on the extent of exposure to the pandemic among university students, their knowledge and beliefs related to the corona virus and the ways they protect themselves against getting infected, the sources of information that they rely on, and other factors influencing their knowledge, beliefs, and behavior. The study was undertaken in the period of February-March 2022 during which the fourth wave of the pandemic in the country took place and in this period the omicron variant of the virus dominated. We investigate factors associated with the extent of knowledge about the corona virus and COVID risk perceptions, information updating behavior, preferences for alternative protective measures, especially vaccination and use of facemasks. We also assessed beliefs about the effects of vaccination, trust in vaccines, and passive and active demand for vaccination. Finally, we investigate facemask use intensity and factors influencing the likelihood of infection and COVID-19 disease based on subjective self-reported experiences.

Key words: Corona, COVID-19, pandemic, university students, knowledge, beliefs, behavior.

JEL codes: I12; I15; I18.

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1. Introduction

The corona pandemic has triggered a lot of research on the impacts of the pandemic especially in developed countries where systematic high quality data collection was rapidly implemented. While there have been similar attempts of establishing national systems for recording infection rates and sickness and deaths related to the pandemic in developing countries, the completeness and quality of the data is lower due to more severe resource constraints. Africa has among the lowest Covid-19 testing rates in the world (Our World in Data, 2022). Without a clear picture of the infection rates, it is also impossible to verify the number of deaths due to the pandemic. The under-reporting of infections therefore also leads to underreporting of deaths associated with the pandemic. The systems for registration of accurate mortality figures are also inadequate or non-existing in many African countries. ECA (2017) found that only 18 African countries record and report annual deaths and WHO (2022: SCORE Dashboard (who.int)) found that just 10% of the deaths are officially registered in Africa against 98% in Europe. This study found that the data from Malawi were particularly weak when it comes to the recording of births, deaths and causes of death (who_score_mwi_en.pdf). The Economist (2021) modelled the global excess death toll to be 7-13 million by May 2021. The figure was 92.7 persons per 100,000 in South Africa as the highest in sub-Saharan Africa and this figure was also considered significantly under-estimated. They estimated the death count to be 14 times higher than the official figures and being 1.8 million rather than 200,000 for sub-Saharan Africa. This illustrates the need for further investigation of the impacts of the pandemic based on broader surveys of the population. There are large knowledge gaps regarding how people in Africa have experienced the pandemic, their knowledge, beliefs, perceptions, and behavior. Such knowledge can be instrumental to design future policies and recommendations for how people should relate to likely future waves of the pandemic.

Based on a study in ten countries, Dryhurst et al. (2020) found that risk perceptions related to the pandemic have been found to be influenced by personal experience with the virus, individualistic and prosocial values, hearing about the virus from friends and family, trust in government, science, and medical professionals, personal knowledge of government strategy, and personal and collective efficacy. Furthermore, they found that the corona risk perception correlated significantly with reported adoption of preventative health behaviors in all ten countries. So far, we are not aware of many studies of corona risk perceptions in African countries. We know that the dissemination of relevant information as well as treatments, such

as efficient vaccines, is more challenging in the African context. These exists anecdotal evidence that religion plays a role, and that vaccine skepticism may hinder efficient protection against the potentially deadly virus. A recent qualitative study in urban areas in Malawi found such beliefs about the pandemic to influence attitudes potentially strongly towards vaccination that potentially could constrain willingness to vaccinate when vaccine availability improves in the near future (Mbeya et al., 2022).

In this study, we assess the knowledge, attitudes, perceptions, beliefs, and behavior related to the pandemic and vaccines among university students in Malawi. We also assess how the students rank alternative protective measures against the pandemic. We found the use of facemasks as a protective measure to be the most popular and widely adopted measure, hence we assess factors associated with its intensity of adoption measured with a facemask use score. Finally, we assess factors associated with self-reported corona infections among students although most of these self-reported cases had not been verified through proper covid tests. The study is based on a cross-section survey among students from the Lilongwe University of Agriculture and Natural Resources (LUANAR) in Malawi. We collected this data during the fourth wave of the pandemic when the omicron variant of the virus was dominating.

The paper introduces the context in section 2, the survey design in section 3, the conceptual framework in section 4, variable description in section 5, and estimation strategy in section 6. The results are presented in section 7, followed by a broad discussion and interpretation of the results in section 8, before we conclude. The survey instrument is included in an Appendix.

2 The context

Our study was conducted in Malawi, one of the poorest countries in Africa, during the period February-March 2022, which was close to the peak of the fourth wave of the corona pandemic. As of March 22, 2022, there were recorded 85,560 corona infection cases and 2,626 deaths in Malawi (Malawi COVID - Coronavirus Statistics - Worldometer (worldometers.info). With a total population of 20 million, the number of official (known) deaths in the country due to COVID-19 is not very alarming compared to many other countries. However, there could be many unrecorded deaths and infections due to weaknesses in the system for registration and verification (testing). The data above indicate that less than 5% of the population have been infected by the virus and about 3% of those infected have died if these numbers can be trusted.

It is well known that the distribution of vaccines against COVID-19 have been lagging far behind in Africa, compared to other parts of the world. In Malawi, the main types of vaccines distributed are the AstraZeneca and Johnson & Johnson vaccines distributed through the COVAX facility. By March 2022, about 2 million vaccine doses have been given in the country and 862,000 have been fully vaccinated, that is 4.5% of the population, compared to 59.2% for the global population (https://ourworldindata.org/covid-vaccinations?country=MWI).

Vaccine hesitancy is a phenomenon that exists in Malawi and may be rooted in some anecdotal stories related to rare side effects but also some false rumors that vaccines can lead to infertility (https://www.worldbank.org/en/news/feature/2021/10/19/rolling-out-covid-19-vaccines-in-malawi-amid-hesitancy-and-supply-challenges). However, the availability of vaccines and the capacity of the health system in Malawi are likely to be more important constraints to vaccination in the short run. Lack of knowledge may also be an important constraint affecting the demand for vaccines.

In December 2021, the Malawian Government introduced a proposal to implement mandatory COVID-19 vaccines. A civil society group applied to the High Court in Lilongwe aiming to stop the government from implementing the mandatory COVID-19 vaccine, but their application was rejected by the court (Pensulo 2022). The outcome of the proposal is still uncertain.

3 Survey design

We used a stratified random sample design. First, we obtained an overview of all study programs in the university with a list of all students in the different programs by year of study and study campus. We identified classes with more than 16 students across different study programs. We randomly sampled 16 students from such classes. In total we collected data from 48 classes and 764 students. The largest share of the sample is from the Bunda Campus (87%), and the remaining sample comes from the City Campus. We aimed to have a broad coverage of study programs and levels in each study program. We tried to find first to fourth year BSc-students as well as MSc-students. We found difficulties in recruiting classes of MSc-students for the study as they were mostly out of the campus during our study. The exceptions from the standard sampling approach were one BSc-class with only 12 participants and two MSc-groups

which were composed from several MSc-classes. The study disciplines included Agribusiness Management, Agricultural Economics, Gender and Development, Agricultural Extension, Agricultural sciences, Veterinary and Animal sciences, Environmental and Natural Resource Management studies, Engineering and Biotechnology sciences, Food and Nutrition sciences, including more specialized studies within these areas. In this paper we investigate the variation across study programs and year of study in terms of their correlations with the pandemic related variables.

We designed a survey instrument that was programmed in the Survey Solutions software and used tablets for the data collection where the students themselves answered the questions on the tablets handed out to them.

Each session was organized in a classroom under corona safe conditions as the survey took place during the fourth wave of the pandemic in the country. Both the researchers and students had to use facemasks throughout the sessions. The classroom was big enough to allow the seating of 16 students on numbered desks with sufficient distance in between. One researcher was leading each session and guided the students through to ensure that all were on the same page, gave standardized introductions to the different parts and made sure the students did not communicate with each other but focused on giving their personal responses without distractions.

The main parts of the survey instrument focused on their knowledge about the corona pandemic, their perceptions related to the pandemic, vaccination and infection status of students, personal behavior in response to the pandemic, and their perceptions about the behavior of other students related to the pandemic. The survey instrument also included questions about personal and family characteristics, ethnicity, religion, and personal interests.

Limitations: self-reported data, not objective measures of attitudes and behavior. A study in Kenya found that self-reported mask use was quite different from actual mask use (Jakubowski et al. 2021). People may pretend they behave more responsibly than they actually do.

4 Conceptual framework

We have developed a theoretical conceptual framework to explain the relationship between beliefs, knowledge, information updating behavior, corona risk perception, and behavior related to the pandemic in terms of protective measures taken. Beliefs include religious affiliation as well as beliefs about risks associated with vaccination and corona risk perception. Exposure to the corona virus among relatives, friends and cohabitants are also factors that may influence corona risk perceptions and behavior. We can also expect feedback loops between knowledge, perceptions, and behavior. Especially information updating behavior may imply that subjects revise their perceptions and adjust their behavior. This is especially true for the corona pandemic where most countries have provided daily updates on new infections, hospitalizations, and deaths due to COVID-19. We expect that our student sample that has good internet access is very likely to use the internet and update themselves about the pandemic regularly but that this may depend on their COVID risk perceptions. We also hypothesize that their knowledge about the pandemic depends on their information updating behavior. We cannot rule out information feedback effects from their information updating to their COVID risk perceptions.

It is challenging to capture such dynamics in a cross-section survey. We try to do it by obtaining information about the relevant variables that have a recursive relationship while others such as some perceptions and attitudes are instant, and we do not know the extent to which they have changed over time. On the other hand, religious affiliation is a pre-determined variable that we can regard as exogenous to the system. For the endogenous variables, we can only assess their correlations with each other and discuss their theoretical logical connections and hypothesized signs, while recognizing that we study a dynamic system of interacting variables that we have only a point in time picture of. While we use statistical models to analyze the relationships we argue cautiously about causal relations as there are multiple endogenous variables and many of the regression coefficients are likely to suffer from endogeneity bias. We return to this issue in the methods chapter.

Our conceptual model has similarities with other models used to analyze relationships between beliefs, perceptions, attitudes, knowledge, and behavior. Such earlier models used in relation to health issues include the “Health Belief Model” (Rosenstock 1974; Janz and Becker 1984), that has been used in many studies to study how health risk perceptions are influenced by

demographic, media, advice, and perceived vulnerability, and how perceived risks again affect perceived benefits of preventive actions and likelihood of taking actions. Youssef et al. (2022) have applied the model to study determinants of the acceptance of COVID-19 vaccination among Lebanese health care workers. Fathian-Dastgerdi et al. (2021) have used the health belief model in a study of factors associated with preventive behaviors of COVID-19 among adolescents (12-18 years old people) in a random sample from 24 schools in Iran. Tadesse et al. (2020) used the health belief model to study the predictors of COVID-19 prevention practices among employees in Addis Ababa, Ethiopia. They investigated the correlations between knowledge, perceived susceptibility, severity, benefit, barrier, cues to action, and self-efficacy as predictors of COVID-19 prevention.

Another theoretical framework that also has been applied to many studies of the corona pandemic is the knowledge, attitude, and practice (KAP) framework. In relation to the corona pandemic Zhang et al. (2020) applied KAP to the study of healthcare workers in Henan in China. Tomar et al. (2021) applied it to a community study in India. Ferdous et al. (2020) applied it in an online survey in Bangladesh. Al-Hanawi et al. (2020) used it in a study of the public in Saudi-Arabia. Puspitasari et al. (2020) provide a review of studies that use this framework at an early stage of the corona pandemic.

A third and similar to the KAP framework is the knowledge, attitudes and behavior (KAB) framework which focuses more on the adaptive learning process as all have had to climb a learning curve related to dealing with the pandemic. Studies that use this framework related to the corona pandemic include Fattah et al. (2021) who study public health awareness knowledge, attitudes, and behaviors of the public on health risks during the COVID-19 pandemic in Oman. O'Neal et al. (2020) focused on the harnessing of healthy fear via knowledge, attitudes, and behavior related to COVID-19 in the USA. Ahmed et al. (2020) investigated the public knowledge, attitude, and behavior regarding lockdown in terms of staying at home to stay safe related to COVID-19 in China, India, and Pakistan based on a cross-sectional online survey. Yanti et al. (2020) used the approach to study community knowledge, attitudes, and behavior towards social distancing policy as prevention of transmission of COVID-19 in Indonesia. Mistree et al. (2021) combine the knowledge, attitudes, and behaviors framework with a Randomized Controlled Trial among a large sample of low-income youth in India. They randomize two instructional facts-based treatments about

the corona pandemic with scientific concepts, one longer and one shorter. They found that both enhanced the COVID-19 related knowledge of the subjects immediately after, and one week after the treatment. The longer treatment resulted in more sustained changes in knowledge, attitudes, and self-reported behavior one week after the treatment (which still is a very short horizon). They measured knowledge as the number of correct responses from 26 questions and developed an applied knowledge score to investigate the ability to apply the knowledge to different scenarios. They also developed an attitudes score based on six questions and had five binary self-reported behavioral measures; use of facemasks when going out, cleaned/disinfected surfaces at least once per day, consistently maintained two meters distance from others outside the home, washed hands thoroughly using soap or sanitizer, and stayed home during lockdown except for essential trips.

We present our conceptual framework in two causal diagrams that are consistent with the health belief model, the knowledge, attitude, and behavior framework and the knowledge, attitude, and practice framework. Our conceptual framework reflects that we study the beliefs, knowledge, perceptions and stated behavior related to the corona pandemic among university students in Malawi. The local context obviously is important for the identification of the key variables of interest and their distributions and relative importance. Religion plays and important role in Malawi and there are many different religious groups in the country. The religious affiliation of the students may potentially affect their perceptions, beliefs and behavior related to the pandemic. We explore this in a broad sense and treat religious affiliation as a pre-determined variable.

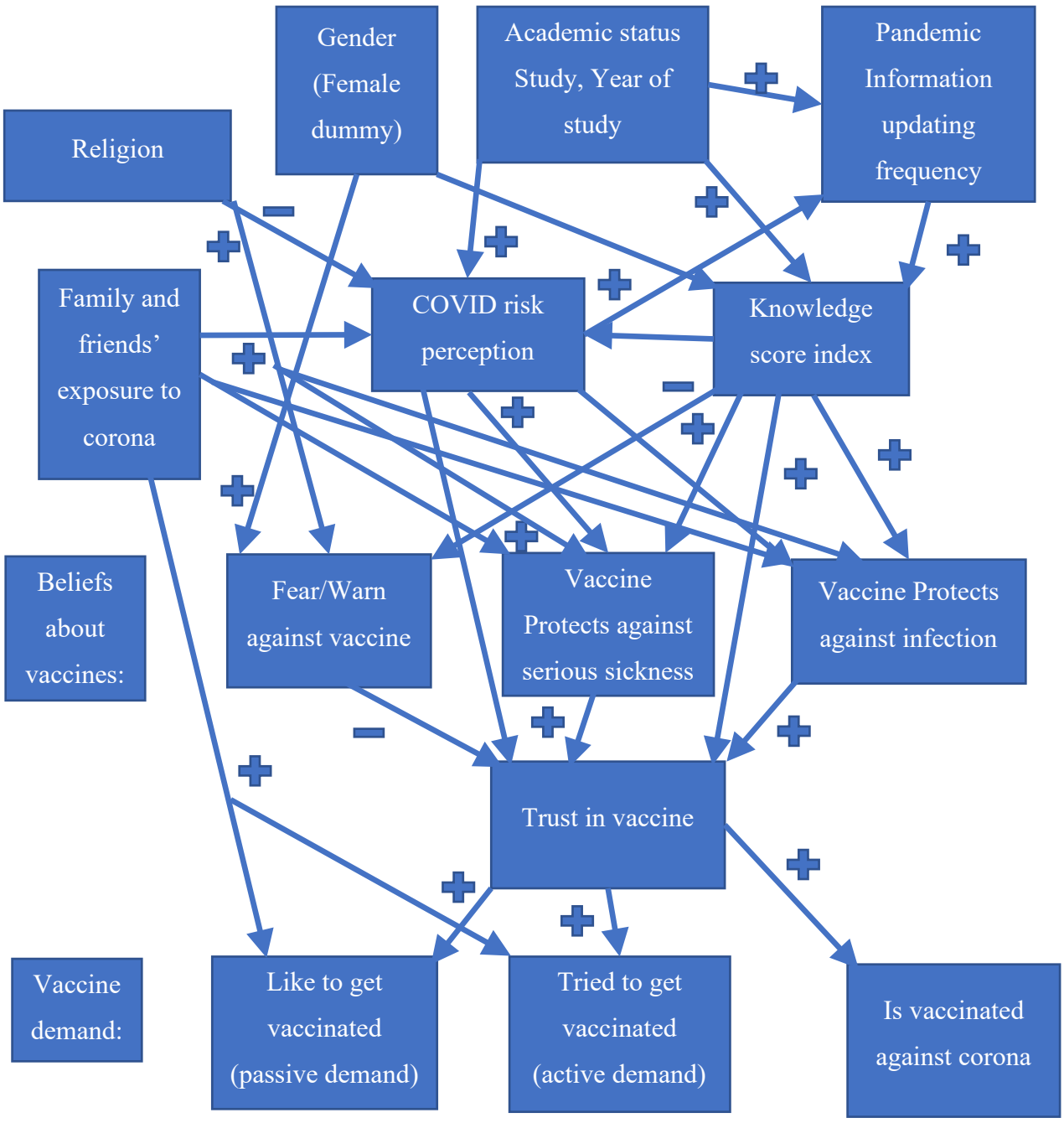

Figure 1. Factors influencing risk perceptions, knowledge, pandemic information updating frequency, attitudes towards vaccination, and demand for personal vaccination against corona.

Figure 1 illustrates that beliefs related to vaccines, such as fears that make students alert towards vaccines and inclined to warn people against getting vaccinated, can be influenced by religion. However, knowledge may also reduce such fears. Beliefs about the effectiveness of vaccines in protection against infections and against serious sickness are also likely to be influenced by their knowledge, risk perceptions and exposure that mediate religious and

academic influences. Trust in vaccines (captured with a 5-level likert scale) is again driven by the beliefs related to the vaccines and influence passive and active demand for vaccines. Actual vaccination status may also depend on access constraints outside the control of students.

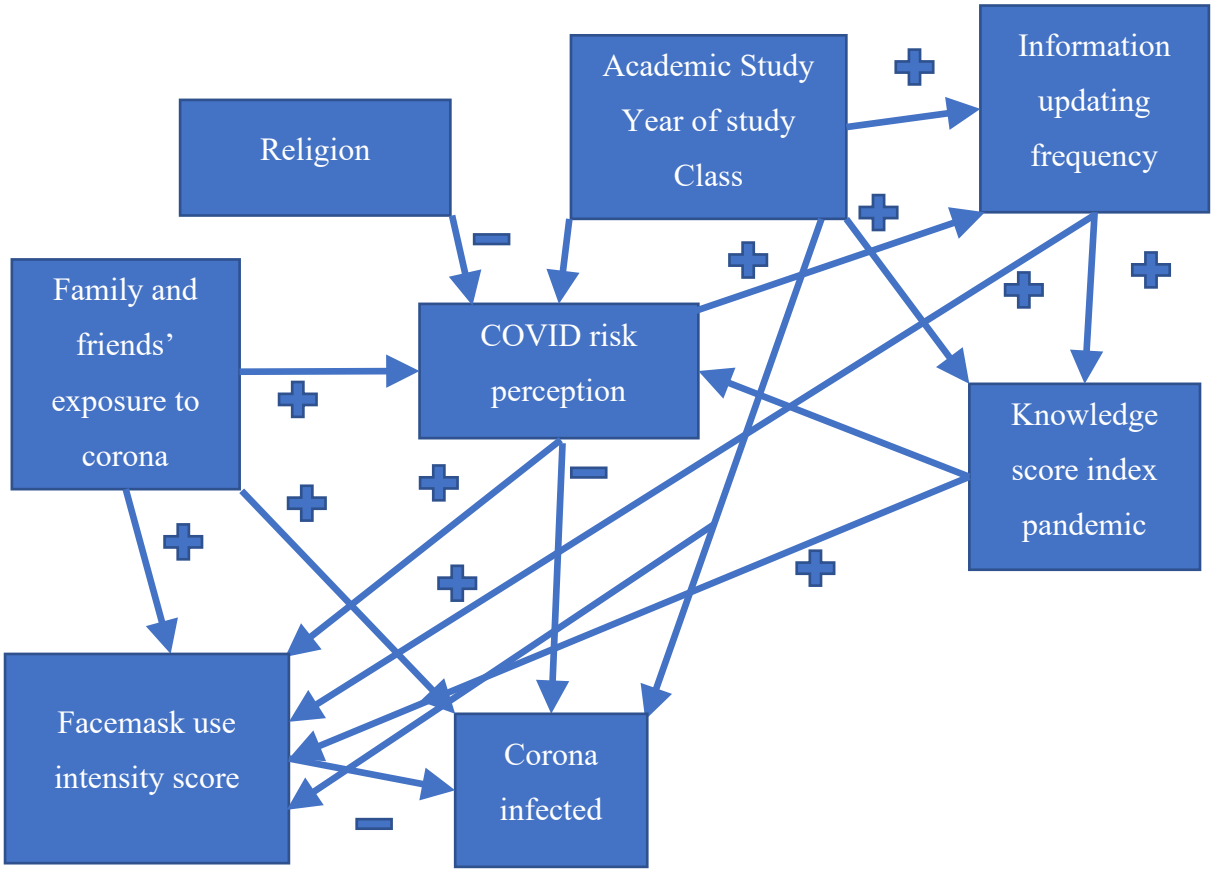

Figure 2. Main behavioral response (facemask use intensity) to the pandemic among students and infection likelihood

Figure 2 focuses on a set of behavioral adjustments that were more feasible to adopt by the students than vaccination. We assume that the same set of basic variables (academic influence, religion, covid risk perceptions, information updating frequency, knowledge index, and exposure among relatives and friends) also influence the use of these alternative protective measures such as use of facemasks, distancing, handwashing, and avoiding crowded places. The first of these behavioral responses, the use of facemasks, was considered the most important protective measure by the students. We therefore collected more detailed data on facemask use in different settings and constructed a facemask use score as an indicator of how careful students were to protect themselves against getting infected and protecting others from being infected by them. We use this facemask use score as a dependent variable and assess how

the predetermined religion, academic study, study year, perception, exposure, and knowledge variables influence or are correlated with the facemask use score. We also run models where we control for academic influence and class effects with Class Fixed Effects.

Finally, we assess whether the likelihood of having been infected based on self-reported corona infection (based on subjective assessment of the symptoms) is affected by the facemask use score, the exposure among family and friends, the covid risk perception, and academic class. We hypothesize that those that have been more careful with facemask use (higher facemask use score) are less likely to have been infected. We also hypothesize that those who perceive the risk to be higher to have been more careful and are less likely to have been infected. Furthermore, those that have been close to infected cohabitants, friends, and relatives are more likely to have been infected. The academic class structure may also have generated cohorts or classes that were more likely to be infected/infect each other.

5 Variable description

Table 1 gives and overview of key variables of interest. The variable 'Corona risk perception' was formed based on the question 'Do you perceive COVID-19 represents a serious risk to your personal health?' and answers were categorized as 2=Yes, 1=Don't know, and 0=No. We asked a range of factual questions about the pandemic such as where it started (country and town), knowledge about the number of corona waves in Malawi up to January 2022, the official number of corona infected and deaths due to COVID-19 in Malawi up to February 2022, names of corona virus variants, and names of COVID-19 vaccine types (see Appendix 1 for details). We constructed a simple knowledge index by adding the number of correct answers to these factual questions. The distribution of the knowledge index is presented in Fig. 1a.

We asked the students how often they updated themselves on the status of the pandemic during the last wave and categorized the answers as 1=Daily, 2=Weekly, 3=Monthly, 4=No efforts made, 5=Expect others to inform me. After reordering 4 and 5, the variable 'Information updating frequency' was constructed as the inverse of this 1-5 categorization, see Table 1 and Fig.1b.

Beliefs related to vaccines were captured with three variables. The 'Vaccines protect against infection' and 'Vaccines protect against serious sickness' variables had three outcomes; 0=No,

1=Don't know, and 2=Yes. The third variable is a dummy variable capturing the response to the following question 'Would you like to warn people against getting vaccinated against COVID-19?'

The variable 'trust in vaccines' was constructed as a 5-level likert scale (5=very high, 4=high, 3=good, 4=low, 5=very low).

Another variable reflecting their attitude towards vaccines was captured with a dummy variable based on the response to the following question: 'Do you recommend all adults to get vaccinated?' that could be answered with Yes or No. Three additional variables attempted to capture the personal demand for vaccination. The first of these was captured based on the question: 'Would you like to get vaccinated against COVID-19? (if you are not vaccinated)' with answer choices 0=No, 1=Don't know, and 2=Yes. 'Vaccinated' was a dummy variable for whether they had been vaccinated at least once against COVID-19. We added a question 'If you are not vaccinated, have you tried to get vaccinated?' and constructed a variable combining this last variable with those that were vaccinated to construct a variable for 'active demand' (intention to vaccinate) which may be compared to the response to the 'passive demand' based on the 'Would you like to get vaccinated' combined with 'Vaccinated'. This allows us to distinguish passive demand, active demand, and actual vaccination. The difference between active demand and actual vaccination can say something about the extent of rationing or difficulty students have faced in getting vaccinated.

The 'facemask use score' variable was constructed based on the frequency (0=Never, 1=Sometimes, 2=Always) of facemask use in nine different types of locations (In stores/shops, at friends' home, in the street, in the bus, in the market, at home, in the university, in the classroom, in church) by summing the frequency score across the nine types of locations, see Fig. 1c. The 'corona infected' variable is equal to one if the student believes they have been corona infected based on the symptoms and the context. Only a share of those who thought they had been infected had actually tested and verified that they were infected. We may therefore have false positives as well as students that may have been infected but without knowing.

Table 1. Key variables

Key variables of interest	Mean	Median	Std. Dev	N
Corona risk perception=0	0.114			764
Corona risk perception=1	0.082			764
Corona risk perception=2	0.804	2		764
Knowledge index	5.35	5	2.18	764
Information updating	2.48	2	1.51	764
Information updating frequency	0.58	0.5	0.33	764
Vaccine protects against infection	0.74	0	0.92	763
Vaccine protects against serious sickness	1.52	2	0.80	763
Covid vaccine warning, dummy	0.16	0		764
Trust in vaccines	3.09	3	1.25	764
Recommend vaccination, dummy	0.80	1		764
Like to vaccinate, dummy	0.58	1		764
Intention to vaccinate, dummy	0.46	0		764
Vaccinated, dummy	0.28	0		764
Facemask use score	12.84	13	3.49	764
Corona infected, dummy	0.18	0		764

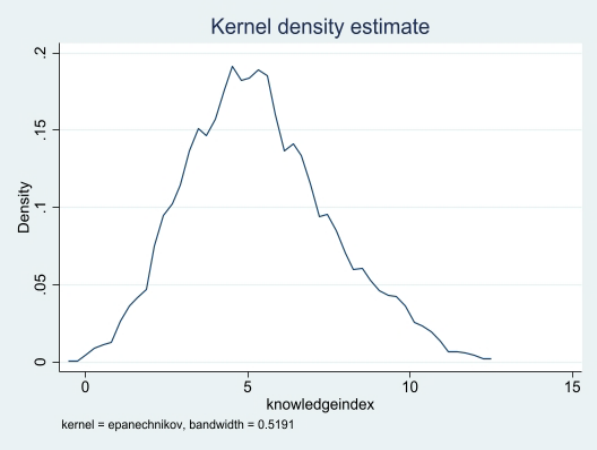

Figure 1a. Knowledge index distribution.

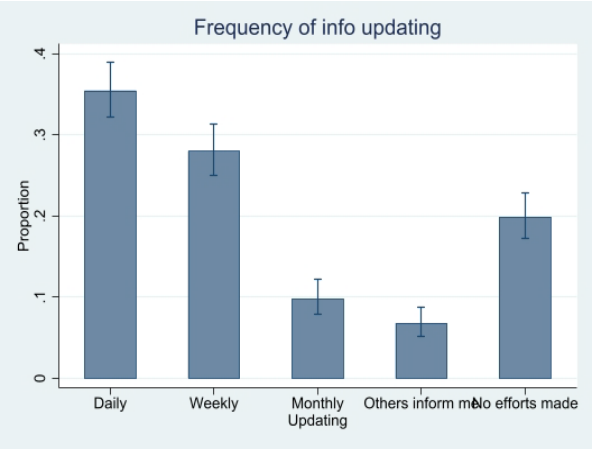

Fig. 1b. Frequency of updating information

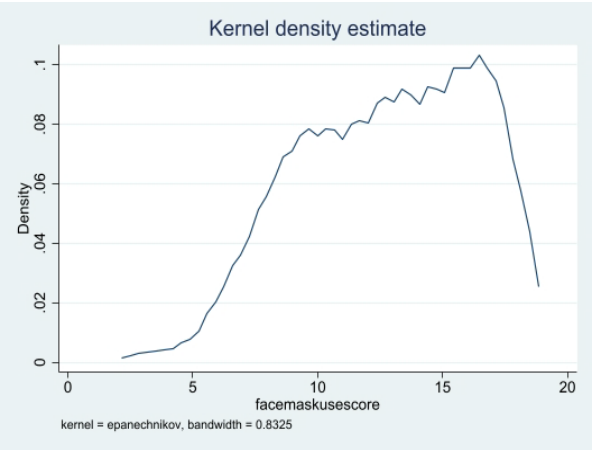

Figure 1c. Facemask use score distribution

Table 2. Explanatory/Control variables

Variable	Obs	Mean	Share	Std. Dev.	Min	Max
Covid sick relatives=0	764	0	0.41			
Covid sick relatives=1	764	1	0.20			
Covid sick relatives=2	764	2	0.39			
Covid sick friends=0	764	0	0.31			
Covid sick friends=1	764	1	0.36			
Covid sick friends=2	764	2	0.32			
Covid died known person(s)	764	0.88	0.88		0	1
Corona infected cohabitant	764	0.32	0.32		0	1
Study program:						
Master: Mixed groups	764		0.04		0	1
Business & Economics	764		0.31		0	1
Agric-Engineering	764		0.12		0	1
Food & Nutrition sciences	764		0.06		0	1
Animal & Veterinary sciences	764		0.13		0	1
Environment-NRM	764		0.13		0	1
Extension&Gender&Community	764		0.21		0	1
Study year:						
First year Bachelor	764		0.25		0	1
Second year Bachelor	764		0.27		0	1
Third year Bachelor	764		0.35		0	1
Fourth year Bachelor	764		0.08		0	1
First year Master	764		0.03		0	1
Second year Master	764		0.01		0	1
Demographics:						
Age, years	764	23.10		3.66	17	48
Sex, 0=male, 1=female	764	0.38			0	1
Siblings	764	4.00		2.09	0	12
Birth rank	764	2.83		1.95	0	11
Risk aversion indicator	764	2.99		1.87	1	6

Table 2 contains the most relevant explanatory and/or control variables that may explain or be correlated with the various variables in Table 1. The ‘Covid sick relatives’ variable takes the value zero if no relatives are known to have been sick from COVID-19, it takes the value one if at least one relative has been sick, and it takes the value two if at least one relative has been seriously sick from COVID-19. The same categorization is used for sickness for friends of the student. The ‘Covid died_known person(s)’ variable is a dummy for whether at least one personally known person to the student is known to have died due to COVID-19. The ‘Corona infected cohabitant’ variable is a dummy variable for whether the student has shared housing with a corona-infected person. The remaining variables in Table 2 should be self-explanatory, except the last one. The ‘Risk aversion indicator’ is a six-level indicator of risk aversion or risk

tolerance from an incentivized experiment in form of a risky investment game, a one-shot version of the Gneezy and Potter (1997) game. A larger value indicates a lower willingness to take risk in the game.

6 Estimation strategy

With our data it is difficult to claim or test causality for relations. We can only assess the signs and significance of the theoretical relationships shown in the conceptual models. We assess the robustness of such correlations by trying alternative specifications and return to the discussion of alternative specifications in each model. Perception variables may be endogenous and interact with certain types of behavior such as information updating frequency and knowledge about the pandemic. We tried to estimate systems of equations models, but these models failed to converge. We tried also multiple Instrumental Variable (IV) specifications but in most cases we were unable to find strong and valid instruments. We use panel data models and correct standard errors for clustering at class level. We use linear class Random Effects (RE) models to investigate differences between Study programs and Year of study in models where we are interested in inspecting variation in academic influence. In other models with use class Fixed Effects (FE) to control for class effects when the differentiated academic influence is not of primary interest but where it is important to control for such potential influence. We assessed possible non-linear effects of the knowledge index variable and found a significant non-linear effect of the knowledge variable. A log-transformed version of this variable is therefore included in one case as it performed as well as a quadratic version.

Below we specify the key models of interest based on our conceptual framework which is consistent with our knowledge, belief, perception, and behavioral framework, and also consistent with the different alternative frameworks we referred to initially.

First, covid risk perceptions are assumed to be a function of the academic influence, religious affiliation, and exposure to the virus among friends and relatives.

1) Covrisk perception=f(academic influence, religion, exposure)

The academic influence may give students a better educated understanding of the risks involved with the pandemic but the biological and statistical understanding of this may vary with their type of study and year of study in the university. Their religion may also influence their risk perceptions. Certain types of religions may be associated with the belief that the religion

protects against the pandemic, and we hypothesize that such religions have a negative influence on the covid risk perception. Personal experience with the virus among friends and relatives may also influence their risk perceptions, especially if they know someone who has been seriously sick or who had died from COVID-19.

Next, we assess factors that influence or are correlated with the frequency of information updating about the corona pandemic among students. We think the academic influence affects the frequency of information updating on the pandemic. Compared to other people in Malawi, students are more likely to use the internet to get updated information and thereby also updating themselves more frequently. However, this may vary with study program and study year for students. We also think the covid risk perception is influencing the information updating frequency.

2) Info updating frequency=f(academic influence, covid risk perception)

We investigated the knowledge about the corona pandemic among the university students and generated a knowledge index. We assess the variation in this knowledge index among students in different study programs and study years. We hypothesize that students that have been longer in the university have more knowledge as they have been more exposed to the academic university environment, and this has influenced their knowledge. We hypothesize that the information updating frequency positively influences their factual knowledge about the pandemic and assume that risk perceptions influence knowledge through the information updating behavior. We also assess whether demographic variables such as age, sex, birth rank, and number of siblings in the family may affect this knowledge index. Here could be knowledge spillover effects among siblings, especially from older to younger siblings.

3) Knowledge index=f(academic influence, info updating frequency, demographic controls)

Next, we investigate how three types of beliefs about corona vaccination is influenced by religion, knowledge about the pandemic, exposure among relative and friend, and covid risk perception. Some beliefs about vaccination are based on scientific knowledge (such as the belief that vaccination reduces the likelihood of being infected or the likelihood of getting seriously sick if you are infected). Other beliefs are based on rumors of non-scientific origin or anecdotal experiences and news about negative side-effects of vaccination that could create vaccination fears and vaccination reluctance. We suggest that better knowledge about the pandemic also is associated with better knowledge and more trust in the scientific knowledge

about vaccines may imply more positive attitudes towards vaccination. Some religious affiliations may be associated with vaccination fears and hesitancy against vaccination and an inclination to warn others against vaccination. Exposure to infections and sickness among friends and relatives with more serious outcomes may trigger a more positive attitude towards vaccination. These are the hypotheses we want to assess with the vaccination belief models. We suggest that the academic influence goes primarily through the knowledge index and control for class FE.

4) Vaccination belief=f(religion, exposure, knowledge index, covrisk perception)

We assume that the different beliefs about vaccines can be pooled into the trust in vaccines variable that is also influenced by covid risk perceptions and knowledge about the pandemic. We also assess whether risk aversion may influence trust in vaccines. Risk aversion may be correlated with trust in vaccines. We control for academic influence with class FE. We include models without and with demographic controls (age, sex, siblings, and birth rank). One belief related to vaccines found in Malawi is that women can get infertile from vaccination. This may cause women to trust vaccines less.

5) Trust in vaccine=f(covrisk perception, knowledge index, vaccine beliefs, risk aversion)

Finally, related to Figure 1 we run a number of vaccine demand related models. The first is a model for whether the students would recommend vaccination for adults. The second is for whether the students themselves would like to get vaccinated (passive demand). The third model is for whether they have tried to get vaccinated (active demand), and the final is a model for those have actually been vaccinated (successful active demand). We assume that these vaccine demand models are a function of the trust in vaccines, knowledge index, covid risk perceptions, exposure among friends and relatives, and risk aversion. We control for academic influence and class effects with class FE.

6) Vaccine demand=f(covrisk perception, trust in vaccines, knowledge index, exposure, risk aversion)

We tested for endogeneity of trust with IV-models using vaccine beliefs as instruments. These were found to be strong instruments for trust in vaccines and satisfied the statistical validity tests but trust in vaccines was only found to be endogenous in the recommend vaccination model. We have therefore included only the IV model results for this model and included panel data versions with class FE only for the other vaccine demand models.

For the second conceptual model (Figure 2) we have specified two additional base models, the first for the facemask use score. We propose that the facemask use score is a function of covid risk perceptions, information updating frequency, knowledge about the pandemic, academic influence, exposure among friends and relatives, and demographic variables (age, sex, siblings, birth rank), and risk aversion. We alternatively control for academic influence with class FE as a robustness check for the other variables.

7) Facemask use score=f(covrisk perceptions, info frequency update, knowledge index, exposure, academic influence, demographics, risk aversion)

A final model is for self-reported corona infection rounds. We hypothesized that corona infection is a function of facemask use score, exposure through relatives, friends and cohabitants, covid risk perceptions, and academic influence or class structure that also may cause exposure or systematic protective measures. We hypothesize that those who have been more careful with their facemask use, as measured with a higher facemask use score, are less likely to have been infected. We also hypothesize that those who have relatives, friends and cohabitants that have been infected, also are more likely to have been infected themselves. On the other hand, we hypothesize that those who perceive the covid risk to be high also have taken more precautionary measures and are therefore less likely to have been infected. Finally, we assessed the effect of study program and study year on the likelihood of being infected. The class structure may also influence how the pandemic has spread among students. This effect may also have come in relation to who they cohabit with in the university. We started with a simple model to assess how facemask use score and exposure from friends and relatives influenced the likelihood of having been infected before assessing the impact of cohabitants and university class structure in RE and FE models, and finally also included demographic controls.

8) Corona infected=f(exposure, facemask use score, covidrisk perception, academic/class influence)

We cannot rule out that important variables have been omitted and creating omitted variable bias. Here are multiple endogeneity issues and the results should be viewed critically and be interpreted with care. We should therefore also not give too much emphasis to the size of the potentially biased estimated coefficients. Such bias may also have caused a change in the sign of the coefficients. We still use the sign and significance to cautiously interpret the results with our conceptual framework and hypotheses as a guiding framework. Results that are consistent with the theoretical framework and robust to alternative specifications can give tentative

indications that theoretical hypotheses are correct. In the next section we present the results with interpretations based on the theoretical framework.

7 Results

We start by first assessing factors influencing or being correlated with covid risk perceptions. These were hypothesized to be a function of the academic influence, religious affiliation, and exposure to the virus among friends and relatives.

Table 3 presents the covid risk preference models where variables other than religion dummies have been implemented in a stepwise way to assess the stability of the religion variables when adding other potential explanatory variables that may influence risk perceptions. Students associated with the Seventh Day Adventists and Pentecostal religions were less likely to be worried about covid risks (significant at 1 and 5% levels respectively in all models) than Roman Catholics which were used as the benchmark religion. Mormons and Sunni Muslims perceived the covid risks to be significantly higher than Roman Catholics but these groups were rather small. When it came to the academic influence, we see that BSc-students perceived the covid risk to be higher than MSc-students and among BSc-students the risk perceptions declined with study year up to the third study year such that risks were perceived to be highest for first year BSc-students. None of the exposure variables were significant and the same applied also to demographic variables.

Table 3. Covid risk perception models

	RE Model1	RE Model2	RE Model3	RE Model4
Religion: Base: Roman Catholic	0	0	0	0
Anglican	-0.240	-0.189	-0.194	-0.210
	(0.202)	(0.199)	(0.200)	(0.196)
Seventh Day Adventist	-0.229***	-0.212***	-0.206***	-0.203***
	(0.069)	(0.070)	(0.070)	(0.069)
Central African Presbyterians	-0.027	-0.0115	-0.01	-0.0138
	(0.065)	(0.065)	(0.065)	(0.064)
Pentecostal	-0.196**	-0.182**	-0.180**	-0.187**
	(0.087)	(0.087)	(0.089)	(0.088)
Jehova's Witnesses	-0.311	-0.318	-0.311	-0.314
	(0.272)	(0.281)	(0.279)	(0.286)
Mormon	0.218***	0.176**	0.168**	0.135
	(0.046)	(0.078)	(0.085)	(0.100)
Sunni Muslim	0.148*	0.144*	0.152*	0.168*
	(0.078)	(0.086)	(0.085)	(0.091)
No Religion	-0.278	-0.275	-0.264	-0.284
	(0.345)	(0.346)	(0.344)	(0.337)
Other	-0.0873	-0.0751	-0.0746	-0.0864
	(0.093)	(0.091)	(0.091)	(0.093)
Study: Base: MasterMix		0	0	0
Business/Economics		0.270**	0.304***	0.262***
		(0.109)	(0.101)	(0.083)
AgricEngineer		0.250**	0.287***	0.251**
		(0.122)	(0.111)	(0.103)
Food/Nutrition		0.282**	0.311***	0.269***
		(0.123)	(0.110)	(0.088)
Animal/Veterinary		0.286**	0.315**	0.278**
		(0.138)	(0.126)	(0.110)
Environment/NRM		0.174	0.204*	0.168*
		(0.119)	(0.112)	(0.099)
Extension/Gender/Community		0.223**	0.251**	0.204**
		(0.114)	(0.104)	(0.088)
Study year: Base: First year BSc		0	0	0
Second year BSc		-0.091*	-0.101**	-0.093*
		(0.051)	(0.051)	(0.053)
Third year BSc		-0.192***	-0.208***	-0.200***
		(0.050)	(0.054)	(0.053)
Fourth year BSc		-0.164**	-0.189**	-0.177**
		(0.066)	(0.080)	(0.088)
First year MSc		-0.0151	-0.0172	-0.0809
		(0.143)	(0.150)	(0.174)
Second year MSc		0	0	0
Age			0.005	0.004
			(0.009)	(0.009)
Sex			-0.025	-0.036

			(0.052)	(0.056)
COV sick relatives=0				0
COV sick relatives=1				-0.003
				(0.074)
COV sick relatives=2				0.016
				(0.066)
COV sick friend=0				0
COV sick friend=1				-0.112
				(0.070)
COV sick friend=2				0.052
				(0.061)
COVID died known person, dummy				0.004
				(0.087)
Lived with corona infected cohabitant, dummy				-0.041
				(0.070)
Constant	1.777***	1.635***	1.504***	1.593***
	(0.047)	(0.114)	(0.246)	(0.236)
Observations	764	764	764	764
R-squares within	0.028	0.029	0.029	0.043
R-squares between	0.002	0.272	0.284	0.264
R-squares overall	0.026	0.042	0.043	0.055
Wald Chi2	224.8	249.3	242.4	415.9
Prob > chi2	0.0000	0.0000	0.0000	0.0000

Note: Cluster-robust standard errors in parentheses, clustering at class level. Significance levels: * p<0.05, ** p<0.01, *** p<0.001

Next, we assess factors that influence or are correlated with the frequency of information updating about the corona pandemic among students. We suggested that the academic influence affects the frequency of information updating on the pandemic. Compared to other people in Malawi, students are more likely to use the internet to get updated information and thereby also updating themselves more frequently. This may vary with study program and study year for students. We also suggested that the covid risk perception is influencing the information updating frequency.

Table 4 presents the results for variables associated with information updating frequency. We find no significant differences across study programs in terms of updating frequency. However, third year BSc-students update themselves significantly less frequently than first year students.

Table 4. Information updating frequency models

	RE model infofrequpdate1	RE model infofrequpdate2	RE model infofrequpdate3
Study: Base: MasterMix	0	0	0
Business/Economics	-0.006	-0.004	0.070
	(0.170)	(0.173)	(0.141)
AgricEngineer	-0.002	-0.007	0.078
	(0.172)	(0.175)	(0.145)
Food/Nutrition	0.069	0.063	0.135
	(0.170)	(0.173)	(0.141)
Animal/Veterinary	0.059	0.055	0.117
	(0.173)	(0.176)	(0.145)
Environment/NRM	0.076	0.071	0.139
	(0.174)	(0.178)	(0.147)
Extension/Gender/Community	0.079	0.076	0.142
	(0.171)	(0.174)	(0.143)
Study year: Base: First year BSc	0	0	0
Second year BSc	-0.019	-0.018	-0.039
	(0.037)	(0.036)	(0.038)
Third year BSc	-0.055**	-0.053**	-0.087***
	(0.024)	(0.024)	(0.025)
Fourth year BSc	0.012	0.006	-0.043
	(0.057)	(0.056)	(0.055)
First year MSc	0.031	0.016	0.031
	(0.168)	(0.172)	(0.161)
Second year MSc	0	0	0
Covid risk perception=0	0	0	0
Covid risk perception=1	0.044	0.057	0.078*
	(0.046)	(0.045)	(0.046)
Covid risk perception=2	0.176***	0.180***	0.178***
	(0.034)	(0.034)	(0.033)
Age			0.010**
			(0.004)
Sex			-0.093***
			(0.025)
Birth rank			-0.006
			(0.007)
Siblings			0.006
			(0.007)
Constant	0.426**	0.355**	0.122
	(0.173)	(0.169)	(0.174)
Observations	764	764	764
R-squares, within	0.033	0.041	0.083
R-squares, between	0.334	0.343	0.298
R-squares, overall	0.059	0.066	0.101
Wald Chi2	87	99.5	125.5
Prob > chi2	0.0000	0.0000	0.0000

Note: Cluster-robust Standard errors in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

A higher covid risk perception is associated with significantly more frequent information updating as we hypothesized. The model with demographic variables shows that older students update themselves significantly more frequently and female students update themselves less frequently than male students.

We investigated the knowledge about the corona pandemic among the university students and generated a knowledge index. We assess the variation in this knowledge index among students in different study programs and study years. We hypothesized that students that have been longer in the university have more knowledge as they have been more exposed to the academic university environment, and this has influenced their knowledge. We hypothesize that the information updating frequency positively influences their factual knowledge about the pandemic and assume that risk perceptions influence knowledge through the information updating behavior. We also assess whether demographic variables such as age, sex, birth rank, and number of siblings in the family may affect this knowledge index. Here could be knowledge spillover effects among siblings, especially from older to younger siblings.

The model results are presented in Table 5. We find surprisingly little significant variation across study programs and study years, but the knowledge index is significantly higher among first year MSc-students than among first year BSc-students. A higher information updating frequency is significantly and positively associated with the knowledge index in one of the models but significant at 10% level only. Female students had a significantly lower knowledge index than male students. Students with a higher number of siblings had a lower knowledge index and students with a higher birth rank had a higher knowledge index.

Next, in Table 6, we investigate how three types of beliefs about corona vaccination is influenced by religion, knowledge about the pandemic, exposure among relatives and friends, and covid risk perception. We hypothesized that; a) better knowledge about the pandemic also is associated with better knowledge and more trust in the scientific knowledge about vaccines and more positive attitudes towards vaccination; b) some religious affiliations are associated with vaccination fears and hesitancy against vaccination and an inclination to warn others against vaccination; c) exposure to infections and sickness among friends and relatives with

Table 5. Knowledge index models: Factors associated with knowledge about the pandemic

	RE model knowledgeindex1	RE model knowledgeindex2
Info frequency update	0.575*	0.427
	(0.268)	(0.285)
First year BSc	0	0
Second year BSc	-0.00611	-0.0141
	(0.243)	(0.256)
Third year BSc	-0.024	-0.0312
	(0.262)	(0.286)
Fourth year BSc	0.529	0.39
	(0.335)	(0.364)
First year MSc	1.003**	0.955*
	(0.362)	(0.430)
Second year MSc	-0.0697	-0.122
	(0.452)	(0.553)
MasterMix	0	0
Business/Economics	-0.367	-0.484
	(0.253)	(0.268)
AgricEngineer	0.205	0.0705
	(0.269)	(0.294)
Food/Nutrition	0.158	0.0786
	(0.239)	(0.248)
Animal/Veterinary	0.0744	0.00556
	(0.344)	(0.347)
Environment/NRM	0.167	0.0665
	(0.396)	(0.416)
Extension/Gender/Community	0	0
Age		-0.00531
		(0.026)
Sex		-0.774***
		(0.170)
Siblings		-0.158**
		(0.050)
Birth rank		0.151***
		(0.044)
Constant	4.997***	5.800***
	(0.377)	(0.648)
Observations	764	764
R-squares, within	0.009	0.056
R-squares, between	0.22	0.159
R-squares, overall	0.027	0.064
Wald Chi2	1312	1901.7
Prob > chi2	0.0000	0.0000

Note: Cluster-robust Standard errors in parentheses: * p<0.05, ** p<0.01, *** p<0.001

Table 6. Covid Vaccine belief models

	Vaccine protects against infection	Vaccine protects against serious sickness	Covid vaccine warning
Religion: Base: Roman Catholic	0	0	0
Anglican	-0.163	-0.058	0.114
	(0.291)	(0.218)	(0.127)
Seventh Day Adventists	-0.203*	-0.030	0.023
	(0.113)	(0.107)	(0.044)
Central African Presbyterians	-0.280***	0.116	-0.058
	(0.089)	(0.092)	(0.041)
Pentecostal	-0.121	0.016	(0.020)
	(0.112)	(0.130)	(0.045)
Jehova's Witnesses	0.15	0.167	0.009
	(0.290)	(0.131)	(0.107)
Mormon	0.336	0.682***	-0.152***
	(0.614)	(0.080)	(0.051)
Sunni Muslim	0.087	-0.037	-0.101
	(0.190)	(0.186)	(0.071)
No Religion	-0.471**	0.291*	-0.133***
	(0.220)	(0.168)	(0.038)
Other	0.049	0.037	(0.064)
	(0.134)	(0.114)	(0.042)
Covid risk perception	0.187***	0.041	-0.0323*
	(0.044)	(0.039)	(0.019)
Knowledge index	-0.0113	0.122***	0.00357
	(0.015)	(0.010)	(0.007)
Lived with corona infected cohabitant	-0.004	-0.033	0.020
	(0.080)	(0.070)	(0.030)
Covid sick relatives=0	0	0	0
Covid sick relatives=1	-0.119	0.119	-0.051
	(0.085)	(0.078)	(0.038)
Covid sick relatives=2	0.0103	0.0693	-0.044
	(0.072)	(0.069)	(0.035)
Covid sick friend=0	0	0	0
Covid sick friend=1	-0.159**	0.0571	0.0381
	(0.081)	(0.073)	(0.044)
Covid sick friend=2	0.0425	0.105	0.0811**
	(0.096)	(0.076)	(0.035)
Sex			0.0227
			(0.023)
Constant	0.683***	0.660***	0.191***
	(0.159)	(0.134)	(0.069)
Observations	763	763	764
R-squares, within	0.061	0.134	0.027
R-squares, between	0.099	0.073	0.040

R-squares, overall	0.064	0.129	0.028
Wald Chi2	121.7	588.5	55.7
Prob > chi2	0.0000	0.0000	0.0000

Note: Cluster-robust standard errors in parentheses: * p<0.10, ** p<0.05, *** p<0.01.

more serious outcomes trigger a more positive attitude towards vaccination. We suggest that the academic influence goes primarily through the knowledge index and control for class FE.

Table 6 shows that Central African Presbyterians, Seventh Day Adventists, and those with covid sick friend(s) are less likely to believe that the covid vaccine reduces the likelihood of infection and the same is the case for those without a religion while those who perceive the covid risk to be high are more inclined to believe that the vaccine reduces the risk of infection. The knowledge index was positively related to the belief that the vaccine protects against serious sickness and so did the few Mormons in our sample. The Mormons and those without religion were less likely to think that people should be warned against vaccinating themselves against covid, while those with seriously covid sick friend were more inclined to warn against vaccination.

Table 7 focuses on variables associated with trust in vaccines. We hypothesized that; a) the different beliefs about vaccines can be strong predictors of the 5-level trust in vaccines variable; b) trust in vaccines is influenced by covid risk perceptions such that those who perceive the risk to be high are placing more trust on the vaccines; c) those with higher knowledge index have higher trust in vaccines; d) more risk averse individuals have higher trust in vaccines as they put more weight on the covid risk; e) female students have less trust in vaccines than male students.

Table 7 shows that all the three beliefs about vaccines assessed in Table 6 are significantly correlated with trust in vaccines with the beliefs that vaccines protect against infection and against serious sickness are positively correlated with trust and those that think people should be warned against vaccination have less trust in vaccinates. Students that perceive the covid risk to be high have more trust in vaccines and so do those with more knowledge about the pandemic. More risk averse students have higher trust in vaccines. Female students have significantly less trust in vaccines than male students. This implies that the results related to trust in vaccines are in line with our hypotheses.

Table 7. Trust in vaccines models

	FE Model1 Trust in vaccines	FE Model2 Trust in vaccines
Covid risk perception	0.218***	0.213***
	(0.065)	(0.065)
Vaccine protects against infection=0	0	0
Vaccine protects against infection =1	0.0172	0.0284
	(0.179)	(0.178)
Vaccine protects against infection =2	0.653***	0.647***
	(0.095)	(0.095)
Vaccine protects against serious sickness=0	0	0
Vaccine protects against serious sickness =1	-0.327*	-0.330*
	(0.196)	(0.195)
Vaccine protects against serious sickness =2	0.283**	0.259**
	(0.117)	(0.116)
COVID vaccine warning attitude	-0.373***	-0.372***
	(0.122)	(0.122)
log(Knowledge index)	0.238**	0.200**
	(0.100)	(0.101)
Age		0.0267*
		(0.014)
Sex		-0.250***
		(0.092)
Siblings		-0.0116
		(0.027)
Birth rank		0.00371
		(0.027)
Risk aversion indicator		0.0514**
		(0.023)
Constant	2.007***	1.453***
	(0.199)	(0.389)
Observations	763	763
Adjusted R-squared	0.078	0.094
R-squares, within	0.144	0.164
R-squares, between	0.292	0.136
R-squares, overall	0.154	0.161
Wald Chi2	17	11.5
Prob > chi2	0.0000	0.0000

Note: Models with Class Fixed Effects. Cluster-robust standard errors with Class as clusters. Significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Next, we look at the vaccine demand related models in Table 8. The first model assesses factors influencing whether the students would recommend vaccination for adults, the second whether the students themselves would like to get vaccinated (passive demand), the third whether they

have tried to get vaccinated (active demand), and the final whether they have actually been vaccinated (successful active demand). We hypothesized that these vaccine demand models are increasing in the trust in vaccines, increasing in the knowledge index, increasing with covid risk perceptions, increasing with exposure among friends and relatives, and increasing with risk aversion. We can only test whether the correlations are positive and significant.

We tested for endogeneity of trust with IV-models using vaccine beliefs as instruments. These were found to be strong instruments for trust in vaccines and satisfied the statistical validity tests but trust in vaccines was only found to be endogenous in the recommend vaccination model. We have therefore included only the IV model results for this model and included panel data versions with class FE only for the other vaccine demand models.

Table 8 shows a strong positive correlation between trust in vaccines and the vaccine recommend and the three vaccine demand-related variables (all significant at 1% levels). The knowledge index was significantly positively correlated with the three vaccine demand variables while the covid risk perception was not significantly related with any of the four demand indicators. Students that have had covid sick relatives were more likely to actively demand vaccination and to recommend vaccination for adults. Students that were more likely to warn against vaccination were also less likely to recommend vaccination for all adults. Risk aversion was weakly positively correlated with demand and significantly positively correlated with actual vaccination.

Based on the second conceptual model (Figure 2) we specified two additional base models, the first for the facemask use score. We hypothesized that the facemask use score is increasing with covid risk perceptions, increasing with information updating frequency, increasing with knowledge about the pandemic (knowledge index), increasing with academic influence (years of study), and increasing with exposure to the pandemic among friends and relatives, and increasing with risk aversion. We alternatively ran models with class RE and class FE and demographic variables (age, sex, siblings, birth rank). The results are presented in Table 9.

Table 8. Vaccination demand related models

	IV Covid vaccine recommend to all adults	FE Like to vaccinate/Is vaccinated	FE Tried to vaccinate/Is vaccinated	FE Is vaccinated
Trust in vaccine	0.216***	0.234***	0.197***	0.132***
	(0.038)	(0.010)	(0.012)	(0.015)
Knowledge index	0.007	0.022***	0.032***	0.032***
	(0.007)	(0.007)	(0.006)	(0.007)
Covid risk perception	0.035	0.034	0.015	-0.034
	(0.024)	(0.020)	(0.025)	(0.023)
Lived with corona infected cohabitant	-0.032	-0.031	0.028	0.017
	(0.032)	(0.031)	(0.038)	(0.037)
COV sick relatives=0	0	0	0	0
COV sick relatives=1	0.009	-0.030	0.037	0.077*
	(0.048)	(0.042)	(0.046)	(0.045)
COV sick relatives=2	0.070**	0.063	0.129***	0.119***
	(0.030)	(0.044)	(0.045)	(0.038)
COV sick friend=0	0	0	0	0
COV sick friend=1	-0.010	0.019	0.041	0.026
	(0.036)	(0.043)	(0.042)	(0.039)
COV sick friend=2	-0.035	0.037	0.022	0.032
	(0.043)	(0.049)	(0.046)	(0.045)
COVID vaccine warning attitude	-0.128***	0.025	0.071*	0.041
	(0.044)	(0.044)	(0.039)	(0.042)
Risk aversion indicator	0.003	0.002	0.010	0.015*
	(0.008)	(0.007)	(0.009)	(0.009)
Constant	0.0419	-0.348***	-0.474***	-0.384***
	(0.087)	(0.063)	(0.073)	(0.072)
Observations	763	764	764	764
Adjusted R-squared		0.379	0.299	0.194
R-squares, within	0.230	0.388	0.309	0.205
R-squares, between	0.285	0.444	0.421	0.296
R-squares, overall	0.269	0.391	0.317	0.212
Wald Chi2	694.1	103.1	66.4	22.8
Prob > chi2	0.0000	0.0000	0.0000	0.0000

Note: Models with Class Fixed Effects. Cluster-robust standard errors, clustering at class level.

Significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Table 9. Facemask use score models

	RE model Facemask use score	FE model Facemask use score
Covid risk perception	0.925***	0.883***
	(0.180)	(0.185)
Knowledge index	0.0681	0.0755
	(0.053)	(0.052)
Info updating frequency	3.259***	3.252***
	(0.370)	(0.372)
Lived with corona infected cohabitant	-0.00132	-0.162
	(0.223)	(0.228)
Covid sick relatives	-0.0856	-0.0457
	(0.140)	(0.144)
Covid sick friends	-0.152	-0.159
	(0.157)	(0.158)
Age	0.107***	0.116***
	(0.037)	(0.037)
Sex	-0.304	-0.334
	(0.232)	(0.234)
Siblings	0.152*	0.197***
	(0.078)	(0.071)
Birth rank	-0.149*	-0.198**
	(0.079)	(0.077)
Risk aversion indicator	0.0289	0.0461
	(0.053)	(0.051)
MasterMix	0	
Business/Economics	2.441***	
	(0.580)	
AgricEngineer	2.951***	
	(0.662)	
Food/Nutrition	1.921***	
	(0.715)	
Animal/Veterinary	1.774***	
	(0.631)	
Environment/NRM	2.424***	

	(0.570)	
Extension/Gender/Community	2.391***	
	(0.661)	
First year BSc	0	
Second year BSc	-1.010***	
	(0.275)	
Third year BSc	-2.019***	
	(0.346)	
Fourth year BSc	-2.112***	
	(0.509)	
First year MSc	-1.466**	
	(0.716)	
Second year MSc	0	
Constant	5.554***	6.376***
	(1.213)	(0.970)
Observations	764	764
Adjusted R-squared		0.204
R-squares, within	0.217	0.215
R-squares, between	0.572	0.026
R-squares, overall	0.27	0.183
Wald Chi2	6001.4	22.5
Prob > chi2	0.0000	0.0000

Note: Cluster-robust standard errors, clustering at class. Significance levels: * p<0.10, ** p<0.05, *** p<0.01

Table 9 shows that the facemask use score is significantly positively correlated with covid risk perception and the information updating frequency, supporting the related hypotheses. It is not significantly correlated with the knowledge index and the exposure to the pandemic among friends and relatives. Many of the academic study program and year of study variables were significant but the effect was opposite of what we hypothesized. First year BSc-students are the ones with highest facemask use score and all BSc-program students had higher facemask use scores than MSc-program students. We can therefore reject the hypothesis that there is an incremental effect of academic influence. Rather it seems that new students are more careful than more experienced students. Still, the age of students was significant and with a positive sign, indicating that older students are more careful with their facemask use. Students with

more siblings had a significantly higher facemask use score while students with a higher birth rank had a significantly lower facemask use score.

We end our analyses with an assessment of variables correlated with self-reported corona infection among students. We hypothesized that the likelihood of corona infection is negatively influenced by facemask use score, positively influenced by exposure through relatives, friends and cohabitants, negatively influenced by covid risk perceptions (triggering more careful behavior in other ways). Finally, we assessed the effect of study program and study year on the likelihood of being infected. The class structure may also influence how the pandemic has spread among students. This effect may also have come in relation to who they cohabit with in the university. We started with a simple model to assess how facemask use score and exposure from friends and relatives influenced the likelihood of having been infected before assessing the impact of cohabitants and university class structure in RE and FE models, and finally also included demographic controls. The results are presented in Table 10.

The first model in Table 10 shows that the facemask use score is significantly negatively correlated with corona infection in line with our hypothesis. The same applies to exposure to the pandemic among relatives and friends which both are significantly positively correlated with corona infection while there was no significant correlation with covid risk perception.

In the second model in Table 10 we only added a variable for whether the students had lived with a corona infected person and this variable came out as highly significant while the exposure to covid among relatives and friends variables became insignificant. This may be because they had lived with their relatives and friends that were infected and this is picked up by the new variables. While the facemask use appears to have had some effect on the likelihood of being infected, it has not been very efficient at protecting students against infection at their homes where facemask use may have been more relaxed.

The third model in Table 10 assesses the variation in likelihood of having been infected across the different study programs and years of study. The model shows that first year MSc-students and third year and fourth year BSc-students are those with highest likelihood of having been infected. Finally, none of the demographic variables were significantly correlated with the likelihood of being infected.

Table 10. Factors associated with students having been corona infected

	RE Model1 Corona infected	RE Model2 Corona infected	RE Model3 Corona infected	FE Model Corona infected
Facemask use score	-0.009**	-0.009**	-0.006	-0.006
	(0.004)	(0.004)	(0.004)	(0.005)
Covid risk perception	-0.009	-0.003	0.003	0.002
	(0.021)	(0.021)	(0.021)	(0.021)
Covid sick relatives	0.0480***	0.018	0.022	0.010
	(0.018)	(0.018)	(0.018)	(0.018)
Covid sick friends	0.0378**	0.013	0.003	-0.002
	(0.017)	(0.017)	(0.018)	(0.018)
Lived with corona infected		0.213***	0.207***	0.205***
cohabitant		(0.032)	(0.031)	(0.032)
Study: Base: MasterMix			0.000	
Business/Economics			0.0930*	
			(0.054)	
AgricEngineer			0.139**	
			(0.059)	
Food/Nutrition			0.122***	
			(0.047)	
Animal/Veterinary			0.096	
			(0.059)	
Environment/NRM			0.193***	
			(0.069)	
Extension/Gender/Community			0.111**	
			(0.054)	
First year BSc			0.000	
			(.)	
Second year BSc			0.045	
			(0.028)	
Third year BSc			0.115***	
			(0.034)	
Fourth year BSc			0.106***	
			(0.033)	
First year MSc			0.473***	

			(0.085)	
Second year MSc			0.000	
Age				0.003
				(0.004)
Sex				0.051
				(0.034)
Siblings				-0.005
				(0.009)
Birth rank				0.001
				(0.010)
Risky aversion indicator				0.002
				(0.007)
Constant	0.222***	0.201***	-0.038	0.086
	(0.063)	(0.065)	(0.067)	(0.115)
Observations	764	764	764	764
R-squares, within	0.024	0.078	0.091	0.084
R-squares, between	0.303	0.399	0.553	0.36
R-squares, overall	0.038	0.095	0.132	0.1
Wald Chi2	37.7	78.7	1363.9	6.3
Prob > chi2	0.0000	0.0000	0.0000	0.0000

Note: Cluster-robust standard errors in parentheses, clustering on class. Significance levels: * p<0.10, ** p<0.05, *** p<0.01.

8 Discussion

Our sample of university students is far from nationally representative in terms of age, knowledge, and cognitive ability. However, the students come from all over the country and almost all of them have a rural background, come from many different ethnic groups, districts, and with diverse religious backgrounds. We also made sure to draw a sample from different study programs and study years to help us assess possible academic influences across specializations and years of study. This has been useful in relation to the investigation of the academic influence on the variation in covid risk perceptions, information updating behavior, and knowledge about the pandemic, together with the potential influence of religious affiliations, and exposure to the pandemic among relatives and friends.

We suggested that the academic influence give students a better educated understanding of the risks involved with the pandemic but the biological and statistical understanding of this may vary with their type of study and year of study in the university. Their religion may also influence their risk perceptions. Certain types of religions may be associated with the belief that the religion protects against the pandemic, and we hypothesize that such religions have a negative influence on the covid risk perception. Personal experience with the virus among friends and relatives may also influence their risk perceptions, especially if they know someone who has been seriously sick or who had died from COVID-19.

However, before we go to the findings related to our conceptual frameworks, it is worth noting a few insights from the basic descriptive statistics. The public official statistics on the pandemic in Malawi indicate that fairly few have been infected and died from the pandemic. However, there could be gross under-reporting of such statistics due to the lack of testing capacity and weak registration system for the deaths. Table 2 indicates that 59% of the students have had at least one relative that has been sick from COVID-19 and 39% have had at least one relative that has been seriously sick from COVID-19 (at least they believe so). 68% stated that they had at least one friend that has been sick from COVID-19 and 32% had at least one friend that had been seriously sick due to COVID-19. 88% reported that they knew at least one person that had died from COVID-19. At least the high numbers for relatives indicate that the disease has also reached far into rural areas as we can assume that most of the relatives of the students live in rural areas of the country. On the other hand, many of the friends may be fellow students. Also 32% of the students have had a corona-infected cohabitant. While these statistics are not directly comparable with the national public statistics, they indicate much higher infection rates than those in the public statistics. About 18% of the students thought they have been infected based on their own judgement of the symptoms against less than 5% of the Malawian population according to the national statistics. As the students are young, it is highly likely that some of them have been infected with the omicron variants without having any symptoms, meaning that the 18% self-reported infection rate also is an underestimate. It is difficult to know whether the students are less or more likely to have been infected than other people in the country. On the one hand students are better informed, more knowledgeable, and more able to protect themselves. On the other hand, they live quite closely together and may easily infect each other. If they believe that the disease will not affect them seriously, they may take less care than older people that may be more vulnerable to the disease.

Of the total samples, 28% of the students stated that they had received at least one dose of a COVID vaccine. This number is also much higher than the national average and one could think that this could be due to the favorable location they live in as university students. However, 73% of the students stated that they obtained their vaccination at their home place and only 13% stated that they obtained the vaccine at the university. This could be related to school closing when the first vaccine was being administered. The high vaccination rate may therefore be due to them being better informed than the general public, and their high awareness may have made them take more active steps to get vaccinated at their home places.

Our findings regarding the academic influence on covid risk perceptions were surprising. While we suggested a gradual influence that would be stronger with the number of years of study, we found the opposite. It was the first year BSc-students who perceived the covid risk to be most severe. There were less significant variations in information updating behavior across study programs and study years, but third year BSc-students updated themselves less frequently than other students. There were also few significant differences in average knowledge index values across study programs and study years but first year MSc-students had a significantly higher knowledge index than other students in other programs and study years. When it came to facemask use scores, the first year BSc-students had higher score on average than all other students and the facemask use score declined with study year among BSc-students. When it came to the likelihood of corona infection, this likelihood was higher among third and fourth year BSc-students and especially first year MSc-students. In general, the variation across the different types of study programs were fairly small.

When it comes to the influence from religions, we assessed this using Roman Catholics as the benchmark. We were particularly interested in how religious affiliation may affect covid risk perceptions, vaccine-related beliefs, and thereby protective measures towards infections. We found significant variations in covid risk perceptions across religions with Seventh Day Adventists and Pentecostals perceiving the personal covid risks to be lower than what those belonging to other religions on average believed. When it came to beliefs related to vaccines, Seventh Day Adventists and Central African Presbyterians were less inclined to believe that the vaccine protects against corona infection while or small sample of Mormons were more inclined to believe that the vaccine protects against serious sickness and were less likely to find

it appropriate to warn against vaccination. As two additional robustness checks we expanded the trust in vaccine models in Table 7 and the demand for vaccine models in Table 8 but adding the Religion dummy variables. The results for the Religion variables are presented in Appendix 1, Table A1 for trust in vaccines and in Table A2 for the demand models. The only other difference between the models in Table 8 and Table A2 is that the trust in vaccine was removed as a RHS variable in Table A2. The effect of religion disappears in Table A2 if trust in vaccines is added as well. The basic finding from these additional models is that Seventh Day Adventists have significantly less trust in vaccines and this also results in them also having a lower demand for vaccination (Table A2). On the other hand, Jehova's Witnesses had significantly higher trust in vaccines than the Roman Catholics and were significantly more likely to recommend that all adults should get vaccinated, and they were also more likely to be vaccinated themselves. When adding religion dummies to the facemask use score models, the only significant effect was that Jehova's Witnesses had a significantly higher average facemask use score. The only significant change we found when adding religion dummies to the corona infection models, was that Sunni Muslims were significantly less likely to have been corona infected based on the self-reported data on infections.

We hypothesized that the knowledge about the pandemic influenced the beliefs and behavioral responses of the students to the pandemic. It may also affect their covid risk perceptions, but it depends on their initial covid risk perceptions whether more knowledge make them perceive the covid risks to be higher or lower but knowledge should make their beliefs about the covid risks more accurate. We hypothesized that more knowledge should enhance the positive beliefs related to the usefulness of vaccination and reduce the vaccine fears and enhance the trust in vaccines. We found that the knowledge index was strongly positively correlated with the belief that vaccines protect against serious sickness, a finding that also has strong scientific backing. The knowledge index was not significantly related to the belief that the vaccine protects against infection or vaccine fears/inclination to warn against vaccination. The knowledge index was positively correlated with trust in vaccines and with demand for vaccines even if the trust in vaccines was included as a separate variable in the demand for vaccine models. Surprisingly, the facemask use score was not significantly correlated with the knowledge index.

The 5-level Likert scale we used to capture trust in vaccines turned out to be a useful variable. Trust in vaccines captured and balanced the beliefs related to vaccines and also captured the

covid risk perceptions and the knowledge index about the pandemic (Table 7) and in the next step it was also strongly correlated with the three demand for vaccines variables, including actual vaccination. The analysis gives insights into the importance of vaccine trust to stimulate vaccine demand and ways to enhance trust in vaccines. These insights can be important for Malawi to ensure a successful vaccine campaign. The central role of religion in the country also points towards working with religious leaders to build trust in vaccines and build knowledge about the pandemic.

We also hypothesized that female students could be more skeptic about vaccination because of some beliefs that seem to float around in Malawi that vaccination can cause infertility of women. While we did not ask directly about this belief, we investigated whether the covid risk perceptions and the inclination to warn against vaccination were more likely among female than male students. However, we did not find that the female dummy variable was significantly related to covid risk perceptions or the inclination to warn against vaccination. On the other hand, when we included the gender variable as a control variable in several of the other models, we found it to be significant in several cases. Female students were updating themselves significantly less frequently than male students and had a significantly lower knowledge index than male students. They also had significantly less trust in vaccines. The female dummy was not significantly correlated with the demand for vaccines when trust in vaccines was included in the demand models. However, it became significant when the trust in vaccines variable was omitted from the demand for vaccine models. The female dummy was not significantly correlated with the facemask use score and the self-reported corona infection.

The use of facemasks was by far the most popular tool used to protect against corona infection among the students in our sample (Holden et al., 2022). 53% of all the students reported use of facemask as the most important method to protect oneself, 18% reported it to be the second most important protection method, and 11% reported it to be the third most important protection method. In this study we created a facemask use score variable based on the frequency of use of facemasks in nine different kinds of settings.

In our analysis in Table 9 we found that the facemask use score was significantly positively correlated with the covid risk perception and the information updating frequency while it was not significantly correlated with the knowledge index and the exposure to the pandemic among

family and friends, meaning that the analysis provides supportive evidence for two of our hypotheses. Finally, in Table 10 we found only weak evidence that the facemask use score protected students against becoming infected while exposure to the virus through family, friends, and especially cohabitants was an important determinant of infection. The fact that the students did not use facemasks much at their homes may explain this as they may have been infected at the place where they are most vulnerable and least rigid in their self-protection.

9 Conclusions

We have studied the knowledge, beliefs, religion, academic influence, information updating behavior, covid risk perceptions, attitudes and behavior related to the corona/COVID-19 pandemic among a random sample of 764 university students from 48 classes in Malawi. The data were collected in February-March 2022 during the fourth wave of the pandemic in the country and based on orchestrated interviews conducted under corona-safe restrictions in classroom environments in the university. We assessed the beliefs related to covid vaccination, trust in vaccines and demand for vaccines. We also assessed the use of facemasks which was the number one priority protection measure used by the students and mapped their self-reported use of facemasks in different environments and generated a facemask use score. We finally assessed how the facemask use score and infection exposure through family, friends and cohabitants and found the latter to be a major factor explaining self-reported infection rates while the facemask use score was only weakly reducing the likelihood of infection. It seems that infections were most likely to take place at the homes of students where they were less likely to use facemasks.

Furthermore, our study revealed that trust in vaccines were influenced by beliefs related to the vaccines as well as covid risk perceptions and that the trust in vaccines was important for the demand for vaccines. We found the vaccination rate to be much higher among the students than among the general public in Malawi and most of the students have been vaccinated at their home areas but many have attempted to get vaccinated but have failed to get vaccinated. The impression is therefore that among the university students there is still a substantial demand for vaccination while vaccination hesitancy exists among about a quarter of the students.

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Appendix 1. Additional econometric models (robustness checks)

Table A1. Trust in vaccines and religion

	Trust in vaccinee	Trust in vaccine
Religion: Base: Roman Catholic	0	0
Anglican	-0.475	-0.53
	(0.337)	(0.335)
Seventh Day Adventists	-0.425***	-0.389***
	(0.142)	(0.142)
Central African Presbyterians	0.0184	0.0406
	(0.121)	(0.121)
Pentecostal	-0.0843	-0.0647
	(0.145)	(0.145)
Jehova's Witnesses	0.768**	0.783**
	(0.315)	(0.313)
Mormon	-0.0926	-0.121
	(0.677)	(0.674)
Sunni Muslim	0.101	0.171
	(0.249)	(0.249)
No Religion	0.191	0.251
	(0.490)	(0.488)
Other	0.338**	0.343**
	(0.163)	(0.162)
All other variables like in Table 7		
Observations	763	763
Adjusted R-squared	0.106	0.12
R-squares, within	0.18	0.199
R-squares, between	0.288	0.16
R-squares, overall	0.187	0.195
Wald Chi2	9.6	8.2
Prob > chi2	0.0000	0.0000

Note: Models with Class Fixed Effects. Cluster-robust standard errors with Class as clusters. Significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Table A2. Religion and demand for vaccination models (expanded from Table 8)

	Covid vaccine recommend to all adults	Like to vaccinate/Is vaccinated	Tried to vaccinate/Is vaccinated	Is vaccinated
Religion: Base: Roman Catholic	0	0	0	0
Anglican	-0.135	0.00151	-0.136	-0.215*
	(0.137)	(0.127)	(0.133)	(0.120)
Seventh Day Adventists	-0.125**	-0.165***	-0.141**	-0.123**
	(0.047)	(0.054)	(0.060)	(0.053)
Central African Presbyterians	-0.0195	-0.0332	-0.0375	-0.0151
	(0.039)	(0.045)	(0.054)	(0.053)
Pentecostal	-0.0455	-0.111*	-0.0963	-0.0767
	(0.046)	(0.061)	(0.061)	(0.069)
Jehova's Witnesses	0.121**	0.0823	0.171	0.273*
	(0.057)	(0.123)	(0.123)	(0.136)
Mormon	0.118	-0.203	0.0398	0.233
	(0.077)	(0.253)	(0.290)	(0.293)
Sunni Muslim	-0.102	0.036	-0.171*	-0.0187
	(0.077)	(0.087)	(0.097)	(0.081)
No Religion	-0.204	0.137	0.094	0.32
	(0.226)	(0.203)	(0.333)	(0.318)
Other	0.00349	-0.00237	-0.0574	-0.0929
All other variables except trust in vaccine like in Table 8				
Observations	763	763	763	763
Adjusted R-squared	0.097	0.091	0.11	0.096
R-squares, within	0.122	0.116	0.135	0.121
R-squares, between	0.25	0.096	0.138	0.049
R-squares, overall	0.129	0.115	0.135	0.115
Wald Chi2	9.8	9	9.2	12.6
Prob > chi2	0.0000	0.0000	0.0000	0.0000

Note: Cluster-robust standard errors, clustering at class. Significance levels: * p<0.10, ** p<0.05, *** p<0.01

Appendix 2: Survey instrument

Generated by steiho, Jan 11, 2022 09:45
Questionnaire created by patrick_kawaye, Jan 08, 2022 07:05
Last modified by steiho, Jan 11, 2022 09:45

Shared with:
samkatengeza (never edited)
steiho last edited 1/11/2022 8:45:04 AM
sarahtione (never edited)

Sections: 8, Sub-sections: 0, Questions: 116.
Questions with enabling conditions: 1
Questions with validation conditions:1
Rosters: 14
Variables: 0

SMARTEX_LUANAR_The_Corona_COVID19_pandemic

Basic information

Title SMARTEX_LUANAR_The_Corona_COVID19_pandemic

INTRODUCTION

Intro

STATIC TEXT

1. This is a NORAD (Norway)-funded project that is a collaboration between Norwegian University of Life Sciences and LUANAR 2. The project aims to build academic competence at LUANAR by giving courses, organizing joint data collection related to Climate Smart Agriculture and Policy Analysis in Malawi. 3. The Corona/COVID-19 pandemic is an important reality to take into account in the project both at LUANAR and in the study areas in Malawi. 4. This project component first aims to get insights about how students at LUANAR think and behave in relation to the pandemic, and second, to build on this insight in organizing fieldwork in rural areas in Malawi that makes a broader mapping of the perceptions, knowledge and behavior related to the pandemic, and third to train a team of enumerators that can carry out corona-safe fieldwork in rural parts of the country. 5. Participation in the survey (and experiments) is voluntary. All information will be treated as confidential and not disclosed to anyone unless in anonymized and aggregated form. 6. Try to give as honest answers as you can. We are not judging you, just try to map out general attitudes, knowledge, perceptions and behavior. 7. Participants can earn some money as participants. The amount of money will partly depend on the decisions of participants in some experiments as well as their luck in some lotteries. 8. The total time this session will take is about 1 hour 30 minutes. 9. You may as a participant also be asked to participate in new rounds in the future that are of similar nature. You will also then have the freedom to refuse to participate.

Consent Are you willing to participate in the survey and experiments

V1 Consent==1

M1 Thank the participant for their time

SINGLE-SELECT

Consent

01 ○ Yes

00 ○ No

DEMOGRAPHICS

Demographics

Interview Date	DATE: CURRENT TIME — Date .....
02.Age	DATE — Age .....
03.Sex	SINGLE-SELECT — Sex 01 ○ Female 00 ○ Male
04.Ethnic group	SINGLE-SELECT — Ethnic_group 01 ○ Chewa, 02 ○ Nyanja 03 ○ Yao 04 ○ Tumbuka 05 ○ Lomwe 06 ○ Nkhonde 07 ○ Ngoni 08 ○ Sena 09 ○ Nyakyusa 10 ○ Tonga 11 ○ Lambya 12 ○ Senga 13 ○ Sukwa 14 ○ English 15 ○ Other
05.Religion	SINGLE-SELECT — Religion 01 ○ Roman Catholic, 02 ○ Anglican 03 ○ Seventh Day Adventist/Baptist 04 ○ Central African Presbyterians, 05 ○ Pentecostal, 06 ○ Jehova's Witnesses, 07 ○ Mormonism (Church of Jesus Christ of Latter-Day Saints), 08 ○ Greek/Other Orthodox, 09 ○ Sunni Muslim, 10 ○ Buddhism, 11 ○ Hinduism, 12 ○ Other religion, specify: 13 ○ No religion
06.District of origin in Malawi	SINGLE-SELECT — District 101 ○ Chitipa, 102 ○ Karonga 103 ○ Nkhata Bay 104 ○ Rumphi 105 ○ Mzimba 106 ○ Likoma 107 ○ Mzuzu City 201 ○ Kasungu 202 ○ Nkhotakota 203 ○ Ntchisi 204 ○ Dowa 205 ○ Salima 206 ○ Lilongwe 207 ○ Mchinji 208 ○ Dedza 209 ○ Ntcheu And 16 other symbols [1]
07.Village name	TEXT — Village_name .....

08.Traditional Authority name	TEXT	TA
09.Mobile phone number	NUMERIC: INTEGER _ _ _ _ _ _ _ _ _ _	Phone_number
10.Year of study	SINGLE-SELECT 01 ○ First year BSc 02 ○ Second year BSc 03 ○ Third year BSc 04 ○ Forth year BSc 05 ○ First year MSc 06 ○ Second year MSc	Year_of_study
11.Type of program	SINGLE-SELECT 01 ○ BSc 02 ○ Diploma 03 ○ MSc 04 ○ Others	Program_Type
If other specify	TEXT	SpecifyType
12.What is the name of the Study program you study?	SINGLE-SELECT 01 ○ BSc. in Agribusiness Management 02 ○ BSc. in Agriculture Economics 03 ○ BSc. in Agricultural Development Communication 04 ○ BSc. in Agricultural Education 05 ○ BSc. in Agricultural Enterprise Development and Microfinance 06 ○ BSc. in Agricultural Extension 07 ○ BSc. in Development Economics 08 ○ Diploma in Youth and Development 09 ○ Diploma in Gender and Development 10 ○ BSc. in Gender and Development 11 ○ BSc. in Food Science and Technology 12 ○ BSc. in Human Nutrition and Food Science 13 ○ BSc. in Human Sciences and Community Services 14 ○ BSc. in Agroforestry 15 ○ BSc. in Aquaculture and Fisheries Science 16 ○ BSc. in Forestry And 3 other symbols [2]	Program
12B.If others, specify E Program_Type==4	TEXT	Specify

FAMILY SITUATION

Family_situation

Question	Response
13.Marital status	SINGLE-SELECT Marital_status 01 ○ Unmarried 02 ○ Married 03 ○ Separated 04 ○ Divorced 05 ○ Widowed
14.Number of children	NUMERIC: INTEGER Number_of_children _ .
15.Are your parents alive?	SINGLE-SELECT Parents 01 ○ Yes, both are alive, 02 ○ Father is dead but my mother is alive, 03 ○ Mother has died but my father is alive, 04 ○ Both are dead
16.Number of siblings	NUMERIC: INTEGER siblings _ .
17.Number of brothers	NUMERIC: INTEGER brothers _ .
18.Birth rank	NUMERIC: INTEGER birth_rank _ .
19.What is the primary source of income for your parents if alive?	SINGLE-SELECT income 01 ○ Farming, 02 ○ Government employment, 03 ○ Private employment, 04 ○ Private business, 05 ○ Pension/Retired, 06 ○ Skilled worker; Skill type: 07 ○ Priest /religious leader, 08 ○ Chief 09 ○ Other 10 ○ Parents have passed away
If others Specify	TEXT SpecifyInc ....
20.Are your parents farmland owners?	SINGLE-SELECT parent_land 01 ○ Yes 00 ○ No
21.If yes to q.20, farmland ownership holding size of parents	NUMERIC: INTEGER parents_farmland_size _ .
22.How do you fund your studies?	MULTI-SELECT study_funds 01 ☐ Help from parents, 02 ☐ Own job and income 03 ☐ Scholarship 04 ☐ Other
If others Specify	TEXT SpecifyFunds ....

FAMILY SITUATION

Roster: 23. MAIN SOCIAL ACTIVITIES/HOBBIES

generated by fixed list

hobbies

01 Sports
02 Religious activity
03 Stay with friends
04 Computer games
05 Reading

06 Music
07 Stay with family
08 Other

24.Rank your main social activities/hobbies (Rank by importance)	SINGLE-SELECT social_activities_rank 01 ○ Very important 02 ○ Important 03 ○ Less important 04 ○ Never
If others Specify	TEXT SpecifyHobbies .....
25. How frequently do you go to Church/religious building:	SINGLE-SELECT Religious_activity 01 ○ Daily 02 ○ More than once per week 03 ○ Once a week 04 ○ 1-3 times per month 05 ○ 1-10 times per year 06 ○ Less than one time per year
26. Are you an active member of a religious group?	SINGLE-SELECT relig_active_memb 01 ○ Yes 00 ○ /no
27.If yes to previous question, do you have a church position?	SINGLE-SELECT church_position 01 ○ Yes 00 ○ No
27B. what is your position	TEXT church_duty .....

KNOWLEDGE ABOUT THE CORONA PANDEMIC

K1. In which town and country was the virus causing COVID-19 first discovered?	TEXT Corona_town_country
K2.How many waves of the virus have you had in Malawi since 2019?	NUMERIC: INTEGER number_of_waves

KNOWLEDGE ABOUT THE CORONA PANDEMIC
Roster: VARIANTS OF THE CORONA VIRUS BY NAME
generated by fixed list vtype

01 Type 1
02 Type 2
03 Type 3

K3. Mention at least three different variants of the virus by name	TEXT Variant_name

KNOWLEDGE ABOUT THE CORONA PANDEMIC
Roster: COVID DEATH JANUARY
generated by fixed list covdeathfeb22

01 Exact number
02 Minmum
03 Maximum
04 No idea

K4.How many are known to have died from COVID-19 in Malawi up to February 2022?	NUMERIC: INTEGER COVdeathfeb22
K5.How many are known to have been infected by the corona virus in Malawi up to January 2022?	NUMERIC: INTEGER CVDinfectfeb22
K6. How many of the staff at LUANAR have died from COVID-19 up to February 2022?	NUMERIC: INTEGER COVstaffdeathfeb22
K7.How large % of the students at LUANAR do you know have been sick from COVID-19 since the beginning of the pandemic?	NUMERIC: INTEGER COVstud_sick
K8.How large % of the staff at LUANAR do you think have been vaccinated against COVID-19?	NUMERIC: INTEGER COVstaffvac
K9.How large % of the students at LUANAR do you think have been vaccinated against COVID-19?	NUMERIC: INTEGER COVstudentvac
K10.What have been the main sources of information on LUANAR COVID-19 status and update?	SINGLE-SELECT COVinfo 01 ○ University Administration public announcement, 02 ○ University staff personal info., 03 ○ Fellow students, rumors, 04 ○ Newpaper, 05 ○ Radio 06 ○ Internet: University webpage, 07 ○ Other
If others Specify	TEXT COVinfo_other
K11.Does vaccination against COVID-19 protect persons against being infected by the virus?	SINGLE-SELECT vacprotinf 01 ○ Yes 00 ○ No 02 ○ Don't know

K12.Does vaccination against COVID-19 protect persons from getting seriously sick?	SINGLE-SELECT vac_prot_sick 01 ○ Yes 00 ○ No 02 ○ Don't know

KNOWLEDGE ABOUT THE CORONA PANDEMIC

Roster: VACCINES THAT WORK

generated by fixed list vac_names

01 Vaccine 1

02 Vaccine 2

03 Vaccine 3

04 Vaccine 4

K13.Which vaccines do you know about that work against COVID-19? Give names of vaccines	TEXT vcn_that_wrk .....

PERCEPTION QUESTIONS RELATED TO THE PANDEMIC

P1.Do you perceive COVID-19 represents a serious risk to your personal health?	SINGLE-SELECT COVriskpercep 01 ○ Yes 00 ○ No 02 ○ Don't know
P2. If yes to P1, why, explain	TEXT COVriskexplainperc .....
P3. If no to P1, explain	TEXT COVnoriskexplainperc .....
P4.Do you perceive it as important for your own health to vaccinate yourself against COVID-19?	SINGLE-SELECT vac_percep_imp 01 ○ Yes 00 ○ No 02 ○ Don't know

PERCEPTION QUESTIONS RELATED TO THE PANDEMIC
Roster: PROTECTION FROM CORONA
generated by fixed list

protection from corona

01 Used facemask,
02 Kept >1 meter distance to people in public spaces,
03 Reduced the number of contact persons,
04 Washed my hands many times per day,
05 Avoided handshakes,
06 Avoided crowded places
07 Used disinfectants regularly
08 Prayed to God to not get infected
09 Traditional medicine
10 Other, explain

P5. Which of these methods protect against getting infected by the corona virus?	SINGLE-SELECT protection_methods 01 ○ Yes 00 ○ No 02 ○ Don't know
P6. Rank the three most important methods above by their importance	SINGLE-SELECT protection_methods_rank 01 ○ Most important 02 ○ Second most important 03 ○ Third most important
If others Specify	TEXT SpecifyRank .....
P7.What do you think are the main positive and/or negative effects of vaccination against COVID-19 are?	MULTI-SELECT vac_main_eff 01 ☐ Reduced risk of getting infected 02 ☐ Reduced risk of getting seriously sick or die 03 ☐ Higher risk of getting infected 04 ☐ Higher risk of getting sick and or die 05 ☐ No effect 06 ☐ Depends on the type of vaccine Uncertain: 07 ☐ Depends on how the individual reacts to the vaccine (age and health condition) 08 ☐ Depends on the type of the vaccine 09 ☐ Depends on the type of corona virus 10 ☐ Other, specify:
P7B. If others specify	TEXT other_methods .....

PERCEPTION QUESTIONS RELATED TO THE PANDEMIC
Roster: VULNERABILITY
generated by fixed list

vun_age

01 People elder than 80 years
02 People 60-80 years old
03 People 40-60 years old
04 People 20-40 years old
05 People 0-20 years old
06 People that are overweight
07 People with other diseases
08 Anybody can get seriously sick

P8. Who do you think are more vulnerable if they get infected by the corona virus? Consider the following groups if not vaccinated

SINGLE-SELECT vulnerability

01 ○ Most vulnerable
02 ○ Second most vulnerable
03 ○ Third most vulnerable
04 ○ Not vulnerable

VACCINATION AGAINST COVID-19 AND INFECTIONS/SICKNESS

V1.Have you already been vaccinated against COVID-19?	SINGLE-SELECT vac_cov19 01 ○ Yes 00 ○ No
V2. If yes to V8, what type of vaccine?	MULTI-SELECT COVvac_type 01 ☐ Astra Zeneca, 02 ☐ Johnson&Johnson, 03 ☐ Pfizer, 04 ☐ Other, name:
If others Specify	TEXT SpecifyVaccinename ....
V3.If yes to V8, how many doses have you received?	NUMERIC: INTEGER COVvac_doses _
V4. If yes to V8, when were you vaccinated first time?	DATE COVvac_date_first ....
V5. If yes to V8, where were you vaccinated?	SINGLE-SELECT COVvac_location_first 01 ○ 1=At LUANAR, 02 ○ 2=At my home place, 03 ○ 3=Other, specify:
If others Specify	TEXT COVvacSpecifyplace ....
V6. If you are not vaccinated, have you tried to get vaccinated?	SINGLE-SELECT COV_vac_tried 01 ○ Yes 00 ○ No
V7.Would you like to get vaccinated against COVID-19?	SINGLE-SELECT liketoget_vac 01 ○ Yes 00 ○ No 02 ○ Don't know
V8. Does your answer to V7 depend on the type of vaccine you get access to?	SINGLE-SELECT vcn_vs_type 01 ○ Yes 00 ○ No
V8a. If Yes to question V8, explain:	TEXT COVvac_explain ....
V9.Do you recommend all adults to get vaccinated?	SINGLE-SELECT COVvacrecom 01 ○ Yes 02 ○ No
V10. Would you like to warn people against getting vaccinated against COVID-19?	SINGLE-SELECT COVvacwarning 01 ○ Yes 00 ○ No
V11. If yes to V5, explain why:	TEXT why_COVvac_warn ....
V12.Should vaccines be reserved for only some groups that should be given first priority?	SINGLE-SELECT COVvac_priority 01 ○ Yes 00 ○ No

VACCINATION AGAINST COVID-19 AND INFECTIONS/SICKNESS

Roster: COV VACCINE PRIORITY GROUPS

generated by fixed list COVvac_prigroup

01 People elder than 80 years
02 People 60-80 years old
03 People 40-60 years old
04 People 20-40 years old

05 People 0-20 years old
06 People that are overweight
07 People with other diseases
08 Anybody can get seriously sick

V13. If yes to V6, who should be given priority?	SINGLE-SELECT COVvacprigroups 01 ○ Yes 00 ○ No
V14.Have you been infected by the corona virus at some point as far as you know?	SINGLE-SELECT CoronaInfected 01 ○ Yes 00 ○ No
V14a.If yes to V14, how did the infection affect your body?	SINGLE-SELECT 00 ○ I did not feel any effect 01 ○ I felt only mild symptoms 02 ○ I felt ill and uncomfortable 03 ○ I got seriously sick but did not go to hospital 04 ○ I got very sick and was hospitalized
V15.If yes to V14, when was this?	DATE MonthInfected ....
V16.Have you at some points in time tested yourself for being infected?	SINGLE-SELECT Coronatested 01 ○ Yes 00 ○ No
V17.If yes to V16, how many times?	NUMERIC: INTEGER Coronatesttimes _
V18.If yes to V16, where was this?	TEXT Coronatestplace ....

VACCINATION AGAINST COVID-19 AND INFECTIONS/SICKNESS

Roster: TIMES FOR CORONA TESTS

generated by fixed list

Times for corona tests

01 First time
02 Second time
03 Third time

V19.If yes to V16, when was this?	NUMERIC: INTEGER time_coronatest _
If others Specify	TEXT SpecifySick ....
V22.Do you have any friends who have been infected by corona?	SINGLE-SELECT COVsickfriend 01 ○ Yes 00 ○ No
V23.If yes to V22, have any of these been seriously sick?	SINGLE-SELECT COVsickfriendsserious 01 ○ Yes 00 ○ No
V24. Do you have any relatives who have been infected?	SINGLE-SELECT COVsickrelatives 01 ○ Yes 00 ○ No
V25.If yes to V24, have any of these been seriously sick?	SINGLE-SELECT COVsickreativserious 01 ○ Yes 00 ○ No
V26. Do you know anybody who have died from COVID-19?	SINGLE-SELECT COVdied_know 01 ○ Yes 00 ○ No
V27. Have you lived with a person that have been infected by the corona virus?	SINGLE-SELECT coronainfcohabit 01 ○ Yes 00 ○ No

PERSONAL BEHAVIOR IN RESPONSE TO THE PANDEMIC

Roster: 23. PERSONAL BEHAVIOR

generated by fixed list

person_beh

01 Used facemask,
02 Kept >1 meter distance to people in public spaces,
03 Reduced the number of contact persons,
04 Washed my hands many times per day,
05 Avoided handshakes,
06 Avoided crowded places
07 Avoided visiting old people/family
08 Prayed to God to not get infected
09 Used traditional medicine
10 Other

B1.What have you done to try to avoid getting infected by the corona virus during the most recent wave of the pandemic? Go through and tick for the items used first. Rank the three most important afterwards	SINGLE-SELECT Corona_protection_rank 01 ○ Very important 02 ○ Important 03 ○ Less important 04 ○ NA
B2.How good were you at practicing each of the stated ranked rules you followed above at the height of the last wave of the pandemic? On a Likert scale from 1 to 5:	SINGLE-SELECT B2 01 ○ Always, 02 ○ Almost always, 03 ○ Most of the time, 04 ○ Sometimes, 05 ○ Almost never or never
If others Specify	TEXT CorprototherSp .....
B3. If you used facemask regularly during the peak of the last wave of the pandemic, how many times did you use such a mask before you disposed it?	SINGLE-SELECT facemaskchange 01 ○ 1-5 times, 02 ○ 6-10 times, 03 ○ 11-20 times, 04 ○ >20 times 05 ○ Changed mask daily 06 ○ Other
B4. What kind of facemask did you use?	SINGLE-SELECT facemasktype 01 ○ Purchased paper mask, 02 ○ Washable cloth mask, 03 ○ Homemade mask from cotton, 04 ○ Other, specify:
If others Specify	TEXT facemasktypesp .....
B5.What are the main benefits of using facemask?	MULTI-SELECT facemaskbenefit 01 ☐ Protect yourself from being infected by others, 02 ☐ Protecting others from being infected by you, 03 ☐ You are safe when you go to crowded places, 04 ☐ You do not need to think about social distancing 05 ☐ Others
If others Specify	TEXT facemaskbenefitspec .....

B6. If you used a washable facemask that you used many times, how often did you wash it during the peak of the pandemic?

MULTI-SELECT facemaskwash

- 01 ☐ Daily,
- 02 ☐ Twice per week
- 03 ☐ Once per week
- 04 ☐ Rarely
- 05 ☐ Never

PERSONAL BEHAVIOR IN RESPONSE TO THE PANDEMIC

Roster: FACEMASK USE

generated by fixed list facemaskuse

- 01 In stores/shops,
- 02 At friends home,
- 03 In the street,
- 04 In the bus,
- 05 In the market,
- 06 At home,
- 07 In the university,
- 08 In the classroom,
- 09 In church,
- 10 Other

B7.What have you done to try to avoid getting infected by the corona virus during the most recent wave of the pandemic? Go through and tick for the items used first. Rank the three most important afterwards

SINGLE-SELECT facemaskuse

- 01 ○ Yes
- 00 ○ No
- 02 ○ Sometimes

PERSONAL BEHAVIOR IN RESPONSE TO THE PANDEMIC

Roster: ADJUSTMENTS_IN_BEHAVIOR

generated by fixed list adjustments_in_behavior

- 01 Used facemask,
- 02 Kept >1 meter distance to people in public spaces,
- 03 Reduced the number of contact persons,
- 04 Washed my hands many times per day,
- 05 Avoided all handshakes,
- 06 Avoided crowded places
- 07 Used disinfectants regularly
- 08 Avoided visiting parents and grandparents to not infect them
- 09 Avoided visiting other old or sick people
- 10 Avoid going to church

B8.Rank your three most important behavioral activities to protect yourself against getting infected by the corona virus

MULTI-SELECT rankprotectact

- 01 ☐ Most imprortant protection activity
- 02 ☐ Second most important protection activity
- 03 ☐ Third most important protection activity

B8.Have you made any adjustments in your behavior to reduce the risk that you will infect others in case you are infected without knowing it? Things you did during the height of the most recent wave of the pandemic to protect others

SINGLE-SELECT B8

- 01 ○ Yes
- 00 ○ No

B9.Do you think it is necessary for you to adjust your behavior due to the corona pandemic?

SINGLE-SELECT B9

- 01 ○ Yes
- 00 ○ No

PERSONAL BEHAVIOR IN RESPONSE TO THE PANDEMIC

Roster: REASONS NO ADJUSTED BEHAVIOR

generated by fixed list Reasons no adjusted beh

- 01 Very low or no risk of getting infected
- 02 Very low or no risk of getting sick if infected
- 03 No or very low risk of infecting others
- 04 I do not want to adjust my behavior as I should be free to do whatever I want
- 05 I do not think I am at risk myself and others should take care of themselves, that is not my responsibility
- 06 Other

B10.If No to B4, what are the reasons? Rank by importance

SINGLE-SELECT ranknoadjustreasons

01 ○ Most important
02 ○ Second most important
03 ○ Third most important

B11.How frequently did you update yourself on the pandemic situation in the country during the last wave? If yes, how often?

SINGLE-SELECT B11

01 ○ Daily
02 ○ Weekly
03 ○ Monthly
04 ○ I do not make any special efforts to be updated on this
05 ○ I expect others to inform me or warn me if important

PERSONAL BEHAVIOR IN RESPONSE TO THE PANDEMIC

Roster: SOURCES OF INFORMATION ABOUT THE PANDEMIC

generated by fixed list sources_of_info_pandemic

01 Radio
02 TV
03 Newspapers
04 Internet
05 Religious leaders
06 Political leaders
07 Health personell
08 Other

B12.If you update yourself regarding the pandemic, what are your main sources of information? (Rank by importance)

SINGLE-SELECT pandemicinfosources

01 ○ Very important
02 ○ Important
03 ○ Less important
04 ○ Not used

B13.If internet is an important source of information, which websites are your main sources of information? Websites:

TEXT pandem_internetsources

.....

PERSONAL BEHAVIOR IN RESPONSE TO THE PANDEMIC

Roster: MOST RESPECTED INFO SOURCES

generated by fixed list Respect_of_info_source

01 Religious leader,
02 Political leaders
03 Health personnel,
04 University leaders,
05 Parents,
06 Best friends,
07 Other

B14.Who do you respect/trust the most and follow the advice of in relation to the pandemic? Rank the three most respected on list

SINGLE-SELECT rankinfosourcetrust

01 ○ Most respected/trusted
02 ○ Second most respected/trusted
03 ○ Third most respected/trusted

If others Specify

TEXT Otherinfosourcesp

.....

PERCEPTION ABOUT THE BEHAVIOR OF OTHERS RELATED TO THE PANDEMIC

O1. Do you think that other students behave in a responsible way in relation to the pandemic?	SINGLE-SELECT O1_othstudbehav 01 ○ Yes 00 ○ No
O2.how big share of the students at LUANAR do you think are too careless and can therefore contribute to the spread of the virus?	SINGLE-SELECT O2_careless_stud 01 ○ 1-20% 02 ○ 21-40% 03 ○ 41-60%, 04 ○ 61-80%, 05 ○ 81-100%
O3.How big share of the students are against the recommended protective measures?	SINGLE-SELECT O3_studagainstprotact 01 ○ 1-20% 02 ○ 21-40% 03 ○ 41-60%, 04 ○ 61-80%, 05 ○ 81-100%
O4.How big share of the students are against getting vaccinated against COVID-19?	SINGLE-SELECT O4_sharestudantivac 01 ○ 1-20% 02 ○ 21-40% 03 ○ 41-60%, 04 ○ 61-80%, 05 ○ 81-100%
O5.How big share of the students are believing that their religion/God protects them against the pandemic	SINGLE-SELECT O5_studreligprot 01 ○ 1-20% 02 ○ 21-40% 03 ○ 41-60%, 04 ○ 61-80%, 05 ○ 81-100%
O6.How big share of the students believe that the vaccine is more dangerous than the corona virus itself?	SINGLE-SELECT O6_COVvacriskiercorona 01 ○ 1-20% 02 ○ 21-40% 03 ○ 41-60%, 04 ○ 61-80%, 05 ○ 81-100%
O7.How big share of the students believe that the corona virus is no serious threat to them and therefore ignore it?	SINGLE-SELECT O7 coronanothreat 01 ○ 1-20% 02 ○ 21-40% 03 ○ 41-60%, 04 ○ 61-80%, 05 ○ 81-100%
O8.How big share of the students believe that traditional medicines are better at protecting against corona infection/COVID-19 than the vaccines?	SINGLE-SELECT O8_sharestudtradmedicine 01 ○ 1-20% 02 ○ 21-40% 03 ○ 41-60%, 04 ○ 61-80%, 05 ○ 81-100%
O9.Are there some special events that have changed your opinion/attitudes/behavior about the corona pandemic/COVID-19 risk?	SINGLE-SELECT O9_specialeventseffect 01 ○ Yes 00 ○ No
O10.If yes to O10, what was this event or events that changed your attitudes/opinion/behavior? Explain	TEXT O10_whatevents .....

APPENDIX A — CATEGORIES

[1] District: 06.District of origin in Malawi
Categories: 101:Chitipa,, 102:Karonga, 103:Nkhata Bay, 104:Rumphi, 105:Mzimba, 106:Likoma, 107:Mzuzu City, 201:Kasungu, 202:Nkhotakota, 203:Ntchisi, 204:Dowa, 205:Salima, 206:Lilongwe, 207:Mchinji, 208:Dedza, 209:Ntcheu, 210:Lilongwe City, 301:Mangochi, 302:Machinga, 303:Zomba, 304:Chiradzulu, 305:Blantyre, 306:Mwanza, 307:Thyolo, 308:Mulanje, 309:Phalombe, 310:Chikwawa, 311:Nsanje, 312:Balaka, 313:Neno, 314:Zomba City, 315:Blantyre City

[2] Program: 12.What is the name of the Study program you study?
Categories: 1:BSc. in Agribusiness Management, 2:BSc. in Agriculture Economics, 3:BSc. in Agricultural Development Communication, 4:BSc. in Agricultural Education, 5:BSc. in Agricultural Enterprise Development and Microfinance, 6:BSc. in Agricultural Extension, 7:BSc. in Development Economics, 8:Diploma in Youth and Development, 9:Diploma in Gender and Development, 10:BSc. in Gender and Development, 11:BSc. in Food Science and Technology, 12:BSc. in Human Nutrition and Food Science, 13:BSc. in Human Sciences and Community Services, 14:BSc. in Agroforestry, 15:BSc. in Aquaculture and Fisheries Science, 16:BSc. in Forestry, 17:BSc. in Environmental Science, 18:BSc. in Natural Resources Management (Land and Water), 19:other

Legend and structure of information in this file