## Original Research Article

# Perception and compliance to COVID-19 vaccine uptake among public transport users in Kiambu county

## Dorothy Kamene Kimeu*, John P. Oyore, Mary Gitahi

Department of Community Health and Epidemiology, Kenyatta University, Kenya

**\*Correspondence:**
Dr. Dorothy Kamene Kimeu,
E-mail: dotkimeu@gmai.com

## ABSTRACT

**Background:** The COVID-19 was declared a pandemic in 2020 and has so far affected 231 countries, causing over 700 million infections and approximately 7 million fatalities globally. The disease created a heavy burden and disorganized healthcare systems worldwide, with more serious pressure being felt in the African developing countries. Covid's effects were felt at all levels of society, with serious implications for social, economic, educational, political, and human security. Since there is no known cure for COVID-19, creating immunity is key to prevent future morbidities and fatalities, through vaccination.

**Methods:** A cross-sectional study design to collect data from public transport users. Dependent variable was COVID-19 vaccine uptake, influenced by knowledge, perception, contextual, and socio-demographic factors. Kiambu County was selected purposively. Study population comprised consenting adults using public transport users. A multi-stage sampling approach was used where Kiambu County was first purposively selected, followed by simple random sampling of three sub-counties. Finally, simple random sampling of individual respondents. Data was collected through questionnaires, with 311 questionnaires being analyzed using SPSS 26.0 software.

**Results:** The proportion of public transport users who received the first dose of COVID-19 vaccine is 69.77% males and 30.23% females. Overall, 62.7% of the respondents complied with the first dose of the COVID-19. Overall, 23.15% of the total respondents complied to the complete COVID-19 vaccine uptake.

**Conclusions:** The findings showed a slightly lower average second-dose vaccination rate among males and a general decline in vaccination uptake among older age groups.

**Keywords:** Epidemic, Pandemic, Case fatality rate, Outbreak, Risk perception

## INTRODUCTION

COVID-19 is an infectious disease caused by the SARS-CoV-2 virus; a type of beta coronavirus closely related to SARS and MERS. The virus was first detected in Wuhan, China, in December 2019, where it began as a pneumonia outbreak. It quickly spread across China and globally, leading the WHO to name it COVID-19 in February 2020, declare it a global health emergency in January 2020, and classify it as a pandemic by March 2020.[1]

In response, countries worldwide implemented strict preventive measures, including hand hygiene, use of face masks, social distancing, travel bans, quarantines, and vaccination campaigns. COVID-19 has since affected over 700 million people globally, resulting in more than 7 million deaths, with a case fatality rate ranging between 0.7% and 8.5%.

In Africa, despite fears due to fragile healthcare systems, case numbers remained relatively low at. This was largely attributed to underreporting, limited testing capacity, and

weak health infrastructure. Africa reported about 12 million cases.[2] In Kenya, the first confirmed case emerged on March 13, 2020. The government responded swiftly with school closures, lockdowns in key counties (Nairobi, Mombasa, and Kilifi), mask mandates, and adherence to WHO guidelines. Travel restrictions were lifted in July 2020, which led to a gradual rise in cases. To date, Kenya has reported over 344,000 cases, 5,000 deaths, and around 100,000 recoveries, with a case fatality rate of 1.7%.[3]

The development of the COVID-19 vaccine marked a significant milestone in managing the pandemic. However, there are still uncertainties around long-term immunity and the consistency of antibody production following infection. While preventive measures were established, compliance remains inconsistent- particularly within Kenya's public transport sector, which accounts for 85% of daily commuters.

After the peak of the Delta variant, most COVID-19 measures were abandoned, including mask mandates and social distancing in public vehicles. National vaccine uptake remains low at about 36%, with similar trends in Kiambu County. Barriers to vaccine compliance include misinformation, low risk perception, religious and cultural beliefs, lack of trust in science, and limited awareness.[4]

The aim of the study was to assess the level of compliance with COVID-19 preventive measures in Kiambu County, with a specific focus on vaccine uptake and the factors influencing public attitudes and behaviors in the region's transport sector.

### Problem statement

As of March 2022, many African countries, including Kenya, relaxed COVID-19 surveillance measures such as mandatory mask-wearing and social distancing in public transport and gatherings. In Kenya, public transport resumed full capacity, making vaccination the primary defense against the virus. Despite efforts to promote vaccine uptake, only 37.2% of Kenyan adults- about 10 million out of 27 million- were fully vaccinated, with just 0.1% of adolescents aged 12-18 covered. In Kiambu County, which has over 2 million residents and ranks second in population after Nairobi, the vaccination rate also stood at 37.2%, placing it 18th nationally. WHO's phased vaccine rollout prioritized healthcare workers and the vulnerable, excluding many public transport users initially. With no vaccine mandates for travel, many commuters delayed getting vaccinated. This gap in policy and prioritization hindered uptake. The study aimed to address the lack of data by exploring factors influencing vaccine adoption among public transport users in Kiambu.

### Research question

What Proportion of public transport users comply to COVID-19 vaccine in Kiambu county?

### Research objective

The objective of this study was to evaluate the compliance to COVID-19 vaccine uptake among public transport users in Kiambu county.
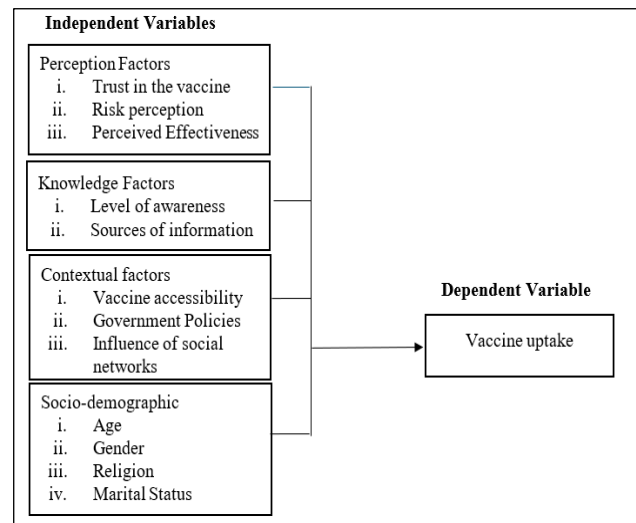


**Figure 1: Conceptual framework.**

## METHODS

### Study type

The study employed a cross-sectional design.

### Location of the study

The study was conducted in Kiambu County, one of largest counties in central Kenya, with a population of >2M people making it the second most populated county in Kenya. Kiambu county was purposively selected due to its high number of COVID-19 cases (19,778), ranking second in the country, despite being 18th in COVID-19 vaccine uptake. The study took place in the year 2022.

### Study period

The study was conducted between August 2021 to February 2023.

### Selection criteria

A multi-stage sampling technique was used: three sub-counties representing urban, peri-urban, and rural settings were randomly selected from the 12 in Kiambu. Simple random sampling was then used to select respondents. Respondents were recruited from queues; those who waited onboard public transport vehicles from the PSV saccos selected for study. Explanation on the aim of the study was given and if they give consent the research assistants proceeded to administer the questionnaire, by asking the respondent to step out of the queue at a reasonable distance. The research assistant first ensured

that the respondent was a resident of Kiambu county and has not been interviewed for the same to reduce chances of repeating a respondent. The volume used for conversation was low such that the people nearby do not follow the conversation. It is estimated that a questionnaire and observation tool took 8-10 minutes per respondent to complete. The exclusion criteria were minors and people who did not consent to the study.

### Data collection technique

This study employed questionnaires as the main data collection technique. A standardized set of questions was organized into a semi structured questionnaire, while making sure there were different questions that cover all the variables of the study. The questionnaires were researcher-administered supervised by field officers and were administered to public transport users.

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The research assistant first ensured that the respondent was a resident of Kiambu county and has not been interviewed for the same to reduce chances of repeating a respondent. The volume used for conversation was low such that the people nearby do not follow the conversation. It is estimated that a questionnaire and observation tool took 8-10 min per respondent to complete.

### Logistical and ethical considerations

Prior to the data collection process, the Kenyatta University graduate school consulted to give ethical consideration. The Kenyatta University Ethical Review Committee provided ethical clearance, and NACOSTI provided research permission. In this study, respect of research participants was prioritized. Respondents' participation in the study was entirely voluntary, and they had the option to withdraw at any time if they desire. Respondents were allowed to participate if they give their informed consent, and they were given enough information if they give their informed consent. They will also have enough information about the study. Privacy and anonymity of respondents was guaranteed.

### Statistical analysis

Analysis of data from the questionnaires was done quantitatively. Cleaning and coding of data collected was done before entry for effective data management. The factors that affect compliance linked to the level of compliance and the data entered into a spreadsheet and transferred for analysis to the SPSS 26.0 software. Descriptive and inferential analysis was done, data was presented in tables, graphs, percentage, ratios. The descriptive analysis involved the use of mean and standard deviation and was the principal statistical methods for data analysis while inferential analysis of the data was presented by correlation analysis, Chi square test and ANOVA.

## RESULTS

### Response rate

The response rate was 81% with 311 questionnaires out of the total number of 384 being complete. 73 questionnaires representing 19% were incomplete and were therefore not utilized in the study.

### Compliance to COVID-19 vaccine-1st dose

The proportion of public transport users who received the first dose of COVID-19 vaccine is 69.77% males and 30.23% females. Overall, 62.7% of the respondents complied to first dose of the COVID-19 vaccine.

### Exclusion criteria

Overall, 23.15% of the total respondents complied to the complete COVID-19 vaccine uptake (1st and 2nd dose).

Respondents generally disagree that social or physical distancing is possible on public transport (mean=2.15). They agree that buses are a significant mode for spreading infectious diseases like COVID-19 (mean=4.44). Opinions are neutral regarding whether young people have a lower risk of infection (mean=3.62). A strong majority strongly agree that traveling poses a major risk and contributes to the spread of COVID-19 (mean=4.82).

Most of the respondents express a neutral stance regarding the availability of information on the risk of COVID-19, as the mean falls in the neutral range at 3.78. Median (for all statements): 4, indicating that the middle respondent tends to lean towards agreement whereas for mode (for all statements): 1 or 5, suggesting that responses are polarized with a significant number strongly agreeing or strongly disagreeing.

The average age of respondents was between ages 24.5 with majority being male of between ages 17-25. The dominant religion of respondents was found to be Christianity with majority of respondents having attained college education and being self-employed, earning an income of less than KES 20,000 per month.

Majority of respondents who complied to COVID-19 vaccine uptake fall into the age groups of 17-25 and 26-30 years with majority being male, with a noticeable drop in female respondents. Those above 50 years achieved 100% compliance. Young adults (17-25 years) had the lowest

compliance at 40%. compliance rate generally increased with age.

The strongest positive correlation with compliance to the COVID-19 vaccine was associated with receiving the first dose (r=0.423), and this correlation was highly statistically significant. In contrast, the location where one was vaccinated showed a moderate negative correlation with compliance, also highly significant.

Additionally, knowledge of COVID-19 preventive measures had a moderate negative correlation with compliance, which was moderately significant. Other factors examined showed weak or very weak correlations with vaccine compliance and were not statistically significant. The perception that risk for COVID-19 is no longer high had the strongest positive correlation with compliance to COVID-19 vaccine (r=0.136), and it is statistically significant. Maintaining hygiene in private

modes was easier compared to public and shared modes of transportation and has the strongest negative correlation (r=-0.156), and it is statistically significant.

Vaccine safety has the strongest correlation with compliance to COVID-19 vaccine (r=0.163), and it is statistically significant. Whether an individual was willing to be the first to receive a new COVID-19 vaccine when introduced had a weak positive correlation that is marginally statistically significant (r=0.111, p=0.051).

None of the correlation coefficients between fully complying to COVID-19 vaccine and other variables are relatively small.

None of the correlations between having the 2nd dose of COVID-19 vaccine and other socio-demographic variables are statistically significant at conventional levels (0.05 or 0.01).

**Table 1: Perception of risk related to COVID-19 vaccine among public transport users.**

| Perception of risk related | N | Mean | SD | Median | N | Mean | Variance |
|---|---|---|---|---|---|---|---|
| Public transportation allows for social and physical distance. | 311 | 2.15 | 0.092 | 1.00 | 1 | 1.616 | 2.610 |
| A good way to spread infectious diseases like COVID-19 is by bus | 311 | 4.44 | 0.043 | 5.00 | 5 | 0.750 | 0.563 |
| There will be less chance of disinfecting them because many passengers use share modes. | 311 | 4.06 | 0.062 | 4.00 | 5 | 1.085 | 1.176 |
| Maintaining hygiene in private modes is easier compared to public and shared modes of transportation. | 311 | 4.64 | 0.036 | 5.00 | 5 | 0.627 | 0.393 |
| Wearing a helmet in a motorcycle/scooter will provide additional protection from the spread of COVID-19 | 311 | 2.44 | 0.100 | 1.00 | 1 | 1.771 | 3.137 |
| The available measures implemented by the government are sufficient | 311 | 4.54 | 0.034 | 5.00 | 5 | 0.593 | 0.352 |
| Crowded buses increase the risk of infection for COVID-19 | 311 | 4.87 | 0.025 | 5.00 | 5 | 0.436 | 0.190 |
| The risk for COVID-19 is no longer high | 311 | 4.86 | 0.034 | 5.00 | 5 | 0.604 | 0.365 |
| Young people have a lower risk of infection for COVID-19 | 311 | 3.62 | 0.100 | 5.00 | 5 | 1.766 | 3.119 |
| The hot weather /climate reduces the risk for COVID-19 | 311 | 3.75 | 0.059 | 4.00 | 4 | 1.036 | 1.072 |
| COVID-19 is a lie | 311 | 2.49 | 0.086 | 3.00 | 1 | 1.509 | 2.276 |
| Africans are least likely to be infected with COVID-19 | 311 | 4.09 | 0.067 | 4.00 | 5 | 1.176 | 1.383 |
| Travelling is a major risk and contribution for COVID-19 | 311 | 4.82 | 0.034 | 5.00 | 5 | 0.601 | 0.361 |

**Table 2: Level of knowledge of COVID-19 vaccine among public transport users in Kiambu county.**

| Level of knowledge | N | Mean | SD | Median | Mode |
|---|---|---|---|---|---|
| There is little information on the risk of COVID-19 | 311 | 3.78 | 1.091 | 4 | 4 |
| Covid-19 vaccines have various side effects | 311 | 3.95 | 1.297 | 4 | 5 |
| COVID-19 vaccination is beneficial in reducing the risk | 311 | 3.86 | 1.222 | 4 | 5 |
| The government offers credible information on COVID-19 risks and vaccines | 311 | 1.93 | 1.185 | 1 | 1 |

**Table 3: Socio-demographic factors that affect compliance to COVID-19 vaccine among public transport users in Kiambu county.**

| Perception of risk related | N | Mean | SE of mean | Median | Mode | Mean | Variance |
|---|---|---|---|---|---|---|---|
| Age | 311 | 1.5723 | 0.06009 | 1 | 1 | 1.05971 | 1.123 |
| Gender | 311 | 1.3087 | 0.02624 | 1 | 1 | 0.46269 | 0.214 |
| Religion | 311 | 1.0579 | 0.01474 | 1 | 1 | 0.26001 | 0.068 |
| Education | 311 | 2.7814 | 0.04238 | 3 | 3 | 0.74732 | 0.558 |
| Employment | 311 | 2.3376 | 0.05917 | 2 | 2 | 1.04349 | 1.089 |
| Income | 311 | 1.492 | 0.0378 | 1 | 1 | 0.66655 | 0.444 |

**Table 4: Correlation analysis of contextual factors related to compliance of COVID-19 vaccine.**

| Compliance to COVID-19 (B2B) | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B2B |
|---|---|---|---|---|---|---|---|---|
| Have you ever contracted COVID-19 (B1) | 10.000 | 0.014 | 0.098 | 0.199 | 0.100 | 0.030 | -0.019 | -0.049 |
| Have you been vaccinated for COVID-19 with 1st Dose? (B2) | 0.014 | 10.000 | -0.292 | -0.054 | 0.079 | -0.133 | -0.137 | 0.423 |
| Where were you vaccinated (B3) | 0.098 | -0.292 | 10.000 | 0.082 | 0.059 | 0.115 | 0.060 | -0.163 |
| Has anyone from your family contracted COVID-19? (B4) | 0.199 | -0.054 | 0.082 | 10.000 | 0.376 | -0.071 | 0.024 | -0.081 |
| Do you know of anyone who has contracted COVID-19? (B5) | 0.100 | 0.079 | 0.059 | 0.376 | 10.000 | -0.021 | -0.095 | -0.012 |
| Do you know of the COVID-19 preventive measures (B6) | 0.030 | -0.133 | 0.115 | -0.071 | -0.021 | 10.000 | -0.116 | -0.133 |

**Table 5: Correlation analysis of perception of risk factors related to COVID-19 vaccine among public transport users.**

| Compliance to COVID-19 (B2B) | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B2B |
|---|---|---|---|---|---|---|---|---|
| Have you ever contracted COVID-19 (B1) | 10.000 | 0.014 | 0.098 | 0.199 | 0.100 | 0.030 | -0.019 | -0.049 |
| Have you been vaccinated for COVID-19 with 1st Dose? (B2) | 0.014 | 10.000 | -0.292 | -0.054 | 0.079 | -0.133 | -0.137 | 0.423 |
| Where were you vaccinated (B3) | 0.098 | -0.292 | 10.000 | 0.082 | 0.059 | 0.115 | 0.060 | -0.163 |
| Has anyone from your family contracted COVID-19? (B4) | 0.199 | -0.054 | 0.082 | 10.000 | 0.376 | -0.071 | 0.024 | -0.081 |
| Do you know of anyone who has contracted COVID-19? (B5) | 0.100 | 0.079 | 0.059 | 0.376 | 10.000 | -0.021 | -0.095 | -0.012 |
| Do you know of the COVID-19 preventive measures (B6) | 0.030 | -0.133 | 0.115 | -0.071 | -0.021 | 10.000 | -0.116 | -0.133 |

**Table 6: Correlation analysis of perception of risk factors related to COVID-19 vaccine among public transport users.**

| Risk factors related to COVID-19 | B2B | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Compliance to COVID-19 vaccine (B2B) | 10.0 | -0.50 | -0.33 | -0.39 | -0.156 | -0.83 | -0.86 | 0.104 | 0.136 | 0.48 | -0.03 |
| Social/physical distancing is possible in public transport (D1) | -0.50 | 10.0 | -0.235 | -0.13 | 00.5 | 0.119 | 0.59 | 0.11 | -0.18 | -0.18 | 0.66 |

Continued.

| Risk factors related to COVID-19 | B2B | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| The bus is a suitable mode for spreading infectious diseases like COVID-19 (D2) | -0.33 | -0.235 | 10.0 | 0.350 | 0.264 | -0.20 | 0.241 | 0.114 | 0.96 | -0.59 | -0.69 |
| Since multiple passengers use share modes, there will be less possibility of disinfecting them (D3) | -0.39 | -0.13 | 0.350 | 10.0 | 0.365 | 0.64 | 0.450 | 0.190 | 0.70 | 0.132 | 0.56 |
| Maintaining hygiene in private modes is easier compared to public and shared modes of transportation (D4) | -0.156 | 00.5 | 0.264 | 0.365 | 10.0 | 0.138 | 0.418 | 0.266 | 0.131 | -0.112 | 0.65 |
| Wearing a helmet in a motorcycle/scooter will provide additional protection from the spread of COVID-19 (D5) | -0.83 | 0.119 | -0.20 | 0.64 | 0.138 | 10.0 | 0.189 | -0.49 | -0.60 | 0.32 | 0.58 |

**Table 7: Correlation analysis of level of knowledge and compliance to COVID-19 vaccine.**

| Level of knowledge | B2B | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 |
|---|---|---|---|---|---|---|---|---|---|
| Compliance to COVID-19 vaccine (B2B) | 10.0 | 0.033 | -0.013 | 0.163 | 0.043 | 0.041 | 0.111 | -0.052 | -0.066 |
| Source of information on COVID-19 vaccine (C1) | 0.033 | 10.0 | -0.417 | 0.067 | -0.062 | -0.096 | 0.160 | -0.116 | 0.092 |
| Extent of trust on source (C2) | -0.013 | -0.417 | 10.0 | 0.101 | -0.054 | 0.044 | -0.074 | 0.036 | -0.163 |
| Belief on safety of vaccines (C3) | 0.163 | 0.067 | 0.101 | 10.000 | 0.246 | 0.025 | 0.134 | -0.124 | 0.006 |
| Sufficiency of information (C4) | 0.043 | -0.062 | -0.054 | 0.246 | 10.000 | -0.132 | 0.274 | -0.099 | -0.020 |
| Reaction to first vaccine announcement (C5) | 0.041 | -0.096 | 0.044 | 0.025 | -0.132 | 10.000 | -0.249 | 0.184 | -0.228 |
| Priority to be vaccinated using a new vaccine (C6) | 0.111 | 0.160 | -0.074 | 0.134 | 0.274 | -0.249 | 10.000 | -0.554 | 0.034 |
| Wait and see perception (C7) | -0.052 | -0.116 | 0.036 | -0.124 | -0.099 | 0.184 | -0.554 | 10.000 | 0.020 |
| Signs and symptoms of COVID-19 (C8) | -0.066 | 0.092 | -0.163 | 0.006 | -0.020 | -0.228 | 0.034 | 0.020 | 10.000 |

**Table 8: Correlation analysis of socio-demographic factors and compliance to COVID-19.**

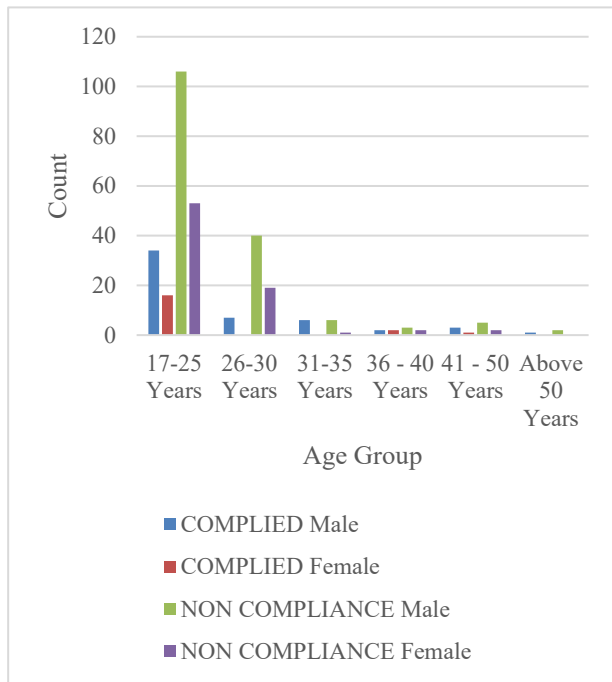| Age (years) | Age | Gender | Religion | Education | Employment | Income | Compliance COVID-19 |
|---|---|---|---|---|---|---|---|
| Age (years) | 10.000 | -00.071 | -0.160 | 0.001 | 0.143 | 0.313 | -0.010 |
| Gender | -0.071 | 10.000 | -0.156 | 0.112 | 0.097 | -0.005 | 0.053 |
| Religion | -0.160 | -0.156 | 10.000 | -0.011 | -0.094 | -0.118 | 0.059 |
| Education | 0.001 | 0.112 | -0.011 | 10.000 | -0.118 | 0.113 | -0.068 |
| Employment | 0.143 | 0.097 | -0.094 | -0.118 | 10.000 | 0.196 | 0.060 |
| Income | 0.313 | -0.005 | -0.118 | 0.113 | 0.196 | 10.000 | -0.077 |
| Compliance to COVID-19 | -0.010 | 0.053 | 0.059 | -0.068 | 0.060 | -0.077 | 10.000 |

**Figure 1: Age, gender and compliance to COVID-19 vaccine uptake.**

## DISCUSSION

### Contextual factors related to COVID-19 vaccine uptake

In the first dose vaccine uptake, a higher percentage of males received the vaccine across all age groups compared to females. However, in the second dose of COVID-19 vaccine uptake, the trend of higher vaccination among males persists, the difference between male and female percentages is less pronounced. Overall, 23.15% of the total respondents complied to the complete COVID-19 vaccine uptake. Majority of them were vaccinated in health facilities. A few of the respondents were aware of individuals who have contracted the virus. A study that examined COVID-19 vaccine reluctance and its associated factors in Malaysia found out that the prevalence of COVID-19 vaccine reluctance was 11.6%.[5] In China 45.2% of people were uncertain about the COVID-19 vaccination.[6] Another study done in Kenya revealed that 43.29% of the people interviewed were indecisive about receiving the vaccine.[7] Majority of the respondents knew COVID-19 preventive measures. However, the most common preventive measure was wearing of mask (96.0%) while coughing etiquette was least common. Other preventive measures were social distancing and washing hands regularly. The respondents believed that those measures prevented COVID-19 at very high and in this case, respondents practiced them to protect themselves from contracting the disease. In Belgium, vaccine willingness was significantly associated with knowing someone with severe COVID-19 symptoms and compliance with restrictive measures.[8]

### Perception of risk related to COVID-19 vaccine uptake

Most respondents expressed their concerns about the risk of COVID-19 in public transport, as indicated by the relatively higher mean score for the statement. The bus is a suitable mode for spreading infectious diseases like COVID-19 (mean=4.44). A study by showed that the higher the travel desire individuals have, the stronger the effects of their attitude toward COVID-19 vaccines. While most of the public transport users generally believe that the available government measures were sufficient (mean=4.54), there was a notable concern about the increased risk associated with crowded buses (mean=4.87), a study associated vaccine hesitancy with the belief that the government restrictions were too lenient and the frequency of socializing prior to the pandemic.

There are varying levels of misconception and misinformation, such as the belief that wearing a helmet provides additional protection from COVID-19 (mean=2.44) and the notion that COVID-19 is a lie (mean=2.49), however, most respondents perceived traveling as a major risk and contribution to COVID-19 (mean=4.82), while opinions on factors like climate, age, and ethnicity influencing infection risk were mixed. This result conforms to a study which focused on the analysis and understanding of the progress, trends and consequences of COVID-19 pandemic over a seven-day period across different countries of the world [9]. In the conclusion, America, Asia and Europe sustained effect of the viral infection, while most African countries experienced a downward progressive control. According to another study, it concluded that race was associated with COVID-19 vaccine intention.

### Level of knowledge and compliance to COVID-19 vaccine

Generally, from the study, the respondents expressed moderate to high levels of awareness about COVID-19 and its vaccination, with some variations in their knowledge levels. With a mean score of 3.78, the perceived lack of knowledge on the risk of COVID-19 is a noteworthy finding. This shows that a significant percentage of Kiambu County residents who utilize public transportation feel that there is not enough information available regarding the risks posed by the virus. This conforms to a study carried out in Nigeria by Nwagbara who found out that 99.5% of the people encompassed in the studies had a fair knowledge on the symptoms of COVID-19 symptoms, mode of transmission as well as measures of prevention opposed to the neighboring country Cameroon where only 21.9% of the population interviewed were accurate on knowledge about COVID-19.[10]

There was also moderate level concern from the respondents about the potential vaccine side effects among the surveyed respondents. The mean score of 3.86 in Table 4 suggests a positive attitude towards the protective effects of the vaccine in reducing the risk of infection, in line with

a study that indicated the beliefs about vaccines and past vaccine compliance raised concerns about the safety, efficacy, and side effects from the COVID-19 vaccines.[11] In another study, conspiracy theories and misinformation about COVID-19 were noted in Nigeria.[12] The leading claim was that COVID-19 was not real, and politicians took advantage of the situation and misused funds. People believed certain claims based on distrust of government, their understanding of Christian scripture, or their lack of personal experience with COVID-19.

The perceive credibility of information provided by the government on COVID-19 risks and vaccines was relatively low, with a mean score of 1.93 signifying a potential area for improvement in public trust and confidence in government communication efforts. This conforms to a study by that found that people who know more about COVID-19 vaccination were less hesitant to COVID-19 vaccine.[13] People who did not seek information independently about the COVID-19 vaccine are more likely to be skeptical.

### Socio-demographic factors affecting COVID-19 vaccine uptake

The summary findings from the study show that the socio-demographic factors depict high concentration on specific sets. The average age of the respondents was found to be approximately 24 years with the male gender dominating the respondents. There is generally higher compliance among males compared to females. The highest compliance is observed in the 17-25 and 26-30 age groups with most of the non-compliance being prevalent among males, particularly in the 17-25 and 26-30 age groups. This conformed to a study that indicated that younger people are known to disregard instructions more than the older population and are more likely to comply less with measures.[14] Incompliance was noted to be high in the younger individuals than the elderly. This relationship was noted to be due to high-risk perception in the elderly population, given their vulnerability to the disease.

Religion wise, none of the Hindus complied to COVID-19 vaccine while more Christians complied to COVID-19 vaccine as compared to Muslims. There was significant difference on religion and compliance to COVID-19 vaccine. The study conducted in Ghana in 2020 to assess the public knowledge, risk perception and preparedness to COVID-19 revealed a high-risk perception towards COVID-19, with Muslims having a higher risk perception than Christians.[15] According to another study done in Kenya, Christians-Catholics were less likely to be unvaccinated. Further, another study found out that those who had more populist views and higher levels of religiosity been more likely to be hesitant or resistant.[16] The proportion of compliance increased with level of education as most of the university graduates complied to COVID-19 vaccine. This aligns with a study which, identified education as a significant predictor of vaccine reluctance among African Americans and Hispanics. A study demonstrated that higher education correlated with reduced inclination towards vaccination.[17]

### Recommendations

The study recommends expanding COVID-19 vaccination beyond health facilities to workplaces and community sites to improve access and compliance. It highlights the need for age-specific campaigns targeting younger individuals to correct risk misconceptions and older adults (50+) to address hesitancy. Tailored education should be adopted to counter myths, provide accurate information, and respond to varying concerns related to COVID-19 Vaccine. Involving community leaders, healthcare workers, and influencers can improve outreach. Strategies must also be inclusive and culturally sensitive, addressing differences in age, gender, religion, and income to ensure equitable vaccine uptake.

### CONCLUSION

The study concludes that COVID-19 vaccine compliance among public transport users in Kiambu County remains low, with no significant variation across different user groups. Males had higher uptake for the first dose, but a more balanced gender distribution was observed in the second dose. Elderly individuals showed lower vaccination rates, highlighting the need for targeted interventions. Perception-related factors influenced compliance in varied ways. While respondents viewed public transport as high-risk, these perceptions did not significantly impact vaccine uptake. Misconceptions, such as the belief that helmets offer COVID-19 protection, were present but not statistically significant. Knowledge levels showed some correlation with compliance, particularly when individuals believed the vaccine was safe. However, reliance on certain information sources was linked to lower vaccine uptake, and distrust in these sources further reduced compliance. Notably, respondents who preferred to wait and observe others before vaccinating showed significantly lower compliance. Although some statistical tests suggested potential patterns, most results were not strongly significant, indicating the need for cautious interpretation. In terms of socio-demographic factors, only age showed a statistically significant association with vaccine uptake. Younger males (17-30 years) had higher compliance, while those over 50 were least compliant. Other factors such as gender, religion, education, employment, and income were not statistically significant in predicting vaccine uptake. Overall, the study highlights that while perceptions and knowledge influence behaviour to some extent, vaccine uptake is shaped by a complex mix of factors, with age being the most consistent predictor. The findings emphasize the need for targeted communication, trust-building efforts, and context-specific strategies to improve COVID-19 vaccine compliance in similar populations.

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