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COVID-19 related risk perception among taxi operators in Kingston and St. Andrew, Jamaica☆

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ABSTRACT

Background: In the Caribbean, all countries have confirmed COVID-19 cases. Considering the high infectivity of the virus, no preexisting immunity to the virus and an associated modest reproductive rate (R₀), the high density of persons utilizing public transport is of immense public health concern. Public transport systems may facilitate and accelerate the transmission of the disease.

Aim: The aim of this study was to assess the COVID-19 related risk perceptions among taxi drivers by virtue of their occupation and the implications for health promotion interventions.

Methods: A cross-sectional study was conducted in May 2020 among 282 taxi drivers in the Kingston and St. Andrew (KSA) metropolitan region in Jamaica. A 28-item anonymized self-administered questionnaire was used to collect data which was subsequently analyzed using SPSS version 20. A risk score was generated and the Mann-Whitney U and Kruskal Wallis tests were used to determine differences in the mean ranks for risk perception score as applicable. A 5% alpha level was utilized in determining statistical significance.

Results: Risk perception scores ranged from 10 to 21 with a median of 17 (IQR 3.25) and there was no statistically significant difference in the median risk perception score by socio-demographic variables. There was however, a statistically significant positive correlation (Spearman’s ρ = 0.238, p < 0.001) between risk perception and knowledge. Approximately, 86% of respondents reported that they obtained COVID-19-related information from news reports (traditional media).

Conclusion: Taxi drivers perceive themselves to be at occupationally related risk of COVID-19. Therefore, greater understanding of this issue is paramount as it can aid in the crafting of initiatives that may enhance personal safety of both taxi drivers and commuters.

1. Introduction

Almost every country in the world has been affected by the novel coronavirus. In January 2020, the World Health Organization designated the outbreak due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), also named COVID-19, a "public
health emergency of international concern” (World Health Organization, 2020a). The majority of cases and deaths to date from COVID-19 have been reported in the United States of America, Brazil, United Kingdom and Italy (Worldometer.D-19 Cor, 2020). In the Caribbean, all countries have confirmed COVID-19 cases (Caribbean Public Health A, 2020). Responses to the pandemic have varied not only from country to country, but within countries and their constituent subpopulations – geographically, socially and ethnically. COVID-19 has changed the way people live their lives around the world. Actions to stem the spread of the virus include social/physical distancing, wearing of masks, increased hand washing and allied sanitary processes. Pervasive response measures involve quarantines and lockdowns, but there is great variation in their severity, duration, and implementation. At both individual and societal level, diversity of action and responses are observed; ostensibly influenced by factors such as risk perception, prevalence and incidence of coronavirus-related morbidity and mortality, and the socio-economic impact of COVID-19 disease (World Health Organization, 2020b, 2020c).

'Social distancing’ is one of the response measures imposed by some governments across the world to minimize the spread of the disease. It is essentially the effort to maintain 3–6 feet physical distance between individuals in the public space and the curtailing of gatherings and interactions which are normally a part of the routine and rhythm of life. Public transport systems ubiquitously involve shared spaces and close contact among commuters, drivers and other road users. This is especially true in Jamaican urban aggregations, where population density and economic activity are high. This is also a reality in some communities where the availability of public motorized vehicles is relatively low, and unmatched with the demand. As such, there is growing concern about overcrowding of vehicles operating in the public sphere. Public transport systems may facilitate and accelerate the transmission of COVID-19. The presence of high numbers of individuals in close contact coupled with the variable responses and behaviours of players in the public transport sector to the COVID-19 pandemic, is of immense public health concern and worthy of attention (World Health Organization, 2020d). Other key considerations are related to the high infectivity of the SARS-CoV-2 virus despite the associated modest reproductive rate (R₀) and the lack of immunity to the virus (Centre of Disease Control, 2020; Ren et al., 2020; Wu et al., 2020; Xie and Chen, 2020; Zhang et al., 2020; Zhao et al., 2020) among the population. Also, in light of the possibility of indirect spread of COVID-19, the concern is not only about disease spread among commuters in close contact but also between drivers and passengers. Exploring the attitudes and behaviours of transportation system players can uncover a better understanding of the interactions between travelers and drivers and is an important step in reducing COVID-19 transmission in public spheres in the Jamaican setting.

Taxi drivers and bus drivers have been described as being at the forefront of the spread of the coronavirus (New York Times, 2020; Lan et al., 2020) and as such may be at increased risk of infectious diseases by virtue of their occupation (Nasir et al., 2016). Persons in this profession are disproportionately negatively impacted by COVID-19 (Office of National Statistics, 2020) and there is recognition that they can make an important contribution in curtailing and limiting the spread of COVID-19 (Wong et al., 2020). In various jurisdictions, guidance has been issued for taxi drivers (Washington State Department of Health, 2020; Watford Borough Council, 2020). Taxi drivers have expressed their own fears regarding COVID-19. There have also been mixed actions from this group in Jamaica and across the world including withdrawal of service, reduction in the number of passengers transported in vehicles at any one time, reluctance to carry health workers, cleaning of vehicles after trips, partitioning of vehicles, pre-payment or contactless payment to reduce physical interaction and maintaining social distance (Glasgow Times, 2020; Jamaica, 2020; Medical News Today.D, 2020; Gleaner, 2020a; Gleaner, 2020b). What drives their actions and reactions, practices and behaviour? Greater understanding of such determinant factors is of paramount importance as it can aid in the crafting of initiatives that may directly or indirectly enhance personal safety of both taxi drivers and their passengers during the prevailing COVID-19 crisis; potentially improving the effectiveness of the public health response in Jamaica and parallel international settings.

1.1. Taxi operation in Jamaica

With 75% of Jamaican households not owning a motor vehicle, the taxi industry is a critical part of the transportation sector for local commuters. An estimated 20,492 public passenger vehicles (PPV) are licensed and registered with the Transport Authority of Jamaica which governs the sector. Island wide, the majority (95%) of these comprise route taxis (62%), contract carriage (23%), hackney carriages (10%) (Auditor General Departmen, 2017). In the greater Kingston/St. Andrew Metropolitan Area (KSMA) (which includes the capital city, where about 1 million persons - 34% of the country’s population reside) (Bailey, 2014), taxis generally fall within these three operational categories: route taxis, hackney carriage and contract carriage. Route taxis carry passengers paying separate fares along a designated route and where passengers may board or alight along the route. Hackney carriages are vehicles used for carrying passengers and which stand or ply for hire on thoroughfares or any location frequented by the public and in the KSMA region hackney carriages are more popular based on their less restrictive remit and greater operational latitude. Contract carriages (colloquially called ‘private’ taxis) are vehicles that under an expressed or implied contract carry passengers for hire or reward (Auditor General Departmen, 2017). A fourth category is known to exist, so called ‘robot taxis’ (‘illegal’, ‘unregistered’, ‘informal’ drivers); their exact numbers unknown. In the greater KSMA, most taxis operate from or traverse through 6 major transport hubs. The taxi industry is/has been traditionally male dominated. Approximately 8% of the male labour force is employed in the transport section compared to the corresponding figure of 2% for females (The Statistical Institute, 2016).

1.2. Theoretical framework

Many theories and models have been advanced and proposed to help explain an individual’s actions and behaviors pertaining to health. These include but are not limited to the Health Belief Model (Glanz et al., 2015), The Transtheoretical Model (Prochaska et al., 2008), Social Cognitive Theory (Bandura, 1986) and the Social Ecological Model (Bronfenbrenner, 1977), all of which to varying
extents reflect the idea that behaviours are shaped by individual factors and social environments. With regard to COVID-19, early emergent research for understanding determinants of such behaviors has utilized the Health Belief Model (Costa, 2020). The Health Belief Model, originally developed by Rosenstock and colleagues in the 1950’s and later modified in the 1980’s (Rosenstock et al., 1988), is one of the most popularly psycho-sociological models used for explaining, predicting and influencing health behaviours. It has been most often applied for health concerns that are prevention-related and asymptomatic (National Institute of Hea, 2008). The Health Belief Model has previously been used in the exploration of behaviours in taxi drivers (Razmara et al., 2018). The model posits that perceived susceptibility, perceived severity, perceived benefits and barriers, cues for action and self-efficacy influence the likelihood that a particular health behavior will be pursued. The first two elements (perceived susceptibility, perceived severity) are key components of risk perception and risk perception in turn influences actions taken and behaviours exhibited (Brewer et al., 2007). In the health field, risk and risk perception have been defined in various ways. Renner et al. (2015) view risk as a product of the probability of a hazardous event happening and the severity of untoward consequences (Renner et al., 2015). They also describe risk perception as the ‘how people construe risk’. In discussing COVID-19 and health risk perception, Cori et al. (2020) supports the notion that risk perception constitutes people’s innate assessments of the hazards that they may encounter and associated unwelcomed effects (Cori et al., 2020). Pidgeon (1998) has asserted that risk perception embodies “beliefs attitudes, judgments and feelings”, all within the crucible of culture and social derived values concerning hazards or threats (Pidgeon, 1998). Specifically with respect to COVID-19, the seminal work of Dryhurst et al. (2020) affirms that knowledge and understanding, personal experience, individual socio-demographic characteristics, and social amplification of risks contribute to risk perception (Dryhurst et al., 2020).

Research on knowledge, risk assessment and risk perceptions has generated motley results. Greater knowledge has been associated with lower risk perception and vice-versa (Cardwell and Elliott, 2019; Sjöberg and Drottz-Sjöberg, 1991). On the other hand, higher knowledge has been positively associated with greater risk perception (Benitez-Díaz et al., 2020; Zhu et al., 2016; Regner et al., 2018) and ignorance/lack of knowledge has been reportedly linked to lower risk perception (Buratti and Allwood, 2019). In studies related to COVID-19, no association was found between knowledge and risk perception (Serwaa et al., 2020; Iorfa et al., 2020), however one study (Lohiniva et al., 2020) reported lack of knowledge being associated with increased perception of COVID-19 to cause devastating harm.

Knowledge and awareness of risk does not automatically translate into regarding oneself as being personally at risk. Personal experience may influence risk perception. Renner et al. (2015) notes that personal risk perception is probably less rooted in numerically analytic thinking and more aligned to intuitive-experiential and affective domains where information is processed against pre-existing opinions and beliefs (Renner et al., 2015). Hence, consistent with the views of Lowenstein (2001) (Loewenstein et al., 2001), and corroborated in the case of COVID-19 by Dryhurst et al. (2020) (Dryhurst et al., 2020), personal experience and emotional feelings shape risk perception. In addition to personal experience, socio-demographic variables affect risk perception (Imai et al., 2005; Huynh, 2020; Jacobs et al., 2010). In research focused on COVID-19 for example, income, educational level, presence of chronic or autoimmune disease, and being a user of public transportation, have been found to affect susceptibility and severity risk perception (Costa, 2020).

![Fig. 1. Risk perception - determinants and contributory factors.](image-url)
Social amplification refers to the informational processes, structures, social group dynamics and individual responses that shape and contextualize the experience of risk and attendant costs (Kasperson et al., 1988). Consequently, the generation and transmission of information via various communication channels (the source, the medium and the signal), as well as interaction with peer groups to decode, interpret and endorse meanings of risk play a role in accepting, denying, or altering risk (Renn et al., 1992). Social amplification of risks is relevant to COVID-19 (Haas, 2020).

Other factors that may mediate or modify risk perception include: voluntariness, discernment of the nature of the risk itself, visibility and trust (Cori et al., 2020). Risks that are deliberately taken tend to be seen as lower compared to involuntary ones which connote ‘uncontrollability’ and tend to be viewed as greater. Unusual risks are more frightening, and fear is more heightened if the risk is deemed ‘man-made’ vis-a-vis ‘natural’. Invisible risks, ceteris paribus, are seen to confer greater impending peril than visible ones and a similar pattern holds for risks with irreversible versus reversible consequences. Trust, confidence and seeming ability of self or other agency to manage threats can change risk perception. These sentiments are echoed by contemporary qualitative exploratory work on COVID-19 risk perceptions which identified the following risk perception domains: ‘catastrophic potential’, ‘probability of dying’, ‘reasons for exposure’, ‘belief of being in control of the situation’ and ‘trust towards authorities’ (Lohiniva et al., 2020). Distillation of the all the aforementioned literature generates a conceptual framework illustrated in Fig. 1 for probing risk perception, its determinants and associated factors.

Risk perceptions are precursors to actions. Actions can have negative or positive consequences which may threaten the viability of society or enhance its longevity and prosperity. Studying risk perception is therefore important, and with regard to COVID-19, the imperative to do so among taxi drivers is even greater given their designation as ‘at-risk public-facing workers’ (Sim, 2020), as an occupational group with reported high mortality from COVID-19 (Office of National Statistics, 2020) and as important links in the chain of COVID-19 transmission in early and late outbreaks (Lan et al., 2020).

Despite recognition of the potential roles of taxi drivers in COVID-19, to date, only few such studies have been published in the international peer reviewed literature pertaining to taxi drivers and COVID-19. None have been found from Jamaica or the wider Caribbean. Insights gained from such studies may be useful in crafting, honing, modifying, or reinforcing health education and health promotion and broader public health efforts among this group in the fight against COVID-19 locally and globally. This paper seeks to describe the occupationally related risk perception regarding COVID-19 among taxi drivers in Kingston and St. Andrew, Jamaica, and uncover perspectives that can be used for policy making and guide health promotion interventions. Hypothetical questions to be answered are: What are the perceptions held of COVID-19 work-related risks by taxi drivers? Are their risk perceptions related to their knowledge of COVID-19, and their socio-demographic characteristics? Does risk perception vary with information source?

2. Methods

A cross-sectional study was conducted in May 2020 among taxi drivers in the Kingston and St. Andrew Metropolitan Region in Jamaica. Eligible study participants were taxi drivers operating route taxis and public or private hackney carriages in well-established taxi hubs in the KSMA. The hubs constitute a broad cross-section of geographical locations within the KSMA (Liguanea/Papine, Half-Way-Tree, Three Miles, Cross-Roads, Downtown, Harbour View and Chancery Street). Taxi drivers operating from closed hubs and sectors (e.g. private taxi drivers operating from the airport and those taking tourists on excursions) that were closed due to the COVID-19 crisis were excluded from the study.

The estimated number of route taxi drivers in Jamaica is 19,000, with roughly 50% operating in Kingston and St. Andrew. Taxi drivers specifically have not been studied in the currently published peer-reviewed literature regarding their knowledge, attitudes and practices pertaining to COVID-19. However, in a study conducted by Geldsetzer (2020) to ascertain the knowledge and perception of COVID-19 among the general public in the United States and the United Kingdom, 74.8% of participants from the United States of America were knowledgeable that droplets were the main mode of transmission of the corona virus (Geldsetzer, 2020). Utilizing that proportion and applying the usual 95% confidence interval, and 5% margin of error, the minimum required sample total 282 (Raosoft, 2004). Stratification was done by hub and 41 taxi drivers were recruited from each of the seven hubs for the study. Hubs were visited on three randomly selected days during the study period during a given week at specified time periods (8am-12pm and 1pm–5pm). At the time of visit, systematic sampling was done with alternate taxi drivers approached for participation in the study.

We employed a cross-sectional study design as this is universally accepted as an appropriate method to get a picture or snapshot of what prevailed at the time of the study. We chose to go to the hubs where the taxi drivers are, to obtain our study participants. Unlike the situation in more highly developed countries, where the taxi industry is tightly regulated, with complete registration of taxi drivers, in the case of Jamaica, as in many developing or lesser developed countries, this is not the case. The industry is comprised of taxi drivers, many of whom are ‘transient’ and unregistered. Consequently, no valid listing or complete sampling frame exists. In such situations, a rapid appraisal method can be used to obtain information quickly and economically, and the ‘hubs’ element which we utilized coupled with various sampling techniques has been advocated for rapid assessment surveys in the transport sector (Agency for Internation; Starkey, 2007).

Data collection was done over a two-week period in May 2020. A 28-item anonymized self-administered questionnaire was used to collect data on the socio-demographic characteristics (gender, age, marital status, education, and household conditions), characteristics of taxi, perceived job-related risk relating to COVID-19, knowledge, practices and attitudes relating to COVID-19.

Data were analyzed using SPSS version 20. The relative frequencies for the socio-demographic characteristics of taxi drivers, and perceived job-related risk relating to COVID-19 were determined. A risk score was generated by computing the scores for the seven risk-related variables. A score of three, two and one were assigned to response of ‘agree’, ‘undecided’, and ‘disagree’ respectively for each risk-related question, except where the question was negatively worded. Where the question was negatively worded, a score of
three was assigned to ‘disagree’, two to ‘undecided’ and one to ‘agree’. The risk score ranged from 7 to 21 with higher scores indicative of greater risk perception. Median risk perception scores were disaggregated by socio-demographic characteristics and the Mann-Whitney U and Kruskal Wallis tests were used to determine differences in the mean ranks for risk perception score as applicable. A 5% alpha level was utilized in determining statistical significance.

All taxi drivers provided informed consent for participation in the study. Ethical approval for the study was obtained from (removed for blinded review). All protocols for the conduct of face-to-face research during the COVID-19 pandemic were adhered to.

3. Results

3.1. Socio-demographic characteristics

There was a total of 282 taxi drivers in the study. As seen in Table 1, the majority of taxi drivers was male (97.5%). Most (56.1%) participants were in the age category 36–55 years and the majority was in union (57.0%). Seventy four percent of participants reported having secondary education as their highest level of education. Among taxi drivers, most (59.1%) reported that between two and four persons lived in their household. The type of taxi registration varied. Most (63.9%) taxis were operating as public hackney carriages and 9% were robot taxis (informal drivers).

3.2. Perception of risk

Taxi drivers provided their perception of risk while operating. As seen in Table 2, approximately 66% of taxi drivers disagreed that there is little chance of catching COVID-19 when passengers sit in the back seat of the vehicle. Sixty seven percent of participants agreed that they are likely to catch COVID-19 when they handle passengers’ luggage, while 28.6% disagreed. Most drivers (89.1%) agreed that passengers who sneeze and cough present a danger to them, while 79% also agreed that collecting cash from passengers increases their risk of catching COVID-19. With regard to wearing masks, 82.6% of respondents agreed that carrying passengers who are not wearing masks is a high-risk activity, however, only 40.7% agreed that they will not get COVID-19 on the job if they wore their masks when carrying passengers. Approximately 57% of respondents agreed that transporting one less passenger is useful in helping to reduce the spread of the coronavirus.

3.3. Risk perception score

A risk perception score was computed for each taxi driver using seven risk-related items captured in Table 2. Scores ranged from 10

| Table 1 | Socio-demographic characteristics of taxi drivers. |
|---------|--------------------------------------------------|
| Variable | Frequency n (%) |
| Gender (n = 281) |   |
| Male | 274 (97.5) |
| Female | 7 (2.5) |
| Age Category (n = 280) |   |
| ≤35 years | 62 (22.1) |
| 36–55 years | 157 (56.1) |
| ≥56 years | 61 (21.8) |
| Marital Status (n = 281) |   |
| In Union | 158 (57.0) |
| Not in Union | 119 (42.3) |
| Main breadwinner (n = 278) |   |
| Yes | 193 (69.4) |
| No | 85 (30.6) |
| Highest Level of Education (n = 273) |   |
| Primary and below | 37 (13.6) |
| Secondary | 202 (74.0) |
| Vocational | 19 (7.0) |
| Tertiary | 15 (5.5) |
| Numbers of persons in household (n = 279) |   |
| Live alone | 41 (14.7) |
| 2–4 | 165 (59.1) |
| 5–7 | 64 (22.9) |
| ≥8 | 9 (3.2) |
| Type of Taxi (n = 277) |   |
| Route | 41 (14.8) |
| Hackney Carriage | 177 (63.9) |
| Contract Carriage | 34 (12.3) |
| Robot | 25 (9.0) |

* In Union: Persons married, or living as married. Not in union: Persons who are single, separated, divorced or widowed.
to 21 with a median risk perception score of 17 (IQR 3.25). Higher scores were indicative of greater perception of risk. Associations between risk score and socio-demographic factors were examined. There was no statistically significant difference in the median risk perception score by gender, age category, marital status, highest level of education, main breadwinner in the household, number of persons in household and type of taxi (Table 3).

### 3.4. Association between risk perception and knowledge

Ten items were used to assess taxi drivers’ knowledge relating to COVID-19. Knowledge score ranged from 2 to 10, with a median knowledge score of 9 (IQR = 2). There was a statistically significant positive correlation (Spearman’s rho = 0.238, p < 0.001) between risk perception and knowledge. As knowledge score among taxi drivers increased, so too did their risk perception score.

### 3.5. Information source

Among taxi drivers, 85.8% reported that they obtained COVID-19-related information from news reports (traditional media). Approximately 51% obtained information from social media. The Ministry of Health and Wellness website was the least (14.2%) utilized information source for COVID-19 related information among taxi drivers (Table 4).

The number of information sources used by taxi drivers ranged from zero to five with a median of 1 (IQR = 1). The elements of risk perception were explored by number of information sources used. As seen in Table 5 below, there was a statistically significant difference in the median number of information sources among participants who agreed (median = 2.0, IQR = 1.5), were undecided

### Table 2

Frequency of risk perception among taxi drivers.

| Variable | Agree | Undecided | Disagree | Total |
|----------|-------|-----------|----------|-------|
| There is little chance of catching COVID-19 when passengers sit in the back seat of the vehicle. | 77 (28.3) | 15 (5.5) | 180 (66.2) | 272 (100.0) |
| I am likely to catch COVID-19 when I handle passengers’ luggage. | 183 (67.0) | 12 (4.4) | 78 (28.6) | 273 (100.0) |
| Sneezing and coughing passengers present great danger to me. | 238 (89.1) | 7 (2.5) | 22 (8.2) | 267 (100.0) |
| Collecting cash from passengers increases my risk of catching COVID-19. | 214 (79.0) | 4 (1.5) | 53 (19.6) | 271 (100.0) |
| Carrying passengers who are not wearing masks is a high-risk activity | 232 (82.6) | 5 (1.8) | 34 (12.5) | 271 (100.0) |
| I will not get COVID-19 on the job if I wear my mask when carrying passengers | 109 (40.7) | 21 (7.8) | 138 (51.5) | 268 (100.0) |
| Transporting one less passenger is useful in helping to reduce the spread of the coronavirus. | 153 (56.9) | 7 (2.6) | 109 (40.5) | 269 (100.0) |

### Table 3

Mean rank of risk perception score across socio-demographic variables.

| Variable | Risk Perception Score | P-Value |
|----------|-----------------------|---------|
| | N | Median (IQR) | Mean Rank | U Or H |
| Gender | | | | |
| Male | 244 | 17 (3.0) | 125.97 | 618 | 0.506 |
| Female | 6 | 17 (4.0) | 106.50 | -0.665 |
| Age Category | | | | |
| <35 years | 57 | 19 (3.0) | 132.72 | 1.91 (2) | 0.385 |
| 36–55 years | 137 | 17 (3.0) | 129.97 | |
| ≥56 years | 55 | 17 (4.0) | 114.57 | |
| Marital Status | | | | |
| In Union | 141 | 17 (3.0) | 118.09 | 6640 | 0.158 |
| Not in Union | 105 | 18 (3.0) | 130.76 | -1.141 |
| Highest Level of Education | | | | |
| Primary and below | 32 | 17 (3.75) | 127.70 | 2.20 (3) | 0.531 |
| Secondary | 184 | 17 (4.0) | 119.15 | |
| Vocational | 17 | 19 (3.0) | 141.50 | |
| Tertiary | 11 | 17 (4.0) | 134.00 | |
| Main breadwinner in family | | | | |
| Yes | 172 | 18 (3.0) | 127.67 | 5818.5 | 0.212 |
| No | 75 | 17 (4.0) | 115.58 | -1.249 |
| Numbers of persons in household | | | | |
| Live alone | 38 | 17.5 (4.75) | 118.36 | 2.58 (3) | 0.462 |
| 2-4 | 147 | 18 (2.0) | 130.71 | |
| 5-7 | 56 | 17 (2.5) | 117.28 | |
| ≥8 | 8 | 17.5 (7) | 105.63 | |
| Type of Taxi | | | | |
| Route | 39 | 17 (4.0) | 111.05 | 4.71 (3) | 0.194 |
| Public Hackney | 157 | 17 (3.0) | 127.45 | |
| Private Hackney | 28 | 18.5 (2.0) | 138.63 | |
| Robot | 23 | 17 (4.0) | 104.59 | |
various risks. The greater the number of information sources, the less the perception of the risk of contracting COVID-19 when passengers sit in the back seat of the vehicle (H (Worldometer.D-19 Cor, 2020) = 8.85, p = 0.012). Similarly, a statistically significant (H (Worldometer.D-19 Cor, 2020) = 6.41, p = 0.041) higher median number of information sources was noted among those who agreed (median = 2.0, IQR = 1.0) that ‘I am likely to catch COVID-19 when I handle passenger’s luggage’ than among those who were undecided (median = 1.0, IQR = 0.75) and those who disagreed (median = 1.0, IQR = 1.0). With regard to the variable ‘I will not get COVID-19 on the job if I wear my mask when carrying passengers’, the median number of information sources among those agreeing (2.0, IQR = 2.0) was statistically greater (H (Worldometer.D-19 Cor, 2020) = 6.53, p = 0.038), than those disagreeing or were undecided who had similar medians (1.0, IQR = 1.0). The number of information sources used by taxi drivers for the other risk perception variables did not differ significantly by those agreeing, disagreeing or among those who were undecided (see Table 5).

4. Discussion

Our study elucidated information on risk perception in a high-risk occupational group – taxi drivers. In examining the findings of this study, we sought to be guided by the conceptual framework derived from a search of the literature on risk perception. Among taxi drivers studied, there is obvious awareness regarding the nature of the risk of COVID-19 and the perception that they are high risk for this disease which is also perceived as serious. Perceived sources of higher risk include passenger related behaviours like sneezing and coughing; driver behaviours of handling passengers’ luggage, not wearing masks and not carrying one less passenger. Accessing information sources about COVID and being more knowledgeable about its prevention contribute to higher perception of risk. The need to make a living and support families are drivers to continue facing the risks while wearing of masks is perceived as a modifying factor.

Taxi drivers considered themselves as at relatively high risk for contracting COVID-19 by virtue of their occupation, with their typical risk perception score at the higher end of the scale. This observation is consistent with findings from Dryhurst et al. (2020) and Office of National Statistics (Office of National Statistics, 2020). The relatively high risk perception scores may reflect taxi drivers views of the nature of risk, i.e. novelty, perceived susceptibility, potential to cause damage to health or non-health assets (example income), as well as their knowledge about COVID-19 disease. We found no association between socio-demographic variables and risk perception. In contrast, another study has reported associations with gender and age in some countries (Dryhurst et al., 2020), but consistently no association was found between risk perception and educational level (Dryhurst et al., 2020). Differences in gender distribution in our study (97.5% male) and possible differences in age profile of study participants may partly explain the variation in findings. It is however not surprising that risk perception was not related to educational level. We posit that primary education is sufficient to allow persons to process and appreciate the widespread essential information disseminated about COVID-19 from health authorities and therefore, significant differences might not exist. Additionally, almost 86% of respondents had a common source of information (news reports).

Diverse sources of information were reported, including traditional media (approximately 86%) and social media; the latter highlighting the use of emerging communication technologies. The number of information sources was related to participants’ views of various risks. The greater the number of information sources, the less the perception of the risk of contracting COVID-19 when passengers sit in the vehicle, and a similar pattern was noted with regard to catching COVID-19 and handling passenger’s luggage. The risk perceptions may be linked to convergence of messages from the various information sources, which reinforce a common perception. This observation is explained by the phenomenon of the social amplification of risk (Kasperson et al., 1988; Renn et al., 1992). In the current digital age characterized by the proliferation of multiple information sources and networks, social amplification has been found to be a significant determinant of COVID-19 related risk perception around the world (Dryhurst et al., 2020). We also noted that participants who agreed that they will not get COVID-19 if they wore mask when carrying passengers had higher number of information sources. We theorize that persons with multiple information sources may have more comprehensive information about the protective effects of masks. We also acknowledge the possibility that persons disagreeing with the statement, display a nuanced response recognizing that wearing masks does not guarantee protection from COVID-19, as there are different portals of entry, example, mucous membranes of the eyes. Knowledge score was positively correlated with risk perception score. Similar findings have been reported in the literature (Benítez-Díaz et al., 2020; Zhu et al., 2016; Régner et al., 2018; Buratti and Allwood, 2019). Knowledge and awareness of risk may influence perception of risk, controllability, catastrophic potential and susceptibility as previously illustrated in Fig. 1.

Regarding the transport of one passenger less than they are normally licensed to carry at any one-time (to facilitate social/physical distancing), mixed views existed; only 57% was in agreement. This could be due to the anticipated negative economic impact that such

| Source of Information          | Frequency |
|-------------------------------|-----------|
| News Report (Traditional Media<sup>a</sup>) | 218       |
| Ministry of Health and Wellness Website | 36        |
| Social Media                  | 130       |
| Fellow Taxi Drivers           | 52        |
| Government Press Conference   | 62        |

| Number                  | Percentage of Cases |
|-------------------------|---------------------|
| 218                     | 85.8%               |
| 36                      | 14.2%               |
| 130                     | 51.2%               |
| 52                      | 20.5%               |
| 62                      | 24.4%               |

<sup>a</sup> Traditional media refers to television, radio and newspaper.
a measure would have on the livelihood of taxi drivers. Additionally, given the relatively modest vehicle size of taxis, the perception might be that one less passenger makes no difference to the prevention of COVID-19, i.e., passenger-driver as well as the passenger-passenger separations are still less than the recommended ‘physical distancing’. There have also been mixed actions from this group in Jamaica and across the world including withdrawal of service, reduction in the number of passengers transported in vehicles at any one time, reluctance to carry health workers, cleaning of vehicles after trips, partitioning of vehicles, pre-payment or contactless payment to reduce physical interaction and maintaining social distance (Glasgow Times, 2020; Jamaica, 2020; Medical News Today.D, 2020; Gleaner, 2020a; Gleaner, 2020b).

Risk perception regarding COVID-19 is a multifactorial issue. Consequently, multifaceted approaches will be required to address misperceptions and reinforce appropriate awareness, knowledge and understanding of the disease. These can ultimately drive and shape views, responses, behaviors and actions taken by taxi drivers themselves to reduce personal risk and community transmission. Interventions to address risk perception must be specific and targeted. For example, the issue of transmission of the virus via health workers uniforms needs to be discussed and a clear message crafted and delivered to taxi drivers. Information should also focus on vehicle and personal sanitation, mask wearing during commute for both passengers and drivers, limiting the number of passengers transported at a single time and the installation of plexiglass partitions between the driver and passenger compartments (Glasgow Times, 2020; Jamaica, 2020; Medical News Today.D, 2020; Gleaner, 2020a; Gleaner, 2020b).

The latter recommendations we recognize, present an economic challenge in our environment, and resistance to, and non-compliance with such measures may arise. A balance between the ideal and the pragmatic will need to be struck through discourse among relevant parties.

Multiple channels and sources of information should be utilized for conveying messages and information to taxi drivers. The use of traditional media complemented by the burgeoning social media space are appropriate mechanisms to achieve greater penetration of the taxi driver community. Some attention should be paid to consistency of messages and reliability of information sources. If not addressed, there is the potential for mistrust of authorities and overall undermining of confidence in the health system and its capacity to respond to the pandemic. In such circumstances, perceptions of risk pertaining to COVID-19 could be either exaggerated, leading to panic and irrational behaviour, or attenuated leading to complacency and nonchalance. Neither is ever desirable in a crisis.

Limitations of this study include the sample being largely from the Kingston and St. Andrew Metropolitan Area. Findings may therefore not be generalizable nationally, regionally or globally. We also acknowledge that the quality of sources from which taxi drivers obtained their information was not assessed and beyond the scope of this study. Nevertheless, the study provides insight on risk perception which may stimulate further research in diverse internationally settings. It adds to the emergent body of knowledge concerning taxi drivers and the COVID-19 pandemic. Our search of the literature suggests that this is one of few studies which has explored COVID-19 related risk perception among taxi drivers, an internationally acknowledged ‘at risk group’. This research provides empirical evidence regarding the COVID-19 risk perception of taxi drivers, and justifies the need to address perceptions in order to ultimately increase adherence to recommended COVID-19 prevention and mitigation measures. Such adherence in turn can reduce risk of transmission to both taxi drivers and passengers, overall, enhancing personal safety.

| Risk Perception Variables | Response       | Median (QQR) | Mean Rank | H (df) | P     |
|---------------------------|----------------|--------------|-----------|--------|-------|
| There is little chance of catching COVID-19 when passengers sit in the back seat of the vehicle | Agree          | 2.0 (1.5)    | 156.30   | 8.85(2)| 0.012a|
|                           | Undecided      | 1.0 (1.0)    | 121.57    |        |       |
|                           | Disagree       | 1.0 (1.0)    | 127.04    |        |       |
| I am likely to catch COVID-19 when I handle passengers’ luggage | Agree          | 2.0 (1.0)    | 143.39   |        |       |
|                           | Undecided      | 1.0 (0.75)   | 110.29    | 6.41(2)| 0.041a|
|                           | Disagree       | 1.0 (1.0)    | 120.89    |        |       |
| Sneeze and coughing passengers present great danger to me | Agree          | 1.0 (1.0)    | 132.93    | 0.314(2)| 0.855|
|                           | Undecided      | 1.0 (1.0)    | 117.36    |        |       |
|                           | Disagree       | 1.0 (2.0)    | 132.75    |        |       |
| Collecting cash from passengers increases my risk of catching COVID-19 | Agree          | 1.0 (1.0)    | 134.67    |        |       |
|                           | Undecided      | 2.0 (0.0)    | 151.00    | 0.238(2)| 0.888|
|                           | Disagree       | 1.0 (1.0)    | 132.58    |        |       |
| Carrying passengers who are not wearing masks is a high-risk activity | Agree          | 2.0 (2.0)    | 134.28    | 0.017(2)| 0.992|
|                           | Undecided      | 2.0 (0.75)   | 137.40    |        |       |
|                           | Disagree       | 1.0 (1.0)    | 135.56    |        |       |
| I will not get COVID-19 on the job if I wear my mask when carrying passengers | Agree          | 2.0 (2.0)    | 146.76    |        |       |
|                           | Undecided      | 1.0 (1.0)    | 125.57    | 6.534(2)| 0.038a|
|                           | Disagree       | 1.0 (1.0)    | 123.22    |        |       |
| Transporting one less passenger is useful in helping to reduce the spread of the coronavirus | Agree          | 1.0 (1.0)    | 133.58    |        |       |
|                           | Undecided      | 2.0 (2.0)    | 121.71    | 0.192(2)| 0.909|
|                           | Disagree       | 1.0 (1.0)    | 134.16    |        |       |

*a denotes statistical significance.*
5. Conclusion

Taxi drivers perceive themselves to be at occupationally related risk of COVID-19. Multiple factors affect risk perception. These should be borne in mind as programs and interventions targeted at providing information and shaping behavior are developed. The influence of knowledge, attitudes and economic factors and their impact on COVID-19 related practices and responses in the taxi driver community should be further explored given their potential role in the mitigation and control of the current COVID-19 pandemic.

Author statement

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Conceived the idea for the study, participated in data collection, data analysis and manuscript preparation

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Declaration of competing interest

The authors declare that they have no conflict of interest.

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