

Research



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Working conditions and respiratory health of informal food vendors' in Johannesburg, South Africa: a cross-sectional pilot study

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Abstract

Introduction: informal vendors are among the most deprived sections of the informal sector. The daily and prolonged exposure to biomass fuel and outdoor air pollution is a major cause of morbidity and mortality in this industry. **Methods:** a cross-sectional pilot study was conducted among 100 informal vendors at 38 indoor (inside buildings) and outdoor (roadside or street) vendor, stalls within Johannesburg, South Africa. The purpose of the pilot study was to determine the suitability of the data collection tools for the main study, which included the walkthrough survey checklist and the previously validated respiratory questionnaire by the British Medical Research Council. Furthermore, it was to obtain a snapshot of demographic profile, occupational risk factors, and respiratory symptoms among informal vendors. Data were analyzed using SPSS 26.0. **Results:** there were more roadside vendors, often exposed to air pollutants, as compared to vendors inside buildings. Most vendors in the study had access to water. The hygiene status in and around stalls was found to be below acceptable standards. Most were female vendors (63%), with an average age of 25-34 years. Fifty-five percent of the stalls sold cooked food; with most selling meat (58%) and porridge (55%). Most vendors worked more than 8 hours (73%) a day. Female vendors also noted cooking at home, reflecting an increased risk of exposure. Twenty-six percent of the vendors lived nearby heavily trafficked roads and 20% lived near large industrial pollution sources. Smoking vendors were 12% and 35% experienced passive smoking. The results reflected an improper respiratory protective equipment usage, with 54% using cloth masks, and 73% reporting changing of masks at least three times a week. Upper respiratory symptoms were most prevalent in cooking vendors, with no report of chronic diseases. **Conclusion:** therefore, we conclude that occupational health management is required in improving the workplace conditions and eliminating illness and disability related to work in this industry; thus ensuring the business's

operations and stakeholder involvement are strengthened.

Introduction

Globally, the workplace is acknowledged as a critical social determinant of health. According to the National Development Plan (NDP), 11 million jobs will be generated by 2030, with the informal sector creating 1 to 2 million employment [1]. Vendors on the street have become one of the most significant service providers for the busy urban lifestyle. This makes it easy for city workers, school learners, varsity students, and commuters to find food close to their work, academic institutions, and transportation facilities. The ease of access and affordability of street food makes it popular among urban dwellers or people living in the middle of the city as they can find these services right across the street from their homes [2]. Street foods generate a high volume of sales and a high level of employment. The Daily Maverick reported in 2021 that about 60% of the fruit and vegetables sold at South Africa's (SA) municipal fresh produce markets was bought by street vendors; In Johannesburg alone, buyers for the informal sector accounted for at least 3.9-billion South African Rands (ZAR) a year in produce sales which is half the turnover of the city's main fresh produce market [3]. Average profits have been estimated to be above earnings from alternative sources of employment [2]. The average income generation of informal vendors in SA was reported to be about 32 billion ZAR annually [4]. The City of Johannesburg (COJ) Informal Trading By-laws defined informal trading as "any activity that may include street trading, which comprises the selling of goods or supply of services for reward on a public road; selling of goods in a controlled market or public place; mobile trading such as caravans and light motor vehicles; selling of goods in stalls or kiosks and at special events" [5]. Foodstuff is defined by the drugs and drug trafficking act, 1992 (Act No.140 of 1992) and the foodstuff, cosmetics and disinfectants act, 1972 (Act No.54 of 1972) as any

article or substance, except a drug, ordinarily eaten or drunk by a person or purporting to be suitable or manufactured or sold for human consumption and includes any part or ingredient of any such article or substance or any substance used or intended to be used or destined to be used as a part or ingredient of any such article or substance [6,7].

Some of the different types of informal vendors trading areas include; trading in the street, trading in malls or markets, mobile vendors, and special events vendors [8]. One of the potential sources of exposure to vendors' health is air pollution from nearby industries, construction, traffic and biomass fuels from the cooking activity. According to a study of an industrialized city, particulate matter concentrations (PM₁₀) at the roadside (210 ± 70 micro/m³) were significantly higher than inside shops (130 ± 40 micro/m³) [9]. A separate study by Amaran (2016) found that the average PM_{2.5} exposure among roadside vendors was 31.05g/m³, while the average exposure among the unexposed comparison group was found at 19.41g/m³ [10]. A survey of adult Thai street vendors found that 37% reported fatigue, 27% coughed, 23% felt dizzy, 20% reported headaches, and 20% reported nasal congestion [11]. Additionally, another study found that respiratory symptoms such as coughing, chest tightness, wheezing, and phlegm were significantly higher among exposed vendors [12]. In terms of compliance with national legislation, it was reported by the SA Department of Labour (2020) that the current occupational health and safety legislation neglects the informal economy, even though research shows that this economy is growing; with the informal economy finding it frustrating to comply with the requirements and finding the legislation as more punitive. Furthermore, it was reported that government departments that regulate occupational health and safety often work in silos, with little coordination and collaboration [9]. With the increase in overcrowding and non-compliance by informal vendors, metropolitan municipalities

have experienced deterioration of the public environment on many streets especially as these have not been designed for the high-density trading activities [10]. The primary aim of this study was to determine the suitability of the proposed data collection methods for the main study [12]. The secondary aim was to highlight the variables in these activities which had the potential to cause harm to human health, to promote a high health and safety standard in informal trading and to support the improvement of current programs and the development of new ones to bridge current gaps.

Methods

Study design and setting: a cross-sectional pilot study was conducted to determine the suitability of the proposed data collection methods for the main study, which includes the walkthrough survey checklist and the respiratory questionnaire. For this pilot study, two vendor trading sites were used, a market vendor group and scattered roadside or street vendors.

Study population: the informal vendor population of the study was the entire City of Johannesburg (COJ) Metropolitan Municipality. This is one of the most heavily impacted municipalities in SA by informal trading activities. For this pilot project, Ward 57, which is located in the Region F of the municipality and home to industrial establishments, was used as the study area. According to census 2011, the ward had a population of 36,672 and a population density of 1,148.4 people per square kilometre.

Sample size and sampling: the cross-sectional pilot study was conducted among 38 informal vendor stalls and 100 informal food vendors operating inside buildings (indoors) and those operating at the roadside (outside) stalls. A simple random sampling technique was used in this study to select informal food vendors in each type of trading stall (indoor and outdoor).

Data collection method

Walk-through-survey checklist: a walkthrough survey checklist was used to inspect the 38 stalls in addition to observations. The walkthrough survey was done with the stall owners or managers. The walkthrough survey was descriptive in nature, describing the working conditions of informal vendors (requiring information such as the type of cooking medium used, access to water and waste disposal facilities, ventilation), as well as factors in their work environment that may have an impact on their health (requiring information such as any nearby traffic, industrial sources, visible dust, etc).

Respiratory symptoms and diseases questionnaire: the respiratory symptoms and diseases questionnaire was used to obtain a snapshot of occupational risk factors, demographic profile, respiratory symptoms and symptoms among informal street vendors. This tool was adopted from the previously validated questionnaire of the American Thoracic Society and the Division of Lung Diseases (ATS-DLD-78) approved by the the British Medical Research Council (BMRC). This questionnaire was also validated in SA [13]. the respiratory symptoms and diseases questionnaire was used to obtain a snapshot of occupational risk factors, demographic profile, respiratory symptoms and symptoms among informal street vendors. This tool was adopted from the previously validated questionnaire of the American Thoracic Society and the Division of Lung Diseases (ATS-DLD-78) approved by the the British Medical Research Council (BMRC). This questionnaire was also validated in SA [13]. The questionnaire is divided into three sections. Section A was focusing on socio-demographic factors such as age, gender, and educational level; Section B on risk factors such as work duration, wearing of Respiratory Protective Equipment (RPE), and hand hygiene practices. Indicators such as exposure to cooking smoke or fumes at home, and living near a large industrial air pollution source were also included [9]. Health outcomes investigated were

self-reported respiratory symptoms and diseases, which formed Section C of the questionnaire.

Statistical data analysis: collected data from the questionnaires were captured into in the Microsoft Excel spreadsheet, cleaned and then exported into Statistical Package for Social Sciences (SPSS) software (IBM Corporation), Version 26.0 for analyses. Descriptive statistics were computed and expressed as frequency, percentage or mean. The analysis of the walkthrough survey data was descriptive in nature and the situations have been explained with the help of a quantitative paradigm.

Ethical approval: the University of Johannesburg (UJ) approved this study. The study methods were approved by the Faculty of the Health Sciences standards at the UJ (HDC-01-68-2021) and it was registered on the National Health Research Database (NHRD) (NHRD ref. no: GP_202102_036). It was also approved by the Health District Research Committee (DRC) (DRC ref.: 2021-02-013) and the UJ Faculty of Health Sciences Research Ethics Committee (REC) at the University of Johannesburg granted an ethical clearance (REC-01-141-2017). Vendors gave signed consent to participate in the field study. To maintain confidentiality and privacy, the sampled vendor sites were renamed Group A and Group B. The data was collected over the period of 2 days in December 2021. All COVID-19 protocols were followed during data collection.

Results

Description of the study sites and locations: informal food vendors in group A, were located in one of the largest controlled or commercial marketplaces in the country. In this environment, informal vendors are housed in similar stall structures depending on what they sell. The outside vendor stalls selling cooked food were occupying stainless steel stalls. Hand-wash basins and cooking equipment are built-in within the stalls. Those selling non-cooked food were

occupying floor demarcated stalls under one huge roof only covered shelter. Group B comprises roadside vendors who trade in the open spaces or streets which are without any coordination and their stall containers varied. The cooking vendors in this category purchase or improvise trailers or shelters. Although some had to bring them in the morning and remove it in the afternoon. For both groups, there is a trailer stall which was the most prevalent out of all stall types. All vendors in each group had access to water points, with most using communal or public water taps (N=20; 53%) in comparison with those with water taps inside their stalls or structure (N=18; 47%).

Demographics of informal food vendors: this study revealed that 73% of the vendors in the study area were South Africans, and only 26% were non-South Africans (Table 1). The highest number of vendors were females (63%) as compared to males (37%) with most vendors in the age group of 25 to 34 years (35%). Only 4% of the vendors were at 55 years or above. Education results showed that only 4% attended higher education. With most vendors having attended or graduated from secondary schooling (78%), and 15% attended or graduated from primary schooling, and 3% of the vendors never attended school.

Types of trading stalls and food sold: the results showed that the vendors spend an extended period in one location. The majority of the 38 stall owners or managers interviewed had been at that site for more than 5 years. Most stall owners (N=14; 37%) have been working in that occupation and location for 6 to 10 years, followed by (N=11; 29%) who have been there for 11 to 15 years. The vendors mentioned the hardship in securing stalls, hence the longevity in such stalls once they occupy them. The two types of stall locations that influence their workplace exposure included inside buildings stalls (indoor) and outdoor (including street or roadside) vendors. As per Table 2, The majority of participating stalls (N=29; 76%) were outdoor stalls, as opposed to indoor stalls (N=24; 24%). The results showed that out of the 100

participating vendors, 66% were trading outdoor and 34% traded indoor. However, for those working indoors, 3% reported to have worked in the outside trading areas, and out of the 66% who are working outdoors, 9% reported to have worked at indoor trading areas. Even though the majority of the vendors in this pilot research were occupying stalls made of formal structures (N=30; 79%) (either inside trailers or brick walls); concerning, (N= 8; 21%) of the stall were made of temporary structures with no protection, such as an umbrella or an open trolley, to shield themselves and their wares, exposing them to elements of nature while trading.

The results revealed that 84% of the stalls facilities were utilized to prepare food on-site (at the stalls). The study comprised of 47% participants from stalls that sell only cooked food (55% outdoors and 11% indoors), and 22% from stalls that sell both cooked and non-cooked food and (31%) sold only non-cooked food (Table 2). Most vendors who participated in the study were from cooked food stalls (69%) (Table 2). In terms of the job description, 35% of the vendors worked as chefs or cooks, and 41% as waiters. However, the vendors noted that the most interchangeable duties would be between the chefs and waiters, especially during rush hours (mornings and lunch times) when food is in demand to the public. Furthermore, Table 2 demonstrates that the majority of cooking stalls sell meat with porridge (55%), followed by the 47% of them who were selling deep-fried dough. The deep-fried dough known to South Africans as “Amagwinya” was mostly sold during breakfast times which is between (5h00 to 10h00) while the porridge (also known as pap in SA) was sold between 11h30 to 14h00. The vendors noted that the preparation of food onsite close to the lunch hour ensured that the customers receives hot food plates, reducing the need for them to place such food in warmers. Those serving cooked food also serve drinks or snacks to give their clients a full dining experience. Rice, soup, bunny chow, boiled or fried Millie, and

non-cooked food such as fruits and vegetables were among the other items sold.

Duration of exposure: the vendors' working hours ranged from 5h30 to 17h00, depending on what they sold, with most prepared food stalls shutting sooner than the others because they sell until the lunch hour (between 12h00 to 14h00). The recommended working hours are eight hours on any day if the employee works more than five days a week. However, for this study, about 73% of the vendors worked for more than 8 hours a day, followed by 20% who worked for 8 hours and 7% who worked less than 8 hours. The vendors who work over 8 hours from Monday to Saturday or Sunday are working over the recommended working hours in a week. Only 11% employed a rotation approach in their work operations, while the remainder (89%) used a full shift, forcing people to work long hours.

Workplace air pollution exposures: the findings revealed the presence of sources of air pollution in this activity. Such as traffic, with most areas having light traffic (N=24; 63%) as opposed to those with heavy traffic (N=4; 11%). The findings also revealed that the majority of vendors (N=24; 63%) work near substantial air pollution emission sources, as opposed to those who do not (N=14; 37%). Industrial combustion plants (N=23; 61%) and building activities (N=22; 58%) were the emission sources identified. The cooking media utilized at work also had a role (Figure 1). The majority of the stalls (N=20; 53 %) utilized gas, followed by electricity (N=17; 45 %), with most vendors employing both methods at a stall (Table 2). Charcoal or open fire was the least commonly used (N= 1; 3%). Only (N=5; 13%) of the cooking vendor stalls were found to have visible smoke. Furthermore, dust was apparent in (N=21; 55%) of the stalls. While the total cleanliness status of the stalls of (N=22; 58%) was equally non-compliant as compared to (N=16; 42%) sanitary stalls. In terms of waste management, the majority of participating stalls (N=21; 55%) lacked an appropriate waste container with a cover for

refuse storage, with only (N=4; 11%) of the stalls exhibiting rats breeding or animal droppings.

Home air pollution exposures: the results reflected exposures to air pollutants such as fumes occurring at the vendor's homes while cooking or other air pollutants such as residents' nearby traffic (Table 1). 68% of the vendors are the main cooking members of their families' homes. Most of these vendors were found to be female vendors. Only 26% of the vendors lived nearby heavily trafficked roads, and only 20% of the vendors were living near large industrial air pollution sources.

Informal vendors' behaviors: all food handlers practised hand hygiene (Table 1). With only 30% of the vendors practising hand hygiene at all times, most of the vendors (61%) stated that they practised as often as they could. The rest of the vendors (9%) stated that they rarely or occasionally practice hand hygiene. Furthermore, when demonstrated by the field workers on the WHO and CDC methods of hand-washing and sanitization, it became evident that some vendors just wash or sanitize their hands as they see suitable or efficient and were not aware of the proper method of washing or sanitizing their hands. Only 81% of the vendors agreed to be using the appropriate hand-washing method. Tobacco smoke consists of numerous chemicals that act as toxic irritants. In terms of smoking, the results showed only 12% of vendors who smoke, as compared to 88% of non-smokers who noted to have never smoked before (Table 1). However, both smokers and non-smokers (35%) noted to being exposed to passive smoking. The results further showed that smokers are mostly male vendors as compared to females.

Health and safety control in vendor stalls: in terms of implemented health and safety measures, ventilation was not an issue in any of the participating stalls, with the majority of the stalls having natural ventilation (N=27; 71%), and the remaining stalls having both natural and artificial ventilation mechanisms (N=11; 29%).

None of the participants had conducted air monitoring in their stalls, and just a few (N=2; 5%) undertake quarterly biological monitoring, and these are vendors within a controlled market with a medical clinic facility within the market. The majority of vendors who participated indicated they were trained (N = 25; 66%) on health, hygiene, and safety issues. Those who were trained reported receiving such from the Department of Health (N=23; 61%), as well as in-house training (N=6; 16%). With (N=22; 58%) claiming it was only conducted once, and (N=1; 3%) mentioning that it was conducted monthly, quarterly, and yearly. Despite a lack of clean personal protective equipment (PPE); PPE such as an apron, a hairnet, and masks were worn. Most vendors wore RPE, about 54% of the vendors wore cloth masks, followed by hygiene or surgical masks usage (45%). In addition, only 1% used the proper RPE (N95 mask). The challenge with using the RPE was noted in the results as only 54% used their RPE at all times, with 56% either using it almost all the time or occasionally while at work. Seventy-five percent of the vendors noted at least changing or washing their masks two to three times weekly and only 8% changed their masks daily. Furthermore, about 17% changed their masks weekly or within two weeks when most are supposed to be disposed of after each usage such as surgical masks and washed daily for those using cloth masks. These results are summarized in **Table 2**.

Respiratory symptoms and diseases:there were no lower respiratory diseases or vascular diseases reported amongst vendors. Only 35% noted that during the past three years have had a chest illness which has kept them from their usual activities for as much as a week or longer. With no one reporting any current suffering from bronchitis, pneumonia, pleurisy, pulmonary tuberculosis, bronchial asthma, hay fever resulting in asthma or any heart trouble or other vascular diseases. Out of all respiratory symptoms, about 10% of vendors were troubled by shortness of breath when hurrying on level ground or walking

up a slight hill. The symptoms results suggested that cooking vendors are experiencing more upper respiratory symptoms as compared to non-cooking vendors. Twenty-nine percent of cooking vendors experienced nasal congestion and 30% sore throat as compared to non-cooking vendors (with whom 5% experienced nasal congestion and sore throat respectively). Thirty-six percent of the vendors reported that they sometimes experience eyes, nose, and throat irritation during food preparation (Table 3). As this study was conducted during COVID-19 times, it was found that only 8% of the participant contracted COVID-19 between the years 2020 and 2021 which is low. This may be due to most vendors working outdoors in open spaces with no issues with ventilation.

Discussion

Socio-demographic characteristics:these study's findings on informal vendors' dominance by females, an age group of 25 to 34 years and work shifts duration of above 8 hours a day were similar to various street vendors' studies across the world. A study by Ekono *et al.* (2020) found that the vendors between the age of 25 and 35 age groups represented approximately (68.8%) of the workforce and the daily working time of more than 8 hours per day (92%) [14]. Furthermore, education level was similar to another study's participant education level which was most frequently primary and secondary school (40%), with work experience of above 10 years (60%). The results on staying in certain markets for longer periods are similar to results found in other cities in Africa. Such as Calabar, Nigeria, with the average number of years of residence being 10.3 years, while a typical food vendor in Minna, Nigeria had traded for an average of 14.2 years [15]. These data demonstrate a sense of permanency with their present living situation, emphasizing the importance of trading for their livelihoods. In terms of home-based exposure, this study found information on female vendors who cook at home. There has been an increase in the number of men cooking at home, however women

still predominate food shopping and preparation. Vendors, who are cooking at work and also at their homes, will have additional respiratory risk exposure. The amount of time spent cooking both at work and at home increases the exposure to biomass fuels.

In terms of personal habits; there were only 12% of smoking vendors reported in the total sample. However, non-smokers have reported to experiencing second-hand smoking. Exposure to environmental tobacco smoke (ETS) or “second-hand smoke” increases significantly the risk of developing cardiovascular diseases (25-35% increase), lung cancer (20-40%), asthma (40-60%), pulmonary irritation (15%-2.5 times) and chronic obstructive pulmonary disease (COPD) (20%-2.5 times). It is also associated with lowered birth weight and premature death [16]. Furthermore, PM of ETS leads to adverse health effects in the eyes and respiratory tract, for instance irritation [16]. The gap between education and practice is always a concern for occupational health and safety professionals. Furthermore, it was revealed that 19% of vendors did not follow the WHO and CDC standards of handwashing. Scientific studies showed that applying soap to dry hands and scrubbing for shorter than 20 seconds will not remove as many germs [17].

Types of trading stalls and activities: according to the findings of this survey, the majority of vendors work at the roadside, near industrial and construction operations. Only 21% of the stalls in this pilot study were stalls with no shade or carts with umbrellas. Furthermore, the majority of vendors have access to tap water, whether in their structures or from communal or public taps. On the other hand, the opposite was observed in waste management, with the majority of vendors lacking a basic refuse bin with a lid. These results are not consistent with other studies, which may be owing to the limited sample size of this pilot. Many studies found that the majority of vendors lacked shelter or coverage [18,19], such as the study conducted in 2015 in the city of Ahmedabad [18]. During the walkthrough

examination, visible dust was also observed in several stalls. Informal trading has been identified as a long-standing dangerous urban poor occupational practice [20]. The bulk of the vendors are at stalls with both natural and artificial ventilation, which helps with air circulation. However, according to one research, while air conditioning reduces pollution, it may not be enough to avoid respiratory problems caused by exposure to automobile emissions [9].

Occupational health vendors: informal vendors are regarded as the most vulnerable working groups in terms of environmental exposure, especially for those working outside [21-23]. Another study indicated that the mean of PM_{2.5} exposure among roadside hawkers was 31.05 (1.62) mg/m³, whereas the exposure among the comparison group was 19.41 (1.51) mg/m³ (P<0.05) [10]. It is important to stress that many. Furthermore, cooking fuel smoke and working hours are associated with an increased prevalence of upper respiratory symptoms. The respiratory symptoms and other symptoms reported in street vendors in Bangkok, Thailand, were related to exposure to traffic-related pollution, in particular, PM₁₀ and PM_{2.5} as supported by various studies in the world [8]. These findings suggest that there is a concern on health and the use of proper RPE specifically for PM₁₀ and PM_{2.5} among street vendors in Johannesburg South.

Adding to the long work hours, informal vendors are constantly exposed to the unavoidable: adverse weather conditions such as extreme heat or cold, heavy rains [21-23]; they are also exposed to air pollution contributed by the road dust, vehicular emissions, and air pollutants from industrial and other sources, resulting in a wide range of adverse respiratory health effects. As a result, the majority of vendors are exposed to natural elements when trading [18,22,23]. With concern of informal vendors; according to the Global Burden of Disease Study (GBD) 2016, up to 4.1 million people died as a result of ambient PM_{2.5} air pollution in 2016. This places ambient

PM2.5 as the seventh-highest health risk factor for worldwide fatalities among the hundreds of risk variables evaluated by the GBD 2016 [24]. Epidemiological literature has proven that exposure to traffic emissions, industrial emissions, and biomass fuels at home can increase the prevalence of respiratory symptoms [11,22,23,25,26]. The American Lung Association reported that traffic pollution causes asthma attacks, impaired lung function, premature death and death from cardiovascular diseases, and cardiovascular morbidity in children [27]. A study in Central Italy reported a higher prevalence of wheezing by residents with increasing exposure to industrial PM10, while a higher prevalence of cough with phlegm was observed among people more exposed to traffic NO₂ [28]. Another study found that higher traffic density was significantly associated with lower forced expiratory volume (FEV1) and forced vital capacity (FVC) in women [29].

Occupational respiratory risk control measures: in occupational health, work duration has been noted as one of the critical factors in determining a worker's risk of a particular hazard. Vendors should consider administrative measures such as taking regular breaks or instituting rotation during working hours. This further prompts the proper implementation of respiratory control measures in this workplace. Practicing hand hygiene is one of the effective ways for vendors to protect themselves against respiratory infections. South Africa COVID-19 requirements of wearing masks came in handy for many informal occupations where RPE was not used in the past. Most vendors wore cloth and surgical masks. If worn properly, a surgical mask is meant to help block large-particle droplets, splashes, sprays, or splatter that may contain germs (viruses and bacteria) [10,11]; which helps with preventing exposure to COVID-19 however not against other air pollutants. However, street vendors are also exposed to air pollution from biomass fuels and traffic, e.g. particulate matter (PM2.5 and PM10), which the correct type of mask, capable of filtering out about

95% of very fine particles is N95 mask or equivalent [30,31]. Furthermore, most N95 respirators are manufactured for use in construction and other industrial-type jobs that expose workers to dust and small particles [30,31]. Conversely, the percentage of street vendors who reported they had upper respiratory symptoms was higher among cooking vendors, which may suggest that incorrect selection of RPE may be providing ineffective respiratory protection during their work times. Furthermore, most changed it only twice a week, when it's supposed to be disposed of after each usage.

Conclusion

The informal food vendors are very critical to the food system, and therefore the requirements of their workstations include a well maintained sanitary condition. This includes the need for a stall shelter or coverage to avoid exposure to environmental hazards and proper operational facilities. The prolonged use of biomass fuels and exposure to traffic-related air pollution has been shown to increase the risk of developing adverse reproductive outcomes. The dominance of women in the informal trading activity is laying the grounds that development and implementation of programs in that industry should consider gender disparities [32]. Various international studies on informal vendor workplace exposures and notable occupational injuries and diseases have been published over the years, but not enough is taken into account through policy implementation, and programs to prevent and control such ill-health in this group. The current Acts and accompanying regulations and policies have improved the health and safety of workers in various industries, such as mining and construction. This sort of advancement is required in informal industries such as informal trading. Furthermore, future research is needed with quantitative measures including personal air monitoring, time-activity patterns, biomarkers, and interventions tested. Shortcomings and reviews of the pilot study were incorporated into the final questionnaire.

What is known about this topic

- Various literature has highlighted the unsafe working conditions of informal vendors and health outcomes associated with such working conditions
- Women dominated the informal vendors' industry.

What this study adds

- This pilot field study presented new data on the risk assessment in the informal trading industry (overall risk factors and personal behaviours that can contribute to respiratory health outcomes among adult vendors);
- This pilot study further reflected on the challenges of environmental health and safety legislation implementation.

Competing interests

The authors declare no competing interests.

Authors' contributions

MMS conceptualized the study. MMS and VN refined the designs, methodology and analysis of the study. MMS collected data and wrote the original draft. Review and editing were done by MMS and VN. All the authors have read and agreed to the final manuscript.

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Tables and figure

Table 1: socio-demographic parameters of informal food vendors (N=100)

Table 2: indoor (inside buildings) and outdoor (roadside) vendors' work exposure factors

Table 3: respiratory symptoms of informal food vendors

Figure 1: cooking mediums used by vendors

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Table 1: socio-demographic parameters of informal food vendors (N=100)

Variables	Frequency (n)	Percentage (%)
Gender		
Males	37	37%
Females	63	63%
Nationality		
South African	73	73%
Non-South African	26	26%
Age (years old)		
18-24	14	14%
25-34	35	35%
35-44	31	31%
45-54	16	16%
55-64	1	1%
65 and above	3	3 %
Education level		
Never attended	3	3%
Attended primary	7	7%
Graduated primary	8	8%
Attended secondary	34	34%
Graduated secondary	44	44%
Higher education	4	4%
Personal behaviour		
Hand washing habits		
Rarely	2	2%
occasionally	7	7%
Often	61	61%
Always	30	30%
Smoking habits		
Smoker	12	12%
Non-smoker	88	88%
Passive smoking (inclusive of smoker & non-smoker)	35	35%
Home environment factors		
Traffic pollution		
home is near heavy traffic area	26	26%
Home is not near heavy traffic areas	74	74%
Industrial pollution		
Home near large industrial sources	20%	
Home is not near large industrial sources	80%	
Home cooking		
Vendors who cook at home	68	68%
Vendors who do not cook at home	32	32%

Table 2: indoor (inside buildings) and outdoor (roadside) vendors' work exposure factors

Variable	Indoor (n/%) (inside building)	Outdoor (n/%) (roadside/street)	Total N (%)
Type of stall			
Stalls trading area (N=38)	9 (24%)	29 (76%)	38(100%)
Number of vendors (N=100)	34 (34%)	66 (66%)	100 (100%)
Type of job activity (N=100 vendors)			
Chef	4 (4%)	31 (31%)	35%
Waiter	13 (13%)	28 (28%)	41%
Owner/manager	7 (7%)	15 (15%)	22%
Workshift duration (N=100 vendors)			
Less than 8 hours	2 (2%)	5 (5%)	7 (7%)
8 hours	9 (9%)	11 (11%)	20 (20%)
More than 8 hours	23 (23%)	50 (50%)	73 (73%)
Type of cooking medium (N=38 stalls)			
Electricity	3 (8%)	14 (37%)	17 (45%)
Gas	4 (11%)	16 (42%)	20 (53%)
Charcoal (open fire)	1 (3%)	0	1 (3%)
Type of food sold			
Cooked food stalls			21 (55%) stalls
Number of vendors	11 (11%)	36 (36%)	47 (47%) vendors
Non-cooked food stalls			13 (34%) stalls
Number of vendors	23 (23%)	8 (8%)	31 (31) % vendors
Both cooked and non-cooked food Stalls			
Number of vendors	0	22%	22 (22%) vendors
List of food sold (N=38 stalls)			
Deep-fried dough (amagwinya)			18 (47%)
Bunny chow			9 (24%)
Meat			22 (58%)
Porridge			21 (55%)
Rice			12 (32%)
Soup			13 (34%)
Boiled/fried millie			5 (13%)
Fruits and vegetables			4 (11%)
Snacks/drinks			18 (47%)

Table 3: respiratory symptoms of informal food vendors

Variable	Cooked%	Non-cooked (%)	Both (cooked and non-cooked)%	Totals %	
Nasal congestion	16%	5%	13%	34%	
Sore throat	15%	5%	15%	35%	
How often do you have an eye, nose, throat irritation while cooking? E.g. teary eyes, runny nose, etc	Never	Rarely	occasionally	Often	always
	8%	45%	8%	36%	3%



Figure 1: cooking mediums used by vendors