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Evidence on charitable food assistance system's compliance with safety and general hygiene requirements: A systematic scoping review

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ABSTRACT

The charitable food assistance system has an influential role in the larger effort to curtail the problem of food insecurity globally. This review aimed at comparing evidence on the safety and general hygiene of the charitable food assistance system in Africa and the rest of the world. The search strategy involved electronic databases including African Index Medicus, PubMed, Google Scholar and EBSCOhost (MEDLINE with full text, Academic search complete, MEDLINE). We used a thematic analysis to identify the evidence on charitable food assistance programs' degree of conformity with food safety and general hygiene requirements globally. Twenty-three articles met the inclusion criteria. The articles included evidence from the following high-income countries: United Arab Emirates; Nordic Region; Italy; United States; Hong Kong; Canada; Spain; Scotland; Singapore; Austria; Belgium; Wales and Northern Ireland. The following main themes emerged from the included studies: classification, challenges and barriers of the charitable food assistance system; cross-contamination of food and compliance with food hygiene and safety principles. Gaining a greater understanding of the factors affecting food safety and general hygiene compliance within charitable food assistance programs is important. The paucity of data on safety and general hygiene in the charitable food assistance programs globally, particularly in Africa was identified as one of the gaps that necessitates urgent action through primary research studies.

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1. Introduction

Studies show that outbreaks of food-borne diseases result from failure to observe general hygiene requirements in one or more of the following activities, namely: food handling; storage; preparation; processing; cooking; and distribution (1-4). Factors such as lack of basic infrastructure, poor hygienic practices, inadequate sanitary facilities, improper handling and storage of food and food utensils, poor personal hygiene, improper waste storage, and disposal can contribute to poor quality of foods (5-10).

The risks of food-borne diseases are more severe in LMICs (2,11,12), as evidenced by a recent deadly outbreak of listeria in South Africa (13). The outbreak occurred between January 2017 and June 2018, killing 212 people and infecting 1053 (13,14). Out of the 212 deaths, there were persons with higher risks for a severe disease outcome, such as new-born infants (43%); pregnant women; the elderly (14%) and immunocompromised persons (13). The WHO International Food Safety Authorities Network (INFOSAN) has recorded this outbreak as catastrophic and the largest ever of the severe forms of Listeriosis, globally (13). It is far graver than the second-largest documented Listeriosis outbreak, which occurred in the United States (US) in 2011, with a total of 147

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reported cases (13). The outbreak has been linked to malpractices in a factory in the North-Eastern city of Polokwane owned by Tiger Brands' Enterprise unit (13, 14). This was confirmed after samples of a strain of listeria known as *Listeria monocytogenes* Sequence Type 6 (ST6) were found at the facility (13,14). The same ST6 sequence type was identified in a widely consumed ready-to-eat processed meat product called "Polony" (13,14).

These findings are consistent with the findings of other studies conducted elsewhere in the world, suggesting a link of food-borne disease outbreaks to one or more of the malpractices, namely: preparing food with unsafe water; poor safety and hygiene conditions in food production, preparation, processing, cooking, or distribution; lower levels of literacy and education; and insufficient food safety & hygiene legislation or implementation of such legislation (12, 15-18). Mishandling of food or disregard for safety and general hygiene measures enable pathogens to come into contact with food and, in some cases, to survive and multiply in numbers sufficient to cause food-borne illness in consumers (19-21). In contrast to the abundance of literature on food safety and general hygiene compliance in conventional food supply chain, the current data on charitable food assistance system is woefully inadequate for HICs or even unavailable for LMICs, specifically relating to compliance with eight food hygiene principles as stipulated in the Codex Alimentarius. This systematic scoping review charted evidence on the safety and general hygiene compliance of charitable food assistance system in Africa and the rest of the world. The purpose of the review was to identify and summarize the existing gaps in research evidence and to guide future research in this area.

2. Materials and methods

2.1. Approach

This systematic scoping review was guided by the Joanna Briggs Institute Scoping Review Methodology guideline (22). The review team developed review protocol apriori (23), outlining the intended review methodology, which is also summarized below.

2.2. Data source search strategy

We conducted a detailed search of literature presenting evidence on the safety and general hygiene of the charitable food assistance system in Africa and the rest of the world published from 1967–2018. We used the identified search terms across PubMed, Google Scholar, EBSCOhost (MEDLINE with full text, Academic search complete, MEDLINE) databases. We also searched the reference list of all included studies and hand-searched for additional studies which met the inclusion criteria. In all search engines, we used the following search terms: charitable food assistance system, surplus food, food recovery & redistribution programs, food hygiene and safety. We used Medical Subject Headings (MeSH) terms, as well as Boolean terms (AND, OR) to separate the keywords.

As a final step, we approached researchers on Research Gate for any additional literature (particularly grey literature) which may not have been widely available through conventional databases. Following a recommendation from the subject librarian at the University of KwaZulu-Natal (Durban, South Africa). We also searched for relevant articles from the following websites: World Health Organization (WHO) and South African governmental websites: National Department of Health (NDoH) and Department of Social Development (DSD) for policies and guidelines for the charitable food assistance system.

2.3. Study selection

The principal investigator (PI) screened the titles to identify relevant literature for inclusion in the study, imported the combined searches into a bibliographic citation management software, EndNote X7 and removed from the eligible list for further consideration duplicate articles, studies focused on food security and logistics of charitable food assistance system and studies focused predominantly on food security/poverty & food waste/loss prevention aspects of charitable food assistance system. The PI and the co-screener screened independently all remaining titles and abstracts, based on the inclusion/exclusion criteria. Discrepancies on reviewers' response during abstract screening were resolved by discussion between the review team until consensus was reached. All articles deemed potentially eligible were retrieved in full-text form and again screened independently by the PI and the co-screener. The PI and the co-screener evaluated full text articles based on the following criteria: evidence of charity practice, charitable practice dealing with food, charitable food assistance system, donating food for free, food safety and/or general hygiene requirements in the charitable food assistance system. Discrepancies were resolved by seeking the opinion of a third screener.

2.4. Inclusion criteria

The review included studies that presented evidence of:

- Charitable food assistance system globally;
- Charitable food assistance system operating between 1967 and 2018;
- Charitable food assistance system rendering their services for free;
- Safety and/or general hygiene compliance in charitable food assistance system.

2.5. Exclusion criteria

Given that the world's first charitable food assistance system in a form of a Foodbank was set up in 1967 in Phoenix, Arizona in the United States of America by John van Hengel (23), the review excluded all papers published prior to this date. The review also excluded studies that presented evidence of:

- Non-food charitable assistance system;
- Charitable food assistance system not in the context of safety and general hygiene compliance;
- Charitable food assistance system rendering services for monetary gain;
- Safety and general hygiene not in relation to food.

2.6. Data extraction

We read all included articles thoroughly and extracted all pertinent information. Using the pre designed and pre-piloted charting form, we extracted data on study aims/research questions; study population; geographic setting; study design; data collection methods used; data analysis employed; different motives for food charity practice; benefits and challenges/barriers of charitable food assistance system, food safety and general hygiene requirements. We used thematic analysis to group the extracted findings into themes.

2.7. Quality appraisal

As recommended by Levac et al. (24), a quality assessment of the included articles was conducted using the Mixed Method Appraisal Tool (MMAT) – version 2011, which is a validated tool to ensure a minimum quality of the evidence (25). We classified the included studies into three study type categories viz.: quantitative, qualitative and mixed method. We included a fourth category with other types of publications (guidelines, technical or policy reports, and non-peer-reviewed) and developed for it a special quality assessment tool, based on the Authority, Accuracy, Coverage, Objectivity, Date, Significance (AACODS) tool for grey literature studies (26). We followed the MMAT guidelines (score = number of criteria met/4) to calculate the overall quality for each of the studies selected. Then, we rated the selected studies using the following descriptors: Low quality (1% - 25%), where minimal criteria are met; average (26% - 50%); above average (51% - 75%) and high quality (76% - 100%), where all criteria is met.

3. Results

3.1. Screening results

The original search identified 713 peer-reviewed studies and 61 grey literatures. There were 579 publications left after we removed duplicate items. We excluded 541 articles, which did not meet our inclusion

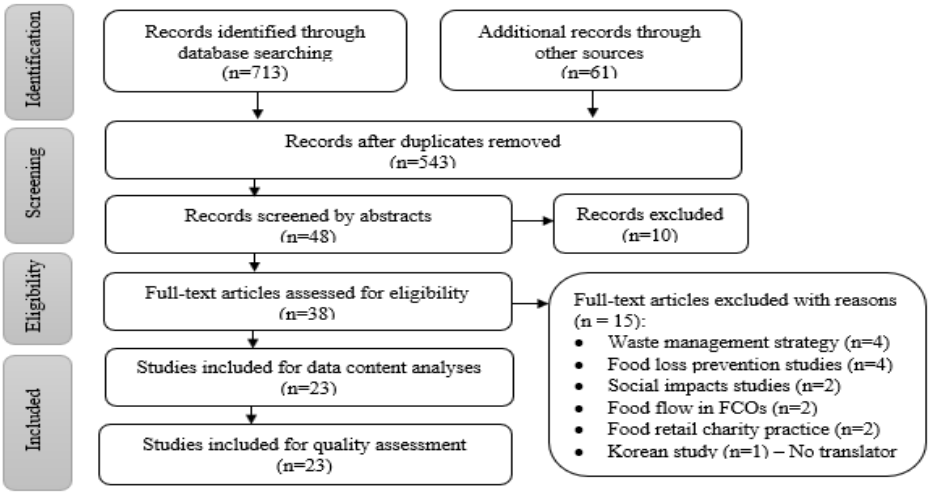

Figure 1. Flow chart of the search and selection process of studies on the charitable food assistance system's compliance with safety and general hygiene requirements in Africa and the rest of the world.

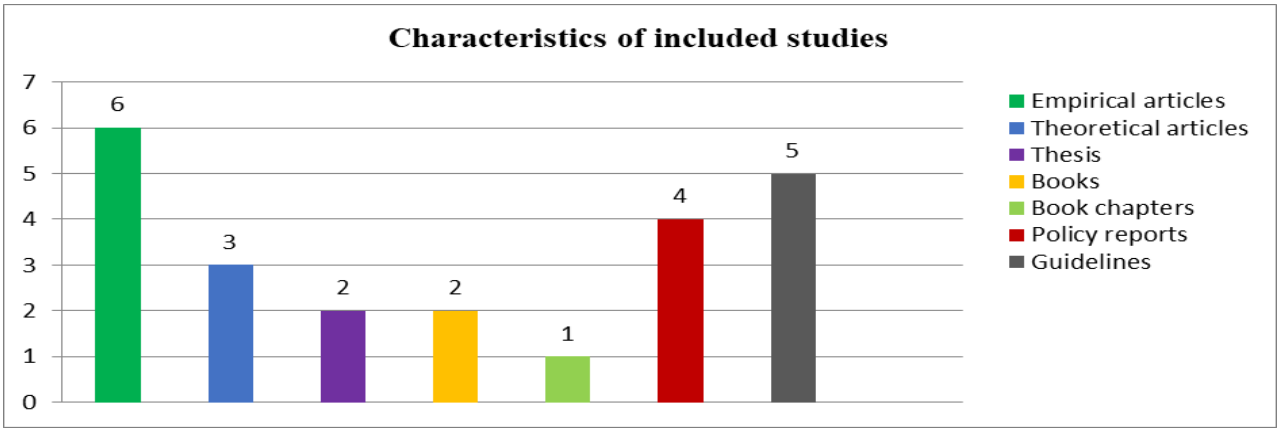

Figure 2. Final list of relevant papers according to their sources (N=23).

criteria. We included 38 articles for full-text screening. We excluded 15 studies after full article screening leaving us with 23 articles from which to extract data. Fig. 1 illustrates the complete selection and the relevant judgment process. Analysis of the full article screening results showed that there was 89.47% agreement versus 56.79% expected by chance which constitutes moderate to substantial agreement (Kappa statistic = 0.77, p-value<0.05). In addition, the McNemar's chi-square statistic suggests that there is not a statistically significant difference in the proportions of yes/no answers by a reviewer with p>0.05.

3.2. Characteristics of included studies

Of the 23 included articles, nine articles were published in peer-reviewed journals and they include six empirical articles (27-32) and three theoretical articles (33-35). The remaining 14 were from other sources, such as books (36,37), thesis (38,39), a book chapter (40), policy reports (41-44), guidelines (45-48) and a manual (49) (Fig. 2).

Of the six empirical articles, five studies were quantitative in nature (27-31) and one study was qualitative in nature (32), with the remaining three (33-35) were review articles (Fig. 3.).

Out of the nine peer-reviewed articles (six empirical articles and three theoretical articles) included, the majority (33%) were conducted in Italy (27,28,30), two studies were conducted in the United States (29,31), and one study each in Canada (32), Spain (34), Austria (35) and Belgium (33). All studies were focused in large cities including Asturias (Spain), Bruges & Ghent (Belgium), Florence (Italy), Ontario (Canada), Vienna (Austria) and Texas (USA).

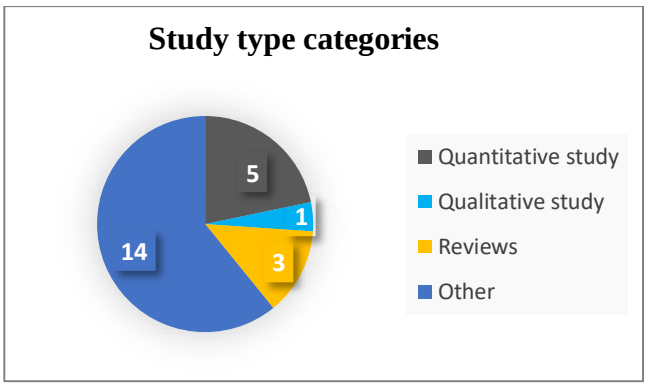

Figure 3. Peer-reviewed articles according to their study types (N=23).

3.3. Results of bias assessment

All six empirical studies (27-32) and three theoretical studies (33-35), were rated to be of high-quality (76% - 100%). Of the six empirical studies, one study was performed on samples of pre-cooked pizzas, raw poultry and raw rabbits (27), one study used on-site inspections to evaluate health and hygiene aspects using the checklist (28), one study sought to develop a transportation schedules that enable the food bank to collect food donations from local sources and to deliver food to charitable agencies (29), one analysed food samples and evaluated volunteer's knowledge on the correct hygienic procedures during the food recovery (30), one used a one-group pre-test/post-test design, which included a pre-test - a two-hour food safety training class, and a post-test to determine the effect of the training (31), one was a cohort study where a research assistant visited each of the food banks on two separate occasions, staying for several hours each time and observing a variety of activities including set-up,

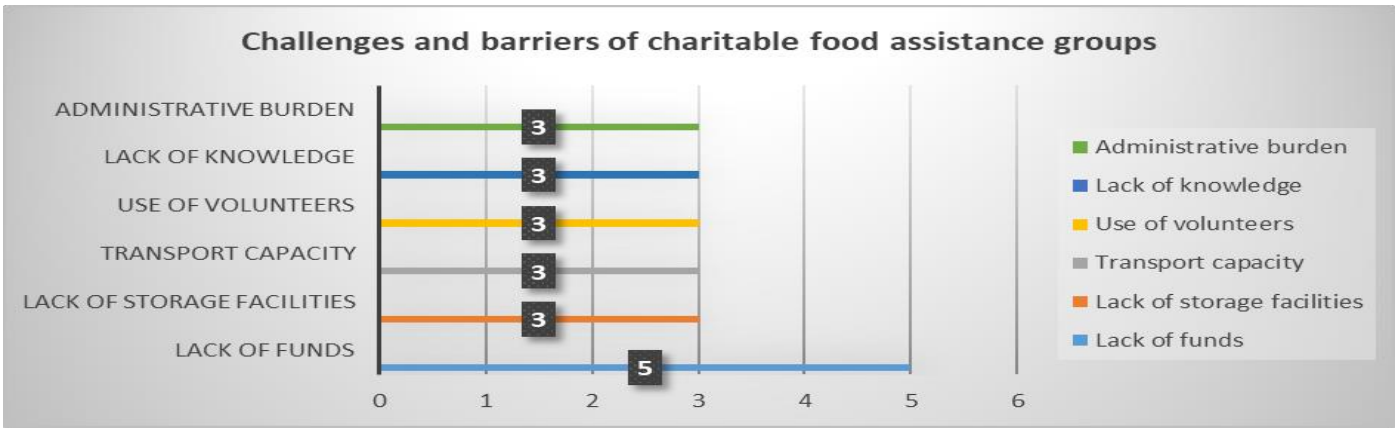

Figure 4. Challenges & barriers of the charitable food assistance programs (N=5).

receipt of food deliveries, food distribution, and clean-up (32). The three theoretical studies consisted of the two studies which used a mixed approach, employed experimental or analytic methods and used cross-sectional study designs (descriptive, observational, experimental, analytic, case studies) and one used a qualitative approach.

3.4. Summary of findings

The articles in this theme (Fig. 4) cited general barriers listed by donors as follows: the administrative burden; the financial burden (cost to donate should not exceed cost of waste disposal); lack of storage capacity at the donor to set aside food losses if not immediately picked up by the charitable food assistance system; lack of (cooled) transport (capacity) at the acceptor side and inefficient communication due to the charitable food assistance system often working with volunteers (27,32,41). The "lack of funds for the organization of logistics" is considered by five articles as "one of the most limiting factors in the charitable food assistance system" (31,33,38,41,42).

The main theme (Fig. 5) "Compliance with basic principles of food hygiene and safety" stipulated in the *Codex Alimentarius*, was subdivided into the following eight subthemes: *Design of premises and facilities* (33,41, 48,49), *Food storage and packaging* (29,33,34,36-38,41,42,44,45,47,49), *Temperature control* (29,33,34,36-38,41,42,44,45,47,49), *Use and maintenance of food transport* (29, 33, 34, 36-38, 41, 42, 44, 45, 47), *Food hygiene* (27-29, 31-50), *Personal hygiene* (30-34,36,38,39,41,45, 49), *Health & hygiene education/training* (28,29,33,34,36-38, 41-45,47,49), *Product information/food labelling* (32-34,36-38,40-42,47,49).

4. Discussion

The purpose of this scoping review was to identify and summarize the existing gaps in the research evidence on charitable food assistance system's compliance with safety and general hygiene requirements in Africa and the rest of the world. The

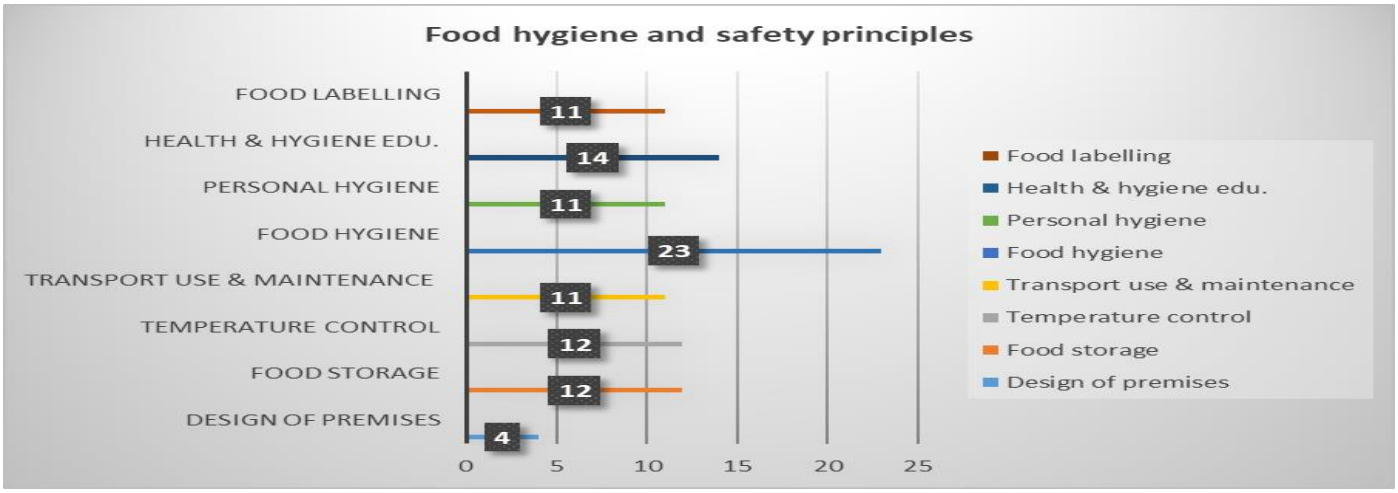

Figure 5. Compliance with food hygiene and safety principles (N=23).

evidence of performance on safety and general hygiene requirements in the charitable food assistance system was demonstrated in the following high-income countries: US; Canada; Italy; Spain; Austria and Belgium. For African countries, there was not a single evidence reported on safety and general hygiene of charitable food assistance system. Our findings also revealed that 22% of the charitable food assistance system evidence reported are from the US, confirming the common view shared by the majority of the studies that the first Food Bank (St. Mary's) founded in Phoenix (Arizona, USA) in 1967 by John van Hengel, gave birth to a lot of other charitable food assistance practices (30, 35,51). As the birthplace of the first food bank, USA continues to pioneer evidence on the charitable food assistance systems.

The results of our study show that the charitable food assistance system has an influential role in the larger effort to curtail the problem of food insecurity globally (32,33,35). However, without proper compliance with the safety and general hygiene requirements, this noble course may easily turn into a public health disaster through being the sources of diseases. The charitable food assistance system receives food donations from grocery stores, farms, retailers, and restaurants that are overstock or close to the ''best by'' date and would otherwise be discarding such food items and distribute it to people in need (52-55). The "surplus" food is edible, but often not saleable (56-60). Products that are at or past their "sell by" dates or are imperfect in any way are donated by grocery stores, wholesalers, distributors, restaurants, caterers, farms and farmer's markets (61,62). In some instances, the food is unblemished (63). In contrast to the abundance of literature on the performance of conventional food supply chain in matters of food safety and general hygiene, the current data on charitable food assistance system is woefully inadequate for HICs or even unavailable for LMIC. The limited data specifically relate to charitable food assistance system's compliance with eight principles of general hygiene as stipulated in the *Codex Alimentarius* (16).

One of our main findings is that the charitable food assistance system lags far behind on compliance with certain basic principles of food safety and general hygiene, such as those recommended by the *Codex Alimentarius Commission* (16) in their International Code of Practice: General Principles of Food Hygiene (28,31, 32,41). These general principles include: design of premises/facilities, food hygiene, food storage/packaging, waste management/pest control systems, personal hygiene, use and maintenance of food transport, product information/labelling, and training/awareness and responsivities (16,64). Our study found that factors such as lack of basic infrastructure, poor hygienic practices, inadequate sanitary facilities, improper handling and storage of food and food utensils, poor personal hygiene, improper waste storage and disposal are predominant in the charitable food assistance system globally (31,32,35,41,65). The evidences show that the charitable food assistance system operates in facilities not suitably designed for food storage, e.g. open–air buildings, warehouses and old garages (41). This undermines the integrity of food by allowing unsanitary conditions to prevail; temperature controls not to be observed (cold chain to be broken); prevailing cross-contamination between and during operations by foodstuffs and lack of separate adequate facilities for the storage of food, ingredients and non-food items, including cleaning materials and hazardous substances (31-33,35,41). Researches have shown that such conditions are conducive for outbreaks of food-borne diseases (1-4). The findings largely show limited research on whether or not internal design and layout of the charitable food assistance establishments permit good food hygiene practices, including protection against cross-contamination.

The evidences show that the charitable food assistance system does not comply with the food product information/labelling requirements (35). Food products are given away without information to the consumer on direction to store and use (49). Furthermore, there is no warning to consumers on the list of ingredients contained in the food product (possible allergens) (66). Workers/volunteers have no training on personal hygiene and proper food handling and protection techniques (30-33,39,49,67). The findings largely show limited research on the knowledge, attitude and perceptions of the charitable food assistance system on food safety and general hygiene requirements. Studies conducted in HICs revealed that the charitable food assistance system in HICs is far less structured and organized than the conventional food supply chain (30,33,49). These findings are consistent with studies conducted elsewhere in the world. Similar findings indicated that, although food redistribution has existed in Africa for a very long time through non-profit organizations (NPOs), non-governmental organizations (NGOs) and community based organizations (CBOs), it is still not comparable to that of the HICs (68).

4.1. Study Strengths and limitation

We used a rigorous and thorough search strategy for the indexed and grey literature to minimize omission of relevant literature reporting on this topic. Additionally, we approached research experts in the field in order that they would provide information and contribute knowledge that was missing (24). As a result of this iterative approach, additional articles were included in the final thematic analysis. In addition, our full article screening tool was piloted resulting in increased reliability as demonstrated by the degree of agreement results, which showed that there were no significant differences in the screeners' responses during full article screening ($p>0.05$). All included primary studies underwent quality appraisal, as recommended by Levac et al. (24). The quality appraisal used approved tools, viz.: the Mixed Method Appraisal Tool (MMAT) for black literature studies (25) and the Authority, Accuracy, Coverage, Objectivity, Date, Significance (AACODS) tool for grey literature studies (26) to assess for bias. A significant limitation is that a Korean Journal article (69) had to be excluded after making it through the title and abstract stage. This was after all attempts to get a Korean interpreter failed. As with all systematic reviews, despite our comprehensive search it is possible that relevant literature reporting on this topic may have been missed, which may have altered our study findings.

4. 2. Recommendations for future research

Although there is an abundance of literature around the charitable food assistance system from a food waste prevention perspective, particularly in HICs, studies focusing on assessing the charitable food assistance system's compliance with safety and general hygiene requirements from a public health perspective, particularly in LMICs, are lacking. This is despite the WHO's position suggesting that food safety must be recognized as a public health function and access to safe food should be a basic human right (12,70). We therefore, believe that the results of this study will stimulate further inquiry into the performance of the charitable food assistance system in matters of safety and general hygiene. Considering that the charitable food assistance phenomenon is a divergence from the conventional food supply chain, we would like to recommend future studies to establish feasible means to bring food charity practice out of the shadows, legitimize it through various governmental efforts, and elevate it through governmental policy initiatives, in order to maximize recovery of edible surplus food, while minimising health risk likely to be caused by consuming such foods.

4. 3. Implications for practice

The hygiene and safety of food throughout the sourcing, recovering, collecting, storing and distributing continuum for charitable purposes is of critical importance. This is largely because of the vulnerability of both the donated food and the populations served by charitable food assistance system with these foods. Studies have shown that failure to observe food safety and general hygiene requirements remains the leading cause of food-borne disease outbreaks in LMICs, especially vulnerable groups, such as children, the elderly and people with underlying diseases such as HIV/AIDS (13,70-74). Researches show that food may become contaminated, or may not reach its destination in a suitable condition for consumption, unless effective control measures are taken during all stages of the food supply chain. Food must be adequately protected by both the conventional food supply chain as well as the charitable food assistance system. This has serious implications on the health of the consumers, especially at-risk population as evidenced in the recent catastrophic Listeriosis outbreak in South Africa, which linked disease to hygiene and sanitation (13,14). Thus, the findings of this scoping review have important implications for research, policy and practice, particularly with respect to compliance of the charitable food assistance system with the eight food hygiene and safety principles as recommended by the *Codex Alimentarius Commission* (16,75). Gaining a greater understanding of the performance of the charitable food assistance system in matters of safety and general hygiene requirements is imperative given the major contribution charitable food assistance system has in the global food security system.

5. Conclusion

One of the main findings of our study is that data on safety and general hygiene in the charitable food assistance system is scarce globally or unavailable, particularly in Africa. The available limited evidence was from HICs and point to shocking findings of non-compliance with safety and general hygiene requirements in global charitable food assistance system. In Africa, there was not a single research evidence on safety and general hygiene in the charitable food assistance system. Primary research studies with a focus on compliance with safety and

general hygiene requirements in Africa are urgently needed to address this research gap. What makes this even more urgent is the startling research evidence showing that the contribution of poor food safety and general hygiene for food-borne illnesses continue to be a major threat to the health of people in Africa, especially vulnerable groups, such as children, the elderly and people with underlying diseases such as HIV/AIDS.

Conflict of interest

The authors have no conflict of interest.

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Appendices

Appendix 1: Initial pilot search

Population	Concept	Key words	Date	No. found
Charitable Food Assistance System	Safety & hygiene compliance	((("food"[MeSH Terms] OR "food"[All Fields]) AND charitable[All Fields] AND ("organizations"[MeSH Terms] OR "organizations"[All Fields])) AND ("safety"[MeSH Terms] OR "safety"[All Fields])) OR (("Appl Catal A Gen"[Journal] OR "general"[All Fields]) AND ("hygiene"[MeSH Terms] OR "hygiene"[All Fields]))	19/02/18	9301

Appendix 2: Database searching

Search date	Database	Key words	No. of retrieved articles	No. of eligible titles	No. after cancelled duplicates
20/02/18	Google scholar	Food charitable orgs, redistribution programs, hygiene, safety	6642	179 – 26	153
21/02/18	Pubmed	Food charitable orgs, surplus food, redistribution programs, hygiene, safety	26400	428 – 52	376
22/02/18	Ebscohost ➢ Medline ➢ Academic search complete ➢ MEDLINE	Food charitable orgs, surplus food, redistribution programs, hygiene, safety	402	106 – 80	26
22/02/2018 23/02/2018 24/02/2018 25/02/2018 26/02/2018 27/02/2018	Grey Literature: ➢ Thesis/dissertation ➢ Conference proceeding ➢ Generic ➢ Case/technical reports ➢ Govt. publications	Food charitable orgs, surplus food, redistribution programs, hygiene, safety	226	61 – 37	24
Total			**33670**	**774 – 195**	**579**

Appendix 3: Full article screening results

A Systematic Scoping Review

Evidence on Food Control System in Charitable Food Assistance System

Full Article Screening

	Author/year	Reviewer 1: Response	Reviewer 2: Response
1	De Pieri et al, 2017	1	1
2	Alexander et al, 2008	0	0
3	Alphin, 2014	1	1
4	Ananprakrit et al, 2017	1	1
5	Baglioni et al, 2016	1	1
6	Bilska et al, 2016	1	1
7	Bonaccorsi et al, 2016	1	1
8	Capodistrias et al, 2015	0	0
9	Castrica et al, 2018	1	1
10	CHEUNG Chi-fai, 2017	1	1
11	Davis et al, 2014	0	0
12	De Boeck et al, 2017	1	1
13	Food and Environmental Hygiene Department, 2014	1	0
14	Food Recovery Committee, 2007	1	1
15	Food Safety Agency, 2016	1	1
16	Foodwise.com, 2012	1	1
17	Frasz et al, 2015	1	1
18	Garrone et al, 2014	0	0
19	González-Torre et al, 2016	1	1
20	Gram-Hanssen et al, 2016	1	1

21	Halton Region, 2011	1	1
22	Hanssen, et al, 2015	1	1
23	Heafz, 2003	1	1
24	Lindberg et al, 2014	0	0
25	Lovrenčić, 2017	0	0
26	Mejía et al, 2015	1	0
27	Midgleya, 2013	0	1
28	Milicevic et al, 2016	1	1
29	Mousa et al, 2017	0	0
30	National environment agency, 2016	1	1
31	NSW food authority, 2003	1	1
32	Park, 2002	1	1
33	Philip et al, 2017	1	1
34	Schneider, 2013	0	1
35	Tarasuk et al, 2005	0	0
36	Tarasuk et al, 2009	0	0
37	Vittuari et al, 2017	0	0
38	Waggoner, 2004	1	1

1=YES; 0=NO

Calculations For Degree Of Agreement Using Stata 13

```
kap Reviewer1Response Reviewer2Response

                   Expected
Agreement   Agreement    Kappa   Std. Err.       Z    Prob>Z
------------------------------------------------------------------
  89.47%     56.79%    0.7564     0.1622      4.66    0.0000

. mcc  Reviewer1Response Reviewer2Response

                    | Controls            |
Cases               | Exposed   Unexposed |      Total
--------------------+---------------------+------------
            Exposed |      24           2 |         26
          Unexposed |       2          10 |         12
--------------------+---------------------+------------
              Total |      26          12 |         38

McNemar's chi2(1) =      0.00   Prob > chi2 = 1.0000
Exact McNemar significance probability      = 1.0000

                 Proportion with factor
                 Cases       .6842105
Controls    .6842105     [95% Conf. Interval]
               ---------    --------------------
difference           0     -.1294718   .1294718
ratio                1      .8600485   1.162725
rel. diff.           0     -.3266607   .3266607

odds ratio           1      .072485   13.79597   (exact)
```