Impacts of Urban Agriculture on the Determinants of Health: Scoping Review Protocol

Abstract

**Background:** Since the 1990s, urban agriculture (UA) has contributed to improving food security in low- and middle- income countries. Now, it is implemented as a multifunctional intervention that can influence various determinants of health (e.g., food security, social relationships). Studies of interest stem from several research disciplines, use a wide range of methods, and show results that are sometimes inconsistent. Current studies have not summarized the overall effects of UA on health and its determinants.

**Objective:** The objective of this protocol is to develop a research strategy for a scoping review that characterizes studies of beneficial and adverse impacts of UA on health and its determinants in a wide range of disciplines.

**Methods:** Initially, with the help of a library specialist, a list of publications will be obtained through a systematic search of seven electronic bibliographic databases: PubMed, Embase, MEDLINE (Embase), CINAHL Plus with full text, Academic Search Premier (EBSCO host), CAB Abstract (Ovid), and Web of Science. Secondly, a three-step screening by two independent reviewers will lead to a list of relevant publications that meet eligibility and inclusion criteria. Finally, data on the bibliography, type of participants, type of study, results of study, and countries will be extracted from included articles and analyzed to be presented in a peer-reviewed article.

**Results:** The findings are expected to identify research gaps that will inform needs for UA research in specific fields (e.g., mental health), among certain population groups (e.g., adults) or within different economic contexts (e.g., low-, middle-, or high-income countries). Furthermore, the findings are expected to identify knowledge gaps and direct future research needs.

**Conclusions:** This is an original study that seeks to integrate beneficial and adverse effects of UA on health at different levels of influence (individuals, households, and community) in a more systematic way to facilitate a better understanding of UA impacts. This protocol is a first of its kind and is expected to lead to a characterization of UA impacts based on sociodemographic profiles of participants and income levels of the studied countries. This will be relevant for policy makers and UA practitioners.

(JMIR Res Protoc 2018;7(3):e89) doi: 10.2196/resprot.9427

**KEYWORDS**

urban agriculture; health; determinants of health; scoping review
Introduction

Background

Since the 1990s, urban agriculture (UA) has been a strategy contributing to improving income and food security for individuals and households in low- and middle-income countries, particularly in Africa [1-5]. In cities such as Dar-es-Salaam, Tanzania and Bamako, Mali, UA provides more than 30% of the city’s vegetable needs and generates wages equivalent or higher than civil servants or unskilled construction workers [5]. In high-income countries, UA has contributed to food security in times of emergency or economic crisis [6-8]. For example, Dar-es-Salaam, Tanzania and Bamako, Mali, UA provides more than 30% of the city’s vegetable needs and generates wages equivalent or higher than civil servants or unskilled construction workers [5]. In high-income countries, UA has contributed to food security in times of emergency or economic crisis [6-8]. For example, it is documented that countries in North America and Europe have encouraged their citizens to engage in UA activities during the first and second World Wars in response to pressures on the food supply [9,10]. Beyond its traditional purposes (food security and income improvement), UA is now considered as a multifunctional intervention [11,12]. It is part of health promotion strategies [13,14], urban planning [12], and/or global policies to develop sustainable city food systems [15,16]. It can also play an important role in the availability of green infrastructure and biodiversity in the urban environments [17]. Its function in the recycling of urban organic waste is also recognized [18]. It can also play an important role in the availability of green infrastructure and biodiversity in the urban environments [17]. Its function in the recycling of urban organic waste is also recognized [18]. In some contexts, it is perceived and practiced by urban dwellers to reduce the ecological footprint of the food industry [12]. It is supported by a range of actors including health professionals [19], government agencies, community groups, and researchers [20]. In general, it can be viewed as small areas used in cities for agricultural production or to raise animals for domestic consumption or local sales [21].

UA as an intervention can have social and economic impacts on individuals, households, and/or an entire community by directly influencing health or its determinants. It can influence food security, mental or physical health, or social relationships at different population levels. A significant number of studies have already attempted to demonstrate the contribution of UA to food security [22,23] by assuming an association between UA and access to food [24] or its association with improved household nutrition through consumption of fresh fruits and vegetables [25]. In addition, engagement in UA may improve physical activity and contribute to well-being and health by reducing stress [26,27]. However, the effects of UA on health and its determinants remain inconsistent. Many of these studies have been criticized for their lack of empirical evidence. For example, among studies that have shown UA contribution to food security at individual or household levels, some are often criticized because of poor data quality or lack of methodological rigor [28,29].

Other studies have focused on the negative effects of UA. For example, several studies highlight the potential public health risks associated with UA [19] by addressing concerns related to urban soil and water contamination. Some have raised concerns about the presence of heavy metals in UA soils or harvested crops [30-33] that may have implications for food safety. In fact, traces of heavy metals can be found in vegetables and fruit grown in urban areas, representing a health risk for individuals who consume such products [33,34]. On the other hand, the potential effects of UA products from contaminated soils on humans are unclear. The concentration of heavy metals in soil does not necessarily reflect heavy metal concentrations in harvested crops and the utilization of these crops does not inevitably represent a risk to human health [35,36]. Nevertheless, it is important to note that UA has potential public health risks, which need to be documented.

Although some systematic reviews have been conducted on UA and health, specifically food security and wellbeing [27], there are no reviews that refer to the adverse effects of UA. To our knowledge, most of these types of studies have not considered a holistic approach that includes beneficial and adverse impacts of UA. Three systemic reviews [28,37,38] have examined the contribution of UA to one type of determinant of health in a specific context: food outcomes in low- and middle-income countries. Two of them: Warren et al [28] and Poulsen et al [37] recommended new research due to poor quality and heterogeneity of the primary studies included. Although both studies have considered food security as an analytical framework, they only had four included studies in common. Poulsen et al [37] only included studies conducted in Africa, even though “region” was not part of the inclusion criteria. In contrast, Warren et al [28] included studies from other geographic locations. The differences may be due to a lack of consistency in research strategy or differences in their selection criteria. Korth et al [38] targeted studies in countries with similar characteristics, low- and middle-income countries, and failed to identify any studies. This reinforces our argument about a lack of consistency in UA contribution to food security in the systematic review processes. One of the common points between the three reviews was the absence of high-income countries in their analysis.

The consideration of high-income countries in literature reviews of interventions similar to UA is not new. Other systematic studies have already evaluated gardening or school gardening, which to some extent are similar interventions to UA. These studies do not allow to draw conclusions about the impacts of UA on health. For example, Ohly et al [39] used a mixed methods approach to measure the impacts of school gardens on health and well-being in high-income countries. However, the assessed studies were qualified as low or moderate quality based on the authors’ criteria. While methodological weaknesses were also reported for the included qualitative studies, the qualitative studies were described as ideological aspirations. Nicklett et al [40] used the same concept of gardening to demonstrate its association with physical health in high-income countries. Yet, like Ohly et al [39], the review identified methodological weaknesses in the primary studies included, which limit conclusions on a possible impact of gardening activities on physical health.

At this time, current studies have not been able to draw definite conclusions on the effects of UA on specific determinants of health or health in general. Given that UA is a multidisciplinary topic (eg, nutrition, agriculture, urban planning), it may be better to address it first in a more general systematic process such a scoping review and consider a broader impact outcome like health prior to engaging future systematic reviews.
With this scoping review we seek to identify evidence from peer reviewed literature that demonstrates beneficial and adverse impacts of UA on the determinants of health according to countries’ income level as defined by the World Bank [41]. The determinants of health are defined as socioeconomic factors that influence health [42]. We aim to identify knowledge gaps and facilitate a better understanding of the global impact of UA on health and its determinants by considering the following two research questions:

1. What are the impacts of UA on health and its determinants?
2. How do these impacts differ according to countries’ income level or sociodemographic characteristics of studied participants?

Conceptually, by answering these questions, we will have a better understanding of how UA as an intervention can affect different health outcomes such as food security, nutrition, social relationships, physical or mental health. Furthermore, we are interested in categorizing these outcomes according to level of influence (individual, household, and community) and countries’ income level (high-, middle-, and low-income). The findings will allow us to draw a global picture of the potential impacts of UA on health present in the existing literature. Identifying research gaps will also allow researchers and policy makers to make informed decisions about future UA research needs and implications for public policy.

Objective
The specific objectives of this study are:

1. To identify UA impacts on health and its main determinants
2. To characterize the results according to population and country income levels

Methods
This scoping review will follow the five steps described by Arksey and O’Malley [43] for similar studies with improvements suggested by Levac et al [44]:

1. Identification of the research questions (listed above)
2. Identification of relevant studies
3. Selection of relevant and reliable studies
4. Data extraction from included studies
5. Collating, summarizing, and reporting the findings

Identification of Relevant Studies:
This scoping review will use the method suggested by Aromataris and Riitano [45] to construct a strategy that can help us target relevant publications on UA impacts on health and its determinants. First, we will identify keywords that are related to our main research questions. To identify keywords, elements of a modified PICOS framework (participants, intervention or concept, context, outcomes, study design) [46] will be specified to establish eligibility criteria defined according to the following:

- Types of participants: This study considers all human participant groups (eg, children, youth, and adults) at different level of influence (eg, individual, household, or community) who have been implicated by UA.
- Intervention or concept: For the purpose of this review, UA is defined as food growing initiatives that include the production of edible plants and livestock in urban areas. The review will seek studies that assess UA in all its forms when it is used as an intervention consisting to grow food or raise animals for domestic consumption, local sales, or as a leisure activity.
- Outcomes: The targeted outcomes are a set of determinants of health inspired from Dahlgren and Whitehead [42]. For example, food security, income, social relations, and factors that influence mental or physical health (listed in Table 1).
- Context: To be included, studies must have been conducted in urban settings of a high-, middle-, or low-income country according to the World Bank’s income-based country classification [41].
- Type of study: Peer reviewed quantitative or qualitative studies demonstrating one or more effects of UA on health or its determinants will be included. Narratives, essays, gray literature and theses will be excluded. Other systematic studies will not be included in the analysis but the list of their references will be examined to identify relevant studies.

Search Strategy
The search strategy has been designed with the help of a library specialist and searches will be performed in the following seven electronic bibliographic databases: PubMed, Embase, MEDLINE (Embase), CINAHL Plus with full text, Academic Search Premier (EBSCO host), CAB Abstract (Ovid), and Web of Science. The outlined keywords in Table 1 and their alternative terms will be searched in the index terms, title, and abstract (tiab) of each database. In case a keyword is not found in the index terms, it will be substituted by its alternative term or a synonym in the index search and will be searched in titles and abstracts only. For example, in PubMed, the index is the medical subject heading (MeSH). The word food security does not appear as a MeSH, so in the search for MesH, we will use food supply as an alternative but the keyword food security will also be searched as it is written in the titles and abstracts. Boolean operators OR will also be used to combine individual keywords while the Boolean operator AND will be used to combine sets of keywords (eg, the words urban agriculture/urban farm or city agriculture/city farm, are searched as following: (urban OR city) AND (agriculture OR farm). An example of the complete search strategy used on PubMed is described in Table 1. This strategy will then be adapted to the other databases using the according syntax and proximity operators.
### Table 1. Example of search strategy used on PubMed and adapted to other bibliographic databases

| Category, number, and keywords      | Index terms or search-field descriptors |
|------------------------------------|-----------------------------------------|
| **Outcome measures**               |                                         |
| 1 Food supply                      | Mesh                                    |
| 2 Food security                    | Tiab                                    |
| 3 Food insecurity                  | Tiab                                    |
| 4 Food access                      | Tiab                                    |
| 5 Food availability                | Tiab                                    |
| 6 Food quality                     | Mesh:NoExp, tiab                        |
| 7 Food safety                      | Mesh:NoExp, tiab                        |
| 8 Food contamination               | Mesh:NoExp, tiab                        |
| 9 Food                             | Mesh:NoExp                              |
| 10 Health* food                    | Tiab                                    |
| 11 Income                          | Mesh:NoExp, tiab                        |
| 12 Cost savings                    | Mesh:NoExp, tiab                        |
| 13 Poverty alleviation             | Tiab                                    |
| 14 Nutritional status              | Mesh:NoExp, tiab                        |
| 15 Nutrient deficiency             | Tiab                                    |
| 16 Fruit and vegetable intake      | Tiab                                    |
| 17 Fruit and vegetable consumption | Tiab                                    |
| 18 Fruits and vegetables           | Tiab                                    |
| 19 Vegetables                      | Mesh:NoExp                              |
| 20 Fruit                           | Mesh:NoExp                              |
| 21 Fruit? Intake                   | Tiab                                    |
| 22 Vegetable? Intake               | Tiab                                    |
| 23 Diet                            | Mesh:NoExp, tiab                        |
| 24 Dietary diversity               | Tiab                                    |
| 25 Malnutrition                    | Mesh:NoExp, tiab                        |
| 26 Undernutrition                  | Tiab                                    |
| 27 Overweight                      | Mesh:NoExp, tiab                        |
| 28 Obesity                         | Mesh:NoExp, tiab                        |
| 29 Quality of life                 | Mesh:NoExp, tiab                        |
| 30 Healthy lifestyle               | Mesh:NoExp, tiab                        |
| 31 Exercise                        | Mesh:NoExp                              |
| 32 Physical activity               | Tiab                                    |
| 33 Leisure activity                | Mesh:NoExp                              |
| 34 Leisure                         | Tiab                                    |
| 35 Well-being                      | Tiab                                    |
| 36 Interpersonal relations         | Mesh:NoExp, tiab                        |
| 37 Social capital                  | Tiab                                    |
| 38 Personal development            | Tiab                                    |
| 39 Empowerment                     | Tiab                                    |
| 40 Education                       | Mesh:NoExp                              |
| 41 Nutrition education             | Tiab                                    |
| Category, number, and keywords | Index terms or search-field descriptors |
|-------------------------------|----------------------------------------|
| 42 Civic engagement            | Tiab                                   |
| 43 Community engagement       | Tiab                                   |
| 44 Horticultural therapy      | Mesh                                   |
| 45 Therapeutic garden         | Tiab                                   |
| 46 Mental health              | Mesh:NoExp, tiab                       |
| 47 Dementia                   | Mesh:NoExp, tiab                       |
| 48 Stress psychological       | Mesh:NoExp                             |
| 49 Stress                     | Tiab                                   |
| 50 Perceptions of life        | Tiab                                   |
| 51 Cultural connection        | Tiab                                   |
| 52 Violence                   | Mesh:NoExp                             |
| 53 Depression                 | Mesh:NoExp                             |
| 54 Security perception        | Tiab                                   |
| 55 Health risk                | Tiab                                   |
| 56 Resilience                 | Tiab                                   |
| 57 Pain                       | Mesh:NoExp, tiab                       |
| **Intervention/Concept**      |                                        |
| 58 Agriculture                | Mesh:NoExp, tiab                       |
| 59 Food production            | Tiab                                   |
| 60 Gardening                  | [Mesh]                                 |
| 61 Community garden*          | Tiab                                   |
| 62 Farm*                      | Mesh, tiab                             |
| 63 Allotment$                 | Tiab                                   |
| 64 Horticultr*                | Tiab                                   |
| 65 Rooftop$                   | Tiab                                   |
| 66 Home garden*               | Tiab                                   |
| 67 School garden*             | Tiab                                   |
| **Context**                   |                                        |
| 68 Cities                     | Mesh:NoExp                             |
| 69 City                       | Tiab                                   |
| 70 Urban                      | Tiab                                   |
| 71 Metropol*                  | Tiab                                   |
| 72 Suburban                   | Tiab                                   |
| 73 Town                       | Tiab                                   |
**Textbox 1.** Data extraction for analysis (type of data and variables)

| Reference   | • Author  
|            | • Year   |
| Study location | • City, country  
|             | • Country income level  |
| Population  | • Type of participants (individual, household, community)  
|            | • Characteristics of participants (age; sex; children, youth, adults)  |
| Type of study | • Study purpose  
|             | • Study design  
|             | • Outcomes measured  |
| Results    | • Type of impacts (beneficial, adverse)  
|           | • Results of study  |

**Selection of Relevant and Reliable Studies**

Due to a limited accessibility of UA scientific papers prior the 1980s, the search will be restricted to articles published between 1980 and 2017. Titles in languages other than English, French and Spanish will be excluded in the selection phase. All identified publications will be transferred to EndNote (X8, Thomson Reuters) and articles whose publication dates and languages do not meet our requirements will be removed. All remaining publications will be transferred to an online systematic review software (DistillerSR, Evidence Partners, Ottawa, Canada), to remove duplicates and for title and abstract screening by two independent reviewers. The full text of eligible articles will be screened by two independent reviewers according to the following inclusion criteria:

- **Relevance:** The study must be relevant to the question and objectives of our research. It will be considered relevant if it demonstrates one or more beneficial or adverse impacts of UA on human health or its determinants.
- **Study design:** To be included into the scoping review, the study must also present data collected from human participants. Furthermore, the design of the study must be appropriate to answer the studied research questions. Studies that report environmental impacts will be considered only if they report effects on humans (e.g., study on soil contamination will not be included unless it reports the effects of soil contamination on human health).

A list of all excluded articles at this stage will be provided with the reasons for exclusion. The reference lists of included studies will also be reviewed to identify relevant studies. The identified studies will be assessed with the same eligibility criteria to validate their inclusion or exclusion. Final inclusion of the publications will be discussed by the two reviewers and any disagreement on the inclusion or exclusion will be resolved by consensus.

**Study Quality Assessment**

The quality of the included studies will be evaluated using the criteria of the Effective Public Health Practice Project (EPHPP) guide for quantitative studies, and the qualitative study evaluation criteria of Wallace et al [47] used by Ohly et al [39] for the assessment of the quality of qualitative studies. The evaluation of the quality of the studies, in both cases, will take into account the risks of bias in the methodologies of the studies. Thus, any evaluated study with a high risk of bias will be reported in the results section.

**Collating, Summarizing and Reporting the Results**

Data as described in Textbox 1 will be extracted from the included articles and the results will be presented in a way to identify the main areas of interest and gaps in the literature on UA impacts.

Once this information is extracted, the results will then be presented in two forms to make a narrative account of the literature [43]. As a first step, a numerical analysis will be presented in the form of a diagram [48] that will highlight the measured outcomes—determinants of health according to number, the nature, and the geographical distribution of the included studies. In a second step, the studies will be grouped according to the category and characteristics of studied participants (individuals, households, and communities; age and sex) to make comparisons, identify contradictions in evidence, methodology, and find research gaps.
Results

The findings are expected to identify research gaps that will inform needs for UA research in specific fields (eg, mental health), among certain population groups (eg, adults) or within different economic contexts (eg, low-, middle- or high-income countries). Furthermore, the findings are expected to identify knowledge gaps and direct future research needs.

Discussion

To our knowledge, this scoping study is the first of its kind to explore both beneficial and adverse impacts of UA on health determinants. Other systematic studies have already provided valuable information on specific benefits of UA. However, in the current context of urbanization and climate change where health and environmental challenges are related to food production in cities, it is obvious that the adverse impacts of UA are a concern [49]. Therefore, the identification of evidence that only include beneficial impacts of UA, does not allow an objective analysis to draw conclusions on its impacts. With our findings, we hope to bring a set of elements that allow a better understanding when defining the advantages and disadvantages of the UA as an intervention.

This study will highlight the state of research on the association between UA and health. A holistic approach that considers beneficial and adverse effects of UA, may inform better public policies and target intervention populations. The scoping review will allow for a better understanding of the contributions or consequences of UA on specific determinants of health. It may also be used by policy makers to target indicators that can help better evaluate UA as an intervention that directly impacts individuals, households, or communities. Such approach will also serve to inform urban planning decisions where the role of agricultural production has not always been evident [50].

Acknowledgments

We express our gratitude toward our library specialist Frédéric Bergeron from Université Laval for his great collaboration in the development of our bibliographic research strategy. We are also thankful to the anonymous reviewers for their constructive comments. PPA is a LASPAU WK Kellogg scholar. MAF is a Canadian Institutes of Health Research Fellow (Funding Reference Number: MFE-152525). This study is partly funded by FRQS (Fonds de recherche du Québec – Santé).

Authors’ Contributions

PPA and AL conceptualized the scoping review protocol. PPA developed search strategy with guidance from the library specialist and inputs from the entire team (PPA, MAF, GC, AL). PPA and MAF wrote the manuscript of the scoping review protocol with critical inputs and appraisal from GC and AL. All authors have read and approved the manuscript.

Conflicts of Interest

None declared.

References

1. Mougeot LJ. Introduction, in Agropolis: The Social, Political and Environmental Dimensions of Urban Agriculture. In: Mougeot LJ, editor. Earthscan and International Development Research Centre. Ottawa: Routledge; 2005: Ea.
2. Smit J, Nasr J, Ratta A. Urban agriculture: food, jobs and sustainable cities. In: United Nations Development Program. Habitat II series. New York: United Nations Publications; 1996:35-37.
3. Smith O. Ottawa, Canada: International Development Research Centre. 2001. Overview of urban agriculture in Western African cities URL: https://idl-bnc-idrc.spacedirect.org/bitstream/handle/10625/30784/120866.pdf?sequence=1&isAllowed=y [accessed 2017-11-04] [WebCite Cache ID 6vpY4zOye]
4. Belevi H, Baumgartner B. A systematic overview of urban agriculture in developing countries from an environmental point of view. JETM 2003;3(2):193 [FREE Full text] [doi: 10.1504/IJETM.2003.003382]
5. Simatele DM, Binns T. Motivation and Marginalization in African Urban Agriculture: The Case of Lusaka, Zambia. Urban Forum 2008 Feb 16;19(1):1-21 [FREE Full text] [doi: 10.1007/s12132-008-9021-1]
6. Pothukuchi K. Five decades of community food planning in Detroit: city and grassroots, growth and equity. Journal of Planning Education and Research 2015;35(4):419-434 [FREE Full text]
7. Espinosa Seguí A, MacKiewicz B, Rosol M. ACME: An International Journal for Critical Geographies. 2017. From Leisure to Necessity: Urban Allotments in Alicante Province, Spain, in Times of Crisis URL: https://www.acme-journal.org/index.php/acme/article/view/1402 [accessed 2017-11-04] [WebCite Cache ID 6vpabYugW]
8. Giorda E. Farming in Mowtown: Competing narratives for urban development and urban agriculture in Detroit. In: Sustainable food planning: Evolving theory and practice. Wageningen: Wageningen Academic Publishers; 2012.
9. Lawson L. Agriculture: Sowing the city. Nature 2016 Dec 22;540(7634):522-523. [doi: 10.1038/540522a]
10. Lawson L. City bountiful. In: A Century of Community Gardening in America. Berkeley, California: University of California Press; 2005.
11. Duchemin E, Wegmuller F, Legault AM. Field Actions Science Reports. 2008. Urban agriculture: multi-dimensional tools for social development in poor neighbourhoods URL: [http://journals.openedition.org/factsreports/113](http://journals.openedition.org/factsreports/113) [accessed 2017-12-19] [WebCite Cache ID 6vpv5Mn81]

12. Lovell ST. Multifunctional Urban Agriculture for Sustainable Land Use Planning in the United States. Sustainability 2010 Aug 04;2(12):2499-2522. [doi: 10.3390/su2082499]

13. Québec En Forme. Les histoires derrière le changement. 2016. Pour un Québec en forme URL: [http://pourunquebecenforme.org/histoires/](http://pourunquebecenforme.org/histoires/) [accessed 2017-12-19] [WebCite Cache ID 6vp91n5H]

14. Wakefield S, Yeudall F, Taron C, Reynolds J, Skinner A. Growing urban health: community gardening in South-East Toronto. Health Promot Int 2007 Jun;22(2):92-101. [doi: 10.1093/heapro/dam001] [Medline: 17324956]

15. Milan Urban Food Policy Pact. MUFPP, 2015 URL: [http://www.milanurbanfoodpolicypact.org/wp-content/uploads/2016/06/Milan-Urban-Food-Policy-Pact-EN.pdf](http://www.milanurbanfoodpolicypact.org/wp-content/uploads/2016/06/Milan-Urban-Food-Policy-Pact-EN.pdf) [accessed 2017-12-19] [WebCite Cache ID 6vpvchvNe]

16. United Nations Habitat III. Quito declaration on sustainable cities and human settlements for all. 2016. A new urban agenda URL: [http://habitat3.org/wp-content/uploads/Habitat-III-New-Urban-Agenda-10-September-2016.pdf](http://habitat3.org/wp-content/uploads/Habitat-III-New-Urban-Agenda-10-September-2016.pdf) [accessed 2017-12-19] [WebCite Cache ID 6vpiCeptw]

17. Cameron R, Blanușa T, Taylor J, Salisbury A, Halstead A, Henricot B, et al. The domestic garden – Its contribution to urban green infrastructure. Urban Forestry & Urban Greening 2012 Jan;11(2):129-137. [doi: 10.1016/j.ufug.2012.01.002]

18. Rojas-Valencia MN, Orta de Velázquez MT, Franco V. Urban agriculture, using sustainable practices that involve the reuse of wastewater and solid waste. Agricultural Water Management 2011 Jul;98(9):1388-1394. [doi: 10.1016/j.agwat.2011.04.005]

19. Brown K, Jameton A. Public Health Implications of Urban Agriculture. Journal of Public Health Policy 2000;21(1):20-39. [doi: 10.2307/3343472]

20. Guitard D, Pickering C, Byrne J. Past results and future directions in urban community gardens research. Urban Forestry & Urban Greening 2012 Jan;11(4):364-373. [doi: 10.1016/j.ufug.2012.06.007]

21. Focus. Food and Agriculture Organization of the United Nations; 1999. Questions relatives à l'agriculture urbaine URL: [http://www.fao.org/Ag/fr/magazine/9901sp2.htm](http://www.fao.org/Ag/fr/magazine/9901sp2.htm) [accessed 2017-09-27] [WebCite Cache ID 6vpi7jnX]

22. Armar-Klemesu M, Maxwell D. Urban agriculture as an asset strategy-supplementing income and diets. In: Bakker N, Dubbeling M, Gundel S S, Sabel-Koschella U U, de Zeeuw H, editors. Growing Cities, Growing Food: Urban Agriculture on the Policy Agenda. Euraurb, Germany; DSE: 2000:183-208.

23. Cofie OO, Van Veenhuizen R, Drechsel P. In Africa session of 3rd World Water Forum. Kyoto, Japan; 2003 Mar. Contribution of urban and peri-urban agriculture to food security in sub-Saharan Africa URL: [http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.365.1569&rep=rep1&type=pdf](http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.365.1569&rep=rep1&type=pdf) [accessed 2017-09-27]

24. Rezai G, Shamsudin M, Mohamed Z. Urban Agriculture: A Way Forward to Food and Nutrition Security in Malaysia. Procedia - Social and Behavioral Sciences 2016 Jan;216:39-45. [doi: 10.1016/j.sbspro.2015.12.006]

25. Alaimo K, Packnett E, Miles RA, Kruger DJ. Fruit and vegetable intake among urban community gardeners. Journal of nutrition education and behavior 2008;40(2):94-101. [doi: 10.1016/j.jneb.2006.12.003]

26. Hawkins JL, Thirlaway KJ, Backx K, Clayton DA. Allotment gardening and other leisure activities for stress reduction and healthy aging. HortTechnology 2011;21(5):577-585.

27. Genter C, Roberts A, Richardson J, Sheaff M. The contribution of allotment gardening to health and wellbeing: A systematic review of the literature. British Journal of Occupational Therapy 2015;78(10):593-605.

28. Warren E, Hawkesworth S, Knaı C. Investigating the association between urban agriculture and food security, dietary diversity, and nutritional status: A systematic literature review. Food Policy 2015 May;53:54-66 [FREE Full text] [doi: 10.1016/j.foodpol.2015.03.004]

29. Ellis F, Sunberg J. Food production, urban areas and policy responses. World Development 1998 Feb;26(2):213-225. [doi: 10.1016/S0305-750X(97)10042-0]

30. Rouillon M, Harvey PJ, Kristensen LJ, George SG, Taylor MP. VegeSafe: A community science program measuring soil-metal contamination, evaluating risk and providing advice for safe gardening. Environ Pollut 2017 Mar;222:557-566. [doi: 10.1016/j.envpol.2016.11.024] [Medline: 28027776]

31. McClintock N. Assessing soil lead contamination at multiple scales in Oakland, California: Implications for urban agriculture and environmental justice. Applied Geography 2012 Nov;35(1-2):460-473. [doi: 10.1016/j.apgeog.2012.10.001]

32. Boente C, Matanzas N, García-González N, Rodríguez-Valdés E, Gallego JR. Trace elements of concern affecting urban agriculture in industrialized areas: A multivariate approach. Chemosphere 2017 Sep;183:546-556. [doi: 10.1016/j.chemosphere.2017.05.129] [Medline: 28570898]

33. Antisari LV, Orsini F, Marchetti L, Vianello G, Gianquinto G. Heavy metal accumulation in vegetables grown in urban gardens. Agron Sustain Dev 2015 May 7;35(3):1139-1147. [doi: 10.1007/s13593-015-0308-z]

34. Izquierdo M, De Miguel E, Ortega MF, Mingot J. Bioaccessibility of metals and human health risk assessment in community urban gardens. Chemosphere 2015 Sep;135:312-318. [doi: 10.1016/j.chemosphere.2015.04.079] [Medline: 25966050]

35. Sipter E, Rózsa E, Gruiz K, Tátrai E, Morvai V. Site-specific risk assessment in contaminated vegetable gardens. Chemosphere 2008 Apr;71(7):1301-1307. [doi: 10.1016/j.chemosphere.2007.11.039] [Medline: 18191173]
36. Warming M, Hansen MG, Holm PE, Magid J, Hansen TH, Trapp S. Does intake of trace elements through urban gardening in Copenhagen pose a risk to human health? Environ Pollut 2015 Jul;202:17-23. [doi: 10.1016/j.envpol.2015.03.011] [Medline: 25796073]

37. Poulsen M, McNab P, Clayton M, Neff R. A systematic review of urban agriculture and food security impacts in low-income countries. Food Policy 2015 55:131-146. [doi: 10.1016/j.foodpol.2015.07.002]

38. Korth M, Stewart R, Langer L, Madinga N, Rebelo Da Silva N, Zaranyika H, et al. What are the impacts of urban agriculture programs on food security in low and middle-income countries: a systematic review. Environ Evid 2014;3(1):21. [doi: 10.1186/2047-2382-3-21]

39. Ohly H, Gentry S, Wigglesworth R, Bethel A, Lovell R, Garside R. A systematic review of the health and well-being impacts of school gardening: synthesis of quantitative and qualitative evidence. BMC Public Health 2016 Mar 25;16:286. [doi: 10.1186/s12889-016-2941-0] [Medline: 27015672]

40. Nicklett E, Anderson L, Yen I. Gardening Activities and Physical Health Among Older Adults: A Review of the Evidence. J Appl Gerontol 2016 Dec;35(6):678-690 [FREE Full text] [doi: 10.1177/073346481563608] [Medline: 25515757]

41. World Bank. List of economies June 2017 URL: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups [accessed 2017-09-27] [WebCite Cache ID 6vptbZaf4]

42. Dahlgren G, Whitehead M. Policies and strategies to promote social equity in health. Stockholm: Institute for Future Studies; 1991.

43. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. International Journal of Social Research Methodology 2005 Feb;8(1):19-32. [doi: 10.1080/1364557032000119616]

44. Levac D, Colquhoun H, O'Brien K. Scoping studies: advancing the methodology. Implement Sci 2010 Sep 20;5:69 [FREE Full text] [doi: 10.1186/1748-5908-5-69] [Medline: 20854677]

45. Aromataris E, Riitano D. Constructing a search strategy and searching for evidence. A guide to the literature search for a systematic review. Am J Nurs 2014 May;114(5):49-56. [doi: 10.1097/01.NAJ.0000446779.99522.16] [Medline: 24759479]

46. Higgins JP, Green S, editors. Front Matter. In: Cochrane Handbook for Systematic Reviews of Interventions: Cochrane Book Series. Chichester, UK: Wiley; 2008.

47. Higgins JP, Green S, editors. Front Matter. In: Cochrane Handbook for Systematic Reviews of Interventions: Cochrane Book Series. Chichester, UK: Wiley; 2008.

48. Peters M, Godfrey CM, Khalil H, McInerney P, Parker D, Osse CB. Guidance for conducting systematic scoping reviews. Int J Evid Based Healthc 2015 Sep;13(3):141-146. [doi: 10.1097/XEB.0000000000000050] [Medline: 26134548]

49. Yadouléton A, N’guessan R, Allagbé H, Asidi A, Boko M, Osse R, et al. The impact of the expansion of urban vegetable farming on malaria transmission in major cities of Benin. Parasit Vectors 2010 Dec 12;3(1):118 [FREE Full text] [doi: 10.1186/1756-3305-3-118] [Medline: 2143999]

50. Pothukuchi K, Kaufman J. The Food System. Journal of the American Planning Association 2000 Jun 30;66(2):113-124. [doi: 10.1080/019443646008976093]

Abbreviations

| MeSH: medical subject headings |
| PICOS: participants, intervention or concept, context, outcomes, study design |
| UA: urban agriculture |
complete bibliographic information, a link to the original publication on http://www.researchprotocols.org, as well as this copyright and license information must be included.