

Article

Urban Public Food Procurement in Kiambu and Machakos Counties as a Driver of Food and Nutrition Security and Sustainability: A Literature Review and Case Studies

Julian Z. Xie ^{1,2,*} , Kathrin M. Demmler ³ , Ann Trevenen-Jones ³ and Kelly D. Brownell ⁴

¹ Healthcare Innovation, Benefits Data Trust, Philadelphia, PA 19102, USA

² Root Causes Consulting, Pittsburgh, PA 15213, USA

³ Food Systems Governance Programme, Global Alliance for Improved Nutrition, 1202 Geneva, Switzerland; kdemmler@gainhealth.org (K.M.D.); atrevenenjones@gainhealth.org (A.T.-J.)

⁴ Duke World Food Policy Center, Duke University Sanford School of Public Policy, Durham, NC 27708, USA; kelly.brownell@duke.edu

* Correspondence: jxie@bdtrust.org; Tel.: +1-(650)-315-6990



Citation: Xie, J.Z.; Demmler, K.M.; Trevenen-Jones, A.; Brownell, K.D. Urban Public Food Procurement in Kiambu and Machakos Counties as a Driver of Food and Nutrition Security and Sustainability: A Literature Review and Case Studies. *Sustainability* **2022**, *14*, 3341. <https://doi.org/10.3390/su14063341>

Academic Editors: Danny Hunter, Luana F. Joppert Swensson, Florence Tartanac, Sergio Schneider and Mark Stein

Received: 23 December 2021

Accepted: 3 March 2022

Published: 12 March 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Abstract: Urban public food procurement can address malnutrition and improve the beneficiary experience at public institutions whilst reshaping food systems to be healthier and more sustainable. We reviewed grey and peer-reviewed literature on urban public food procurement in Kiambu and Machakos counties in Kenya. From the literature, we selected programmes for case study research through stakeholder interviews and targeted literature searching. We searched 11 databases and reviewed 23 relevant articles. The case studies involved early childhood education centre and primary school feeding, hospital food provision, and COVID-19 responses. We found that actionable data and public–private partnerships are enabling factors. Similarly, multistakeholder involvement and governance increase coordination. However, budget constraints threaten programme stability. Procurement criteria focused on nutrition, food quality, and community development, but did not explicitly include environmental sustainability. We linked case studies to the United Nations Sustainable Development Goals 2, 3, 4, 5, 8, and 12. By developing, improving, and scaling public food procurement, urban governments in low- and middle-income countries (LMICs) can reach the most vulnerable whilst improving farmer livelihoods, creating business opportunities, and addressing environmental concerns. This paper contributes implementational insights in Kenyan urban contexts by highlighting opportunities for local and regional policymakers in LMICs and their partners to strengthen public food procurement.

Keywords: public food procurement; urban food systems; low- and middle-income countries; Kenya; multistakeholder governance; public–private partnership; hospital meals; school feeding

1. Introduction

1.1. Multiple Wins from Public Food Procurement

Public food procurement and provision can help bring about food system transformation and address the interconnected malnutrition, noncommunicable diseases (NCD), and climate change crises [1,2]. The EAT Lancet Commission identified food procurement as a key food system transformation strategy, and in 2021, the United Nations Food Systems Summit launched the Healthy Diets from Sustainable Food Systems Coalition and School Meals Coalition. These two coalitions will promote nutritious food supply chains, farmer livelihood support, environmental protection, healthy food environments, education, and demand generation [3,4]. These initiatives recognise that establishing new public food procurement programmes and making existing ones more sustainable along economic, social, and cultural lines is one of many tools available to accelerate progress on the United

Nations (UN) Sustainable Development Goals (SDGs) [5]. More generally, public procurement accounts for an estimated 10% to 15% of global gross domestic product (GDP). This proportion is higher in LMICs, where public procurement accounts for 19.3% and 14.9% of the GDP in South Asia and Sub-Saharan Africa, respectively [6]. As noted by Torres-Pruñonosa et al. sustainable food procurement fits the broader concept of sustainable public procurement, in which governments purchase goods or services with specifications that require suppliers to meet different dimensions of sustainability. Their bibliometric analysis found that school feeding is one of the main themes within sustainable public procurement literature [7].

Public food procurement addresses malnutrition by helping people meet minimum dietary requirements and preventing NCDs. Public food procurement reaches high volumes of people, especially vulnerable groups like girls, women, and people living on a low income. For example, India's Mid-Day Meal Scheme feeds 116 million students [8]. Sassoon General Hospital in Pune serves free patient meals co-funded by the regional government and a local non-governmental organisation (NGO). These meals add to social sustainability by improving patient nutrition, aiding recovery, and reducing economic pressure on family members who would otherwise bring food from outside the hospital [9]. In one example of how public food procurement could prevent NCDs, a study found that students receiving meals with minimum nutrition standards through Brazil's National School Feeding Programme were less likely to regularly consume sugar-sweetened beverages and ultra-processed foods [10]. Public food procurement can also increase human productivity and educational attainment for those receiving food [11].

Beyond food consumers, sustainable public food procurement can contribute to environmental sustainability. According to the UN Intergovernmental Panel on Climate Change, urban food consumption is one strong driver of cities' material flows, carbon footprint, and land footprint [12,13]. Hence, changing the ways that urban institutions source their food could improve these climate change drivers. In addition, public food procurement can simultaneously reduce food waste at the same time as improving livelihoods by creating guaranteed markets for farmers and food producers. Guaranteed markets can particularly benefit smallholder farmers, such as how Brazil's National School Feeding Programme mandates that 30% of ingredients are purchased from local small farmers [14]. Brazil's Institutional Purchase Program offers a 30% price premium for procuring organic-certified or agroecologically-produced products, thereby rewarding farmers for sustainable agricultural practices [15]. The World Food Programme (WFP) Purchase for Progress initiative conducts local and regional staple procurement from smallholder farmers to foster local economic empowerment, reduce post-harvest loss, and speed up food aid delivery [16]. Therefore, public food procurement can jointly enhance environmental and economic sustainability.

In general, the Food and Agriculture Organization of the United Nation (FAO) defines sustainable and resilient city regional food systems as driving food access, generating decent jobs and income, increasing resilience, fostering rural–urban linkages, promoting agroecological diversity, and supporting participatory and inclusive governance [17]. Various urban public food procurement programmes attempt to meet multiple goals jointly. Cities participating in the C40 Cities network and Milan Urban Food Policy Pact (MUFPP) are working on public food procurement to further sustainable diets [18,19]. The Purchase from Africans for Africa pilot project demonstrated potential ways to jointly promote nutritious food demand and procurement through local farmers and farmer organisations. This programme supported home-grown school feeding (HGSF) programmes in Ethiopia, Malawi, Mozambique, Niger, and Senegal [20]. Mozambique's experience with the programme indicates the need for joint policy, and institutional and legal capacity-building, such as to formalise farmer organisations, improve quality control, and improve public procurement procedures and local management [21].

1.2. Rationale for This Paper—Showcasing Urban Governance in Low- and Middle-Income Countries

In addition to multiple forms of inequality, most low- and middle-income country (LMIC) cities face the double burden of malnutrition, where undernutrition (e.g., stunting, wasting, or micronutrient deficiencies) coexists with overnutrition (overweight and obesity) [22,23]. Despite these challenges, urban governments are well-positioned to create and improve food procurement programmes due to their roles in managing and financing public institutions. They can also innovate and exceed national policies [24]. For example, Addis Ababa established a dedicated school feeding agency in 2019 to feed all 351,000 public school students from preschool to eighth grade [9]. In 2017, Quito began working with the Ecuador Ministry of Health to improve school meals according to national school feeding nutrition guidelines [25]. In another example, Quezon City signed the C40 Good Food Cities Declaration and plans to bring public food procurement in line with the Sustainable Consumption and Production Principles developed through a South-South cooperation network to promote sustainable diets and reduce food waste [26].

This paper aims to characterise literature on public food procurement in urban areas in LMICs. There is emerging global guidance for public food procurement, particularly from the World Health Organisation (WHO)'s "Action Framework for Developing and Implementing Public Food Procurement and Service Policies for a Healthy Diet", and FAO's "Home Grown School Feeding Resource Framework" [11,27]. These frameworks discuss national-level best practises and lessons from LMICs. Indeed, WFP helped Kenya establish its Home-Grown School Meals Programme in 2009 to feed 1.6 million children. In 2018, Kenya transitioned to national ownership and adopted its National School Meals and Nutrition Strategy. Kenya's national school feeding programme primarily covers 1.6 million children living in arid and semi-arid lands [28,29].

There continues to be a need for more literature on urban public food procurement in LMICs. FAO and the Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT) have provided further evidence and experiences in their publication "Public Food Procurement for Sustainable Food Systems and Healthy Diets". Though the publication includes several LMIC case studies, such as an HGSF pilot in Busia County in Kenya, they point out that public food procurement research, data, and reporting remain limited [5,30]. Further, a systematic review highlighted gaps in literature on school food and workplace food environments in LMICs [31]. Molin et al. conducted a systematic review about sustainability in public food procurement and found that a minority of articles cover African and Asian countries [32]. Yet, public food procurement programmes already exist and innovate within their local contexts in LMICs, and we can cultivate further progress through sharing experiences and best practices. Our paper aims to contribute to the field with implementational insights on experiences in Kenyan urban contexts, going beyond a national level analysis and providing granularity at the local and regional levels to strengthen public food procurement programmes in LMICs.

1.3. Research Objectives

This paper's objectives were to:

1. Review public food procurement literature for Kiambu and Machakos, with elements of scoping and narrative reviews to characterise available literature.
2. Identify case studies from the literature review and describe their origins, funding, governance, food procurement models, enabling factors, and challenges that inform how policymakers, practitioners, and funders may approach urban public food procurement in LMICs.
3. Based on the literature review and case studies, describe how urban public food procurement can support progress towards SDGs.

This paper presents comparative case studies generated from a review of grey and peer-reviewed literature on urban public food procurement in Kiambu and Machakos between 2012 and 2021. Through these stories, we hope to envision how cities might implement and

improve public food procurement programmes with attention to sustainability, gender, and nutrition. To this end, we first discuss our methodological plan behind the literature review, interviews, and case studies. Next, we present our literature review results. Following this, we present three case studies and two supporting examples in Kiambu and Machakos counties. From these case studies, we then develop overall themes to add to the literature on urban public food procurement in LMICs and their links to the SDGs.

2. Materials and Methods

2.1. Study Area

Our paper focuses on cities and urban areas in Kiambu and Machakos counties in Kenya. These locations were chosen because the Global Alliance for Improved Nutrition (GAIN) has existing operations and relationships in the cities of Thika and Machakos, which are contained within Kiambu and Machakos counties, respectively. In these locations, GAIN operates its Keeping Food Markets Working (KFMW) programme, which covers six urban locations (under the KFMW programme, GAIN operates in the cities of Thika and Machakos in Kenya, the cities of Rawalpindi and Peshawar in Pakistan, and Beira and Pemba in Mozambique). Although urban locations face unique challenges, there are many similarities between the chosen locations for this paper, and other urban cities and regions in Africa and Asia, as they will undergo the largest urban population growth through 2050 [33]. Like other urban localities in LMICs, both Kenyan counties experience the double burden of malnutrition (see Table 1). In addition, around half or more of the residents live in informal settlements with limited basic services like healthcare and clean water [34]. Kiambu and Machakos counties are vulnerable to climate change; for example, Machakos has seen increasing rural-to-urban migration by people moving away from agriculture and seeking other income sources [35,36]. In addition, the food systems in both counties are significantly shaped by traditional (informal) food markets, which can be a source of nutritious foods and urban livelihoods, but also come with food safety and regulatory challenges [37].

Table 1. Selected statistics on double burden of malnutrition in Kiambu and Machakos.

	Stunting for Children under 5 (%)	Overweight and Obesity for Females 15–49 years (%)
Kiambu County	16	46
Machakos County	27	29

City-level data were not available, so county data are presented. Double burden of malnutrition is defined and measured in different ways; therefore, we chose two representative metrics. Stunting is defined as height for age < -2 standard deviations, and “overweight and obesity” as BMI ≥ 25 kg/m². Data originate from Kenya Demographic Health Survey, 2015: <https://www.dhsprogram.com/pubs/pdf/FR266/FR266.pdf> (accessed on 4 July 2021).

2.2. Literature Search

We began with a literature search in April 2021. While the search included public food procurement in all six GAIN KFMW locations (Kiambu, Machakos, Rawalpindi, Peshawar, Beira, and Pemba), this article focuses on the results for the two Kenyan locations, including city as well as county data from Kiambu and Machakos. We adapted the review principles for international development discussed by the Overseas Development Institute, as well as guidance from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) extension for Scoping Reviews [38]. We wrote search strings and identified peer-reviewed and grey literature databases in consultation with a trained librarian (see Appendix A). Search results were imported into Covidence for screening. Program implementation may take multiple years, so to give an up-to-date picture, we focused on articles published in the last 10 years (2012 to 2021). We developed and followed the inclusion and exclusion criteria detailed in Table 2. Articles were first screened by title and abstract, and further screened by full text.

Table 2. Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> • Focused on relevant urban locations and surrounding regions, i.e., Kiambu and Machakos counties and municipalities within the two counties. • Published between 2012 and 2021. • Focused on food procurement with city or regional government involvement. • Discussed public food procurement as a safety net against natural disasters, conflict, and pandemics. COVID-19 food procurement programming was included though activities may be temporary. • Discussed multistakeholder governance in relation to public food procurement. 	<ul style="list-style-type: none"> • Did not relate to relevant geography, dates, or food procurement. • Primarily involved international aid without plans to transition to local governmental control. • Described temporary programming without renewal or scale-up plans. • Discussed related but distinct interventions such as public institution breastfeeding support. • Were duplicates not automatically flagged by Covidence. • Articles were not excluded by language, as databases included non-English texts tagged with English keywords.

Targeted Google, Google Scholar, ReliefWeb, and World Bank searches were conducted for each location with food procurement keywords such as “food procurement”, “institutional food”, “school food”, “school meals”, “hospital food”, “prison food”, “senior food”, and “elderly food” in combination with “Kiambu” and “Machakos” to search for specific examples from 2012 to 2021. We searched for public food procurement within documents such as budgets and strategic plans from city and county health, food, agriculture, education, and social welfare departments (see Appendix A for search strategy). Any scanned documents were converted to electronic versions.

2.3. Case Study Selection and Stakeholder Interviews

We chose case studies where it was possible to verify activity and urban government involvement. We further targeted web searching and stakeholder interviews to gather insights on the selected case studies. We conducted semi-structured interviews between March and June 2021 with the goal of gathering further details and insights to supplement the literature search (see Appendix B for interview guide). Stakeholders were chosen for outreach through GAIN’s network and targeted cold contact by email, WhatsApp, and LinkedIn. We selected individuals involved with programmes from the literature search, using contact information found within articles, government websites, or LinkedIn.

Nine English-language interviews with stakeholders in Kenya were organised, along with additional text conversations through WhatsApp. Two brief conversations through WhatsApp with additional stakeholders (who were government staff) were conducted to verify and supplement the information found in literature. We also conducted six interviews with stakeholders in Pakistan. Interviews were conducted and transcribed remotely via Zoom or WhatsApp video chat due to the COVID-19 pandemic. All interviewees gave permission to participate in this study and to be quoted. This research was supported by a Duke University IRB-Exempt protocol.

2.4. Information Analysis

Our goal was to produce a literature review with both a scoping analysis and narrative review elements. Literature and interview transcripts were analysed to synthesise information on public food procurement funding, governance and partnerships, stakeholder involvement, menu creation and food sourcing, enabling factors, and barriers. This information organisation scheme was adapted in part from GAIN’s “Strengthening Governance for Better Nutrition in Cities” guidance document and the WHO’s “Action framework for developing and implementing public food procurement and service policies for a healthy diet” [11,39]. We conducted a thematic analysis as elaborated by Braun and Clarke [40].

This led to further refinement of the framework by which information is presented in this article.

3. Results

In this section, we first present our literature review results at a high level. Next, we discuss case studies selected from these articles and present them categorised by institution type. Then, we highlight urban school feeding case studies. Finally, we present hospital food provision. We also provide supporting examples on food procurement as part of the COVID-19 food security response, and multistakeholder governance for nutrition. Within each case study, we present an overview followed by information we gathered from literature and interviews organised according to funding governance and stakeholder involvement, menu creation and food procurement model, success measures, enabling factors, and challenges.

3.1. Literature Review Findings

Figure 1 displays a PRISMA-style overview of our literature search across 11 databases. We found 2005 results and included a total of 95 articles. However, information for Pakistan and Mozambique from the literature review and stakeholder interviews was not sufficient to answer questions set forth in our case study framework and hence were excluded from the results in this article. Appendix C briefly summarises the findings from Pakistan and Mozambique. Out of the 95 articles, 15 were focused on Kenya and an additional eight were found through further targeted searching. Citations for these 23 articles can be found in the Supplemental Materials. Information from these articles, as well as the stakeholder interviews, are presented in this study. The themes of the findings are summarised in Table 3.

Table 3. Articles in literature search categorised by location and topic for public food procurement in Kiambu and Machakos (n = 23 articles).

	School Feeding	Hospital Feeding	COVID-19 Response	Multiple Topics
Kiambu	7	3	1	2
Machakos	5	1	1	3
Total	12	4	2	5

Among the nine Kenya interviews, stakeholders represented the departments of education, agriculture, economic planning, and nutrition, as well as one NGO representative and one private sector representative. Their positions included county executives, healthcare workers, program coordinators, and fundraisers (see Table 4).

Table 4. Interviewees categorised by location and/or case study in Kiambu and Machakos.

	Interviewees
Kiambu ECDE feeding	2
Kiambu school feeding NGO	1
Kiambu hospital feeding and nutrition	2
Machakos COVID-19 response	1
Kenya national government representatives	2
Kenya private sector representative	1
Total	9

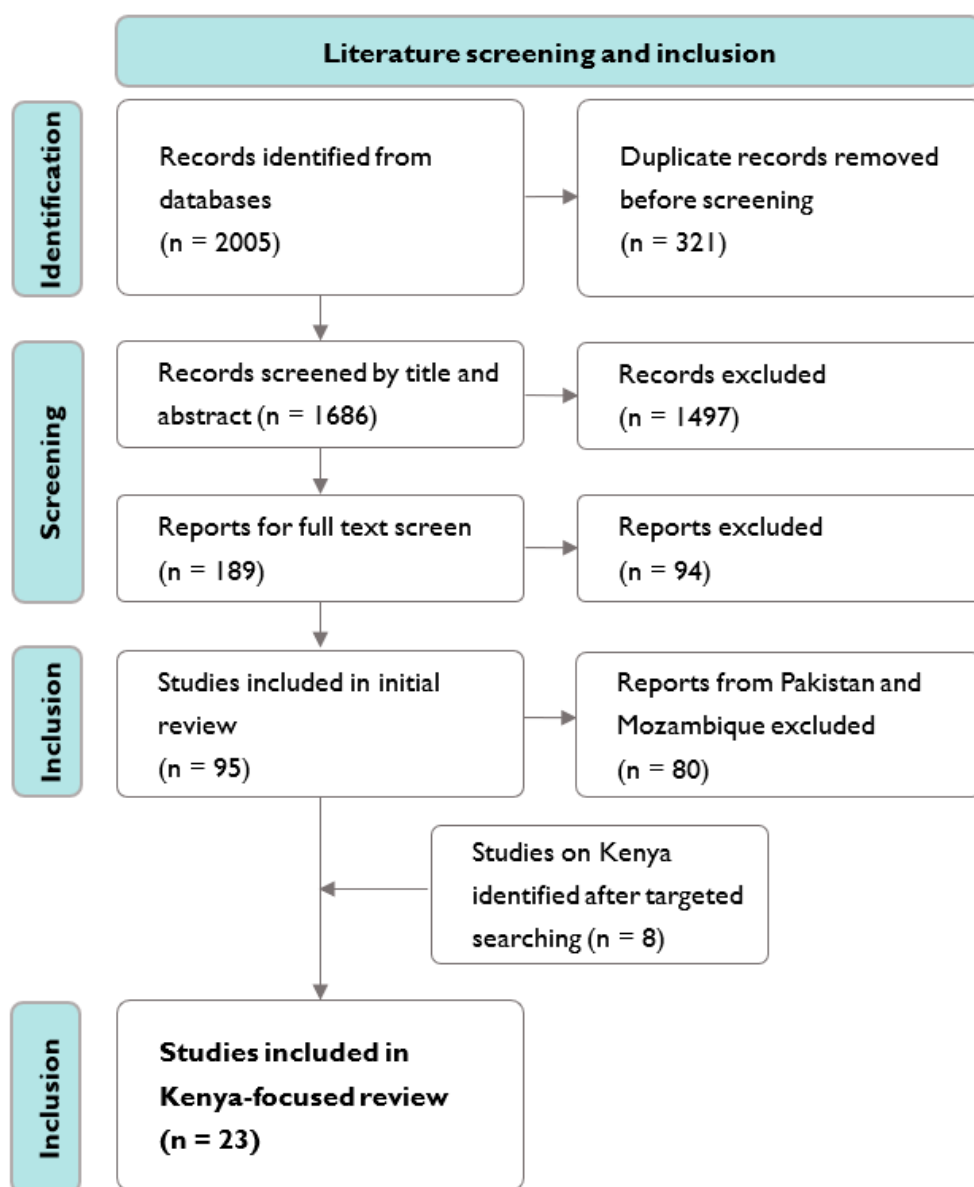


Figure 1. PRISMA diagram for literature search on urban public food procurement in Kiambu, and Machakos, including studies from Peshawar, Rawalpindi, Beira, and Pemba.

3.2. School Feeding Case Studies

Our search yielded two school feeding examples in Kiambu County. For Machakos, we found articles describing its participation in the Kenyan National School Feeding programme, but we did not include it as a case study since it was not urban government-focused [41].

3.2.1. Kiambu County Early Childhood Development and Education (ECDE) Feeding

In Kenya, county governments finance and manage ECDE centres on the basis that ECDE involves higher parental and community involvement. Counties are responsible for ECDE centre feeding, while the National Ministry of Education manages primary school feeding [29]. Historically, parents and communities managed and funded most ECDE centres and any associated feeding programmes [42,43]. In one Machakos study, parents and children named rising ECDE centre fees, food insecurity, and poverty as their top unmet needs to enable attendance [44]. County governments have increased government ECDE investments; however, feeding programmes face continued funding challenges [45–47].

Kiambu County established government-run ECDE feeding under Esther Ndirangu, County Executive Committee Member for Education. Upon starting her post in 2013, Ndirangu visited ECDE centres where she saw children sleeping at school and exhibiting malnutrition such as through hair colour changes from Kwashiorkor disease. This triggered the County Education Department to conduct a County ECDE centre baseline survey. Their survey found significant child food insecurity [48].

In response, the Kiambu County Education Department started a 2013 pilot where they provided uji (a Kenyan porridge) at ECDE centres. The pilot targeted the two highest need ECDE centres in Kiambu's 60 wards (120 out of 477 centres). The pilot reached 18,000 children. The uji programme was associated with increased ECDE student enrolments. This motivated the Kiambu County Assembly to pass legislation that extended the programme to the whole county in 2016 [49]. Thereafter, the ECDE feeding programme reached 60,000 children.

The uji programme was interrupted in 2018 for two school terms due to a budget shortage. It resumed in 2019 but was again interrupted due to the COVID-19 pandemic. During COVID-19, Kiambu County diverted ECDE feeding funds towards food procurement and delivery for vulnerable households (Box 1 describes Kiambu and Machakos Counties' food security programming within their responses to COVID-19). The ECDE uji programme restarted in late 2021 when schools reopened with the easing of certain COVID-19 pandemic restrictions.

Kiambu's uji programme served as an avenue to deliver deworming medicine, vitamin A supplementation, polio vaccines, free tooth-brushing supplies, stationery, and school uniforms produced in local villages. The county provided mattresses for children to sleep on in the afternoon. Additionally, the Education Department began ECDE centre safety renovations [50]. The Education Department also partnered with Microsoft, Oracle, and IBM to receive computer donations and teacher training.

Box 1. Public food procurement during COVID-19.

The COVID-19 pandemic has significantly exacerbated global food and nutrition insecurity through food supply chain disruption, increased economic vulnerability through lost income and livelihoods, food price fluctuations, and gaps in medical and nutrition care delivery [51–53]. Isolation and social distancing due to COVID-19 can also reduce physical food access [54]. In LMICs, local and national governments, NGOs, businesses, and international organisations have deployed a range of food security interventions as part of the COVID-19 response. These interventions include food aid distribution, cash transfers, nutrient supplementation, meal provision, and support for local food production [55].

Machakos' food and medical supplies for urban poor people during COVID-19

In 2020, the Machakos County Department of Economic Planning solicited and distributed food and medical supplies worth KSh 29 million (USD 269 thousand) for 6189 vulnerable households [56]. Machakos recognised a surge in urban poverty after COVID-19 began. Migrant workers from rural areas lost their jobs after industrial plant closures, leading to higher food insecurity and the risk of children leaving school to look for work.

Machakos County asked municipal administrators to identify high-need individuals and households, especially people who had lost jobs, elderly people, orphans, and people with disabilities. Food distributions took place at different sites every one to two weeks. In urban areas, county staff additionally delivered food door to door to pre-identified families, while in rural areas, they distributed food from central areas.

The Machakos Department of Economic Planning appealed for donations primarily from local food manufacturers [56]. They secured donations of maize meal, green grams, spaghetti, rice, cooking oil, salt, sugar, and tea. The county sought donations from local businesses and the Machakos Teachers Association to bring blankets to hospitals, and sanitiser and masks to be given out during food distributions. The county publicised donations and distributions, thereby driving visibility and attracting further donations from individuals and businesses.

Box 1. Cont.

According to the 2021–2022 County Annual Development Plan, Machakos County's Social Welfare subsector also provided food and blankets to 703 elderly people. They gave food, bedding, sanitary towels, and underwear to 545 girls in primary school, and food and hand sanitiser to 10 children's homes during COVID-19 [57].

Kiambu County's food procurement during COVID-19

In 2020, the Kiambu County Government's Social Welfare Department procured and distributed food to vulnerable families within COVID-19 relief efforts [58]. They provided maize, green grams, *uji* mix (porridge flour), and cooking oil. They collaborated with the county's Agriculture, Livestock, and Irrigation Sector to both solicit donations and purchase food from manufacturers, farmers, and individuals. The county government spent KSh 28.7 million (USD 264 thousand); of which some funding was diverted from ECDE feeding due to school closures [59]. Like in Machakos, Kiambu's Members of the County Assembly met in committees with county executives to share data on which households were most in-need. They targeted slums, informal settlements, unhoused children, and tea and coffee estates.

3.2.2. Funding

The Kiambu County Assembly funded the *uji* programme. The 2013 pilot programme received KSh 60 million (USD 557 thousand). In 2016, when the programme was rolled out at every ECDE centre, the county allocated KSh 200 million (USD 1.86 million).

In 2018, Kiambu County's financial situation prevented it from receiving national funds and conducting any new procurement before paying mandatory debts. Therefore, the ECDE feeding programme was paused for that school year. In 2019, the programme resumed with a KSh 60 million budget (USD 557 thousand), which reduced meal frequency from daily to once per week.

Kiambu County considered adding an ECDE centre milk feeding programme in 2019, but their KSh 200 million (USD 1.86 million) budget request to provide both *uji* and milk was not approved. In the 2021–2022 County Annual Development Plan, a KSh 230 million (USD 2.13 million) expense has been requested to feed 35,000 children [58].

3.2.3. Governance and Stakeholder Involvement

The Kiambu County Education Department leads the *uji* programme and coordinates multiple county departments.

- The Department of Health provided food safety training to ECDE teachers. Once teachers received the training, they trained any parents involved with *uji* provision. The Department of Health advised on *uji* nutrition specifications and food safety requirements; for instance, they advised against adding millet due to the aflatoxin risk. The Department of Health conducted additional health interventions. A subcontracted local NGO provided tooth-brushing supplies.
- The Agriculture Department identified *uji* suppliers through their professional networks. They also planted mango trees within ECDE centres for children to eat.
- One such *uji* supplier was JKUAT Enterprises, a state-owned corporation affiliated with Jomo Kenyatta University of Agriculture and Technology, a public university [60].
- The Roads Department made ECDE centres more reachable, both for students on foot and for vehicles delivering food, especially in hard-to-reach areas.
- The Planning Department helped ECDE centres acquire title deeds to prevent land disputes that might jeopardise ownership of the centre's physical space.
- The Finance Department administered programme funding.
- The Energy Department brought biogas stoves to schools.
- In 2021, the Water Department was working on safe water supplies at ECDE centres for safely re-opening schools post-COVID-19. The Education Department estimates that about 40% of ECDE centres are not connected to a public water supply, so they rely on parents to bring water to the centres.

3.2.4. Menu Creation and Food Procurement Model

The Kiambu County Education Department prioritises nutritious, filling, and cost-effective food that would be shelf-stable and preparable without extensive kitchen infrastructure. Though some *uji* only contains maize or one type of grain at a time, the Education Department specified the *uji* needed to contain maize, soybeans, and omena (small, dried fish common in Kenyan cuisine) [61]. From 2019 onwards, the *uji* no longer contained omena, but was re-formulated to have added iron and vitamins. Kiambu County ECDE *uji* always includes the ingredients of maize, soybeans, sugar, and added vitamins and minerals (also including calcium, phosphorous, potassium, zinc). Depending on supplier availability and cost, milk powder may also be added but is not a consistent ingredient. Overall, these decisions lead to higher protein and micronutrient density. *Uji* suppliers pre-cook the *uji* mix in production facilities, then dehydrate, package, and deliver it to ECDE centres. Then, staff add water to the *uji* mix and heat for several minutes, at which point it is ready to consume.

The county purchases *uji* from local suppliers through a public tender process. In tender documents, the county specifies food needs, and potential meal providers submit proposals to meet these needs. Tender proposals are evaluated according to “value for money”, which means meeting nutritional specifications at the lowest cost. The tenders require that proposals follow market prices for the foods to avoid collusion issues. The meal providers purchase *uji* ingredients from businesses that have received pre-qualification status from the county government. To maintain pre-qualification, suppliers are subject to inspections and must document batch numbers for food safety traceability.

Kiambu County procures services from multiple meal providers to cover the county's wards. By hiring locally, the county grows community support. The county intentionally hires local youths, women, and people with disabilities as meal providers. This contributes to Kiambu County's progress on the Kenyan Access to Government Procurement Opportunities (AGPO) programme. AGPO follows a 2013 Presidential Directive that 30% of government procurement contracts be set aside for youth, women, and people with disabilities [62]. In 2016–2017, about 60% of the Education Department procurement contracts were awarded to AGPO-eligible groups, with the remainder largely going towards ECDE centre renovation contractors.

3.2.5. Success Measures

Meal providers and school staff report back to the Education Department to track daily activities. Through these reports, the Education Department learned that during the pilot phase, some ECDE centres had trouble with food delivery timeliness. They addressed these issues by adding Education Department staff support and recruiting local parents to help.

Success is measured through the number of ECDE centres with feeding programmes, students served, ECDE centre enrolment, and community-wide child malnutrition metrics. The County Development Plan documents frame ECDE feeding as primarily helping to achieve SDG4 (Quality Education) [58]. The programme's success was highly visible due to families transferring their children to centres where *uji* was offered. In 2014, Kiambu County had higher ECDE centre enrolments after initiating the *uji* programme [48].

According to a stakeholder interviewee report, in 2018, the Kiambu Education Department recorded a 26% student dropout rate after the *uji* programme stopped. Upon restarting the programme in 2019, the ECDE enrolment rate climbed again from 32,000 to 36,000 (a 12.5% increase). Indeed, the Department has received anecdotal reports that free school meals are a strong incentive for children and families.

The County Department of Health visits ECDE centres twice a year to carry out various services, at which point they weigh and measure children to assess student health and report on their nutrition status.

3.2.6. Enabling Factors

Actionable data and pilot: The Kiambu Education Department conducted a baseline child food insecurity survey that drew attention to the issue and enabled selecting ECDE centres for a strategic pilot. The pilot enabled the county to learn from initial experiences and gather data to advocate for scaling up.

Multistakeholder involvement: Kiambu County integrated multiple government departments, ECDE teachers, parents, and meal providers who largely came from vulnerable groups.

Nutritious and culturally relevant food: *Uji* is a familiar Kenyan food, and the programme fed children a higher nutrient density version, especially since omena is an affordable Kenyan complementary feeding source [61].

Political champions: Governor Kabogo often publicly praised Esther Ndirangu and the Education Department's proactivity about child food security. He also assisted with finding donors and partners. In 2020, Governor James Nyoro publicly stated goals to renovate ECDE centres and expand child feeding [63].

3.2.7. Challenges

Budgetary constraints: Kenyan County ECDE feeding faces unstable funding due in part to a lack of binding legislation to establish permanent mandatory government-funded ECDE centre feeding. Due to budget constraints, Kiambu's ECDE feeding was interrupted in 2018, and had reduced service frequency from 2019 onwards. In addition, the ECDE feeding budget is earmarked only for food, but not storage and delivery costs, which prevents prioritising food safety. The *uji* mix is sometimes stored in teacher staff rooms, and some centres lack kitchens. To mitigate these constraints, ECDE centre staff recruit parents to prepare *uji* off-site and deliver it.

Similar barriers exist for Machakos County, where despite ECDE feeding appearing in its County Annual Development Plan [57], there currently is not an active programme. In 2019, Machakos County publicly announced an ECDE milk programme [64], but never implemented it due to budgetary constraints, according to a stakeholder. However, county-level ECDE milk feeding programmes, which involve local milk procurement, are active in at least seven other Kenyan counties according to a stakeholder interview [65].

In 2020, the Kenya Council of Governors delivered a statement to the national senate proposing a KSh 4 billion (USD 37 billion) ECDE budget increase, some of which would support ECDE feeding [66].

3.3. Food 4 Education's Urban Primary School Feeding

Kenya's national school feeding programme does not cover Kiambu County since it is not arid or semi-arid. Instead, parents and NGOs manage school feeding. To address this gap, the Food for Education NGO (F4E) serves meals at urban schools. Nutritionist Wawira Njiru founded F4E in the Ruiru municipality in Kiambu County in 2012. The programme has expanded to Kiambu, Nairobi, and Mombasa counties [67]. We chose F4E as a case study due to their novel partnership with Nairobi County to fund kitchen construction.

F4E serves children aged 6 to 14 in poor urban areas and younger children from primary schools with an attached ECDE centre. F4E establishes central kitchens at public schools in locations where staff can prepare meals and deliver them to the highest-need schools with the shortest delivery routes. Staff members transport meals in insulated aluminium containers on trucks, performing food quality and temperature checks on arrival. At schools, children access meals through Tap2Eat, which is a smart wristband technology platform. Parents use mobile phones to load debit funds onto the students' Tap2Eat wristbands. During COVID-19, F4E distributed rations with maize flour, wheat flour, and cooking oil to 25,000 people and cash transfers to 1000 families. F4E also provided masks and home learning guides [68].

3.3.1. Funding

Originally, Njiru crowdfunded the first central kitchen in Kiambu. Subsequently, she applied for funding from national and international foundations and corporations [67]. F4E's 2019–2020 budget was USD 2 million, and their 2021–2022 budget amounts to USD 4.8 million due to expansions.

Meal production costs are approximately KSh 25 (USD 0.23), and F4E charges parents the affordable subsidised price of KSh 15 (USD 0.15). Through this fee, parents cover 60% of food production costs while donors cover the rest. F4E plans to bulk-purchase food to bring production costs down to KSh 15, such that parent fees would fully cover the costs. F4E has already reduced meal production costs by 25% from 2018 to 2021.

3.3.2. Governance and Stakeholder Involvement

Despite being an NGO, F4E partners with urban governments where they contribute to capital investments instead of programme operations. F4E developed this idea during stakeholder-mapping conversations. F4E considered how its first kitchen in Kiambu County was at a public school. They recognised how county governments and local school boards approve school infrastructure construction and renovations. Therefore, F4E collaborated with the Dagoretti South constituency in Nairobi County to fund kitchen construction at Mukarara Primary School [69].

F4E organised meetings with Members of the County Assembly (MCAs) representing vulnerable neighbourhoods where the kitchen might be built. The MCAs then discussed with the Subcounty Director of Education and local school board to gain buy-in and approval. Kitchen construction was mutually appealing since MCAs could affirm their commitment to serving constituents, education stakeholders could offer school feeding, and municipal governments could drive local employment.

The Dagoretti MCA advocated for kitchen construction funding from the National Government Constituencies Development Fund (NG-CDF). This funding mechanism's advantage was that it did not require new legislation. Instead, building a kitchen met the county's mandate to manage public property construction and infrastructure development. With the school kitchen built on public property, F4E does not pay rent or ownership fees. NG-CDF covered 70% of kitchen construction costs. Moving forward, F4E seeks to replicate this model, with county governments covering at least 25% of the estimated USD 500,000 in capital expenditures per kitchen.

F4E collaborates with the National Ministry of Education on school feeding policy, meal standards, and advocacy. In the long-term, F4E is working on a memorandum of understanding with the National Ministry of Education that would require government stakeholders to facilitate connections to public schools. Government-facilitated introductions can accelerate conversations with local school boards and community members because they may increase F4E's perceived legitimacy.

3.3.3. Menu Creation and Food Procurement Model

F4E determines the menu based on local food preferences and pre-set nutritional criteria. F4E specifies that meals contain 650 g of food and 40% of the daily average required macro- and micronutrients for child development, under the assumption that F4E may be providing a child's only meal of the day. Meals prioritise protein by having a 1 to 1.5 proportion of protein to other parts of the meal (carbohydrates and fats). F4E adapted these requirements from the Ministry of Health and WHO guidelines aimed at reducing malnutrition and protein deficiency.

F4E meals include green grams (mung beans), red beans, peanuts, maize, vegetables (mainly tomato and onion), rice, and bananas [70]. More recently, the Kiambu and Nairobi kitchens have added beef once a week sourced from local slaughterhouses, since beef is the cheapest meat available for their programme. Where previously F4E primarily purchased food from private consumer food markets, they now prioritise relationships with food aggregators, particularly Nairobi-based Twiga Foods. Twiga began in 2014 as a web-

based formal marketplace to source from thousands of farmers and food manufacturers to business customers. Twiga provides farmers with guaranteed markets, technical assistance, access to credit, and transparent prices. Their customers benefit from fair prices, predictable delivery, food safety traceability, and access to credit [71]. F4E receives food deliveries two or three times per week, reducing cold storage needs.

3.3.4. Success Measures

F4E has served six million meals since its founding in 2012. Currently, they feed 30,000 children from their central kitchens [72]. F4E regularly collects feedback from students and schools through their daily meal interactions. Parents communicate with F4E through its mobile app and social media. F4E is also working with the Busara Center for Behavioural Economics to evaluate community interactions with the programme. Based on internal F4E reporting, from 2018 to 2020, national exam performance in the schools F4E serves increased by 20%, with F4E schools having 30% higher scores than schools without feeding programmes.

3.3.5. Enabling Factors

Nutrition as a priority: F4E founder Wawira Njiru is a nutritionist; this influences the meals' emphasis on protein and dietary diversity. Moreover, F4E benefits from adaptable dietary guidelines from Kenya's Ministry of Health.

Food aggregation: Sourcing through aggregators can increase predictability and standardisation in menu planning. Moreover, bulk purchasing has reduced meal production costs.

Local government capital expenditure support: F4E reduced entry costs by pursuing kitchen construction funding from Nairobi County.

Digital technology: The Tap2Eat digital wallet enables F4E staff to register and verify students efficiently as part of managing beneficiary data. Tap2Eat also allows parents to manage debit funds easily.

3.3.6. Challenges

F4E aims for sustainable financing without donor-reliance; hence, its emphasis on local community and government participation. With permanently funded school feeding, F4E hopes to be a major Kenyan school meal provider. Senator Sakaja Johnson has proposed national school feeding legislation inspired by F4E as well as examples from the US, Latin America, and India. The bill would create committees that link nutritionists and the private sector. It would also expand county governments' school feeding role beyond the ECDE level [73].

3.4. Kiambu and Machakos County Hospital Feeding

Hospitals in Kiambu and Machakos counties serve meals to patients who are admitted for inpatient care. One article and stakeholder interview were specific to food procurement at Thika Level Five Hospital in Kiambu County [74]. "Level five" hospitals typically see patients of higher medical complexity (e.g., patients with cancer) who often have specific nutrition needs.

3.4.1. Funding

Meal charges are bundled into patient hospital bills, so food is free at the point of consumption for patients who have government health insurance. For example, the food preparation budget at Thika Level 5 Hospital is KSh 100 (USD 0.92) per day per patient; however, a stakeholder suggested that KSh 200 (USD 1.84) would be ideal for maximising food quality, nutrition, and quantity. Indeed, a 2018 news article raised concerns about food quantity and quality in Kiambu's hospitals [75].

The Kiambu County Department of Health has been implementing multiple hospital nutrition improvements. In 2016, Kiambu County began constructing new hospital

buildings in four municipalities with “proper running kitchens” [76]. The 2021 Kiambu County Nutrition Action Plan (CNAP) includes a goal to develop and implement hospital menus that are “responsive to patients’ needs across different gender, age, and diversities” with a KSh 3.85 million (USD 36 thousand) cost over 5 years [77]. Box 2 provides further discussion of the CNAP. Hospital nutritionists have been advocating for an additional patient fee to cover higher quality food and wages for all catering staff members, such as workers who deliver food to rooms.

Box 2. Multistakeholder governance through the Kiambu County Nutrition Action Plan.

The Kiambu County Department of Health, with leadership from County Nutrition Coordinator Rachael Wanjugu, launched a five-year KSh 2.54 billion (USD 23.5 million) County Nutrition Action Plan in March 2021, with involvement from the Departments of Finance, Education, and Agriculture [78]. The county began developing the plan in 2016 [79] with financial and technical assistance from Nutrition International and UK Aid [80]. KSh 1.04 billion (USD 9.6 million) will fund high impact nutrition interventions, and the rest will fund nutrition-sensitive interventions, social protection programming, and community health volunteer recruitment. For school settings, planned activities will include developing a school feeding strategy, promoting food safety and nutrition in schools, child nutrition assessments, and expanding deworming and vitamin A supplementation at ECDE centres [81]. The plan recognises Kiambu’s double burden of malnutrition, including plans to regulate the marketing of “unhealthy foods for older children and adolescents in schools” [82]. The plan also contains a monitoring and evaluation framework [77]. The CNAP will be funded by Kiambu County and matching funds from Nutrition International intended to incentivise ongoing domestic resource mobilisation. Moving forward, the CNAP will serve as a commitment that underlies future food system advocacy. Under the plan, the County Nutrition Coordinator will continue facilitating multisectoral collaboration.

3.4.2. Governance and Stakeholder Involvement

Kenyan hospitals use a public tender process overseen by an evaluation committee with hospital nutritionists, procurement managers, and catering staff. Food suppliers submit bids that are awarded based on “value for money”, such as ECDE feeding tenders. The evaluation committee awards points for food safety and quality based on reviewing the food supplier’s previous services to other customers. In addition, evaluation committees favour community development through procuring food from local businesses. In line with Kenya’s AGPO programme, Kiambu County hospitals reserve some procurement opportunities for women, youth, and people with disabilities.

3.4.3. Menu Creation and Food Procurement Model

According to Machakos County’s budget, tender documents, and stakeholder interviews, the meals contain sorghum or millet for breakfast. For other meals, they serve rice, maize meal, bread, or potatoes; milk, eggs, pulses, and beef meat or liver; greens and carrots; bananas and oranges; and tea or milk [83].

Nutritionists oversee menu creation based on assessing patients’ dietary needs and communicating them to hospital catering staff. They intend to feed patients 2000 to 2500 calories a day, composed of 15% protein, 25% fat, and 50% carbohydrates.

Nutritionists individualise patient meal plans based on caloric needs and NCD diagnoses, including diabetes, high blood pressure, and kidney disease. However, a stakeholder expressed concern that commercial therapeutic feeds are often too costly. Instead, hospital kitchens improvise using available ingredients, like using a blender to create post-operative liquid diets.

In addition, Kiambu County plans to create hospital kitchen gardens for at least four county hospitals [58]. A previous Rotary International pilot project created a kitchen garden at Tigoni Hospital. Hospital staff grew vegetables (primarily greens, carrots, onions) for pregnant mothers receiving iron and folate supplementation. The vegetable provision was also an opportunity to increase their dietary diversity and educate them about iron- and folate-rich foods. The garden grew an estimated KSh 35,000 (USD 324) per month of food, thereby slightly reducing meal expenses for patients. During the COVID-19 pandemic, the

garden was placed on hold to make space for COVID-19 patients. Kiambu County plans to restart Tigoni Hospital's garden and scale to other hospitals and community locations after the pandemic. Once the programme returns, the Department of Health plans to measure haemoglobin values for women recipients to track the intervention's effects on anaemia.

3.4.4. Success Measures

Hospital nutrition departments and catering departments keep track of the patients fed. Nutritionists keep track of patients' "Nutrition Care Process", in which they re-assess their nutritional status and do further diet-planning. These data generally are managed at the hospital level without being aggregated or disseminated externally, but the CNAP proposes to establish processes for reporting nutrition data to the Kenya Health Information System. Hospital meals are intended to help accelerate patient recovery and reduce hospital expenditures; however, we did not find details on how this is evaluated. The CNAP also proposes spending KSh 20.6 million (USD 190 thousand) over 5 years for regular inpatient feeding quality assessment through hospital food inspection committees (covering both food and therapeutic feeding) [77].

3.4.5. Enabling Factors

Actionable data and nutrition as a priority: Nutritionists play a prominent role in setting the hospital meal menu both at the procurement stage and through patient dietary assessments. Their dietary assessments then generate data that influence procurement decisions and menu creation. The emphasis on nutrition as part of healthcare delivery lies in Kenya's Essential Package for Health and National Health Sector Strategic Plans [84].

3.4.6. Challenges

Cost: Funding constraints limit the ability to provide nutritious food consistently. For instance, according to a stakeholder, due to budget constraints, animal-source foods are not given every day despite intentions to do so, e.g., beef appears three times a week.

4. Discussion

Our first aim was to characterise urban public food procurement literature for Kiambu and Machakos counties. This study was limited in part by the small volume of relevant literature. School feeding had more literature compared to procurement at other institutions. Though we found articles on Rawalpindi and Peshawar, and conducted several interviews relating to these programmes, we ultimately did not have sufficiently consistent and verifiable information to present case studies with the same level of rigor or detail. Similarly, there was little literature in Mozambique that fit the inclusion criteria, so no case studies were included.

4.1. Case Study Themes

We summarise shared themes from our second aim to describe case study histories, funding, governance and stakeholder involvement, food procurement models, enabling factors, and challenges. These themes are not universally generalisable to all settings, but they provide some emerging insights for further exploration in LMIC urban contexts.

4.1.1. Actionable Data May Accelerate Programme Development and Implementation

Collecting local and regional data may help empower food system leaders [85], especially if more subnational data are integrated into tools like the Food Systems Dashboard [86]. For example, Kiambu County's ECDE centre feeding programme used baseline child food security data to target the highest-need centres with a pilot programme. The pilot's data motivated the County Assembly to make ECDE centre feeding county-wide.

Data can also help with programme targeting and beneficiary management. In Machakos County, the COVID-19 food provision programme relied on communication with municipal governments to identify beneficiaries. In Kiambu and Machakos hospitals, nutritionists

conduct patient assessments to tailor meal preparation. Lastly, F4E uses Tap2Eat, a technological tool that streamlines student registration and data management. These positive data use cases align with calls to make food systems more data-driven [87].

4.1.2. Public–Private Partnerships May Reduce Barriers to Entry

Public–private partnerships among urban governments, NGOs, and businesses may be one method to address resource limitations and support innovative programmes. From our case studies, Kiambu County sources the *uji* mix from suppliers like JKUAT Enterprises, a state-owned corporation affiliated with a local public university. The Machakos County Government used networking power with local businesses to donate food, masks, and other supplies for newly unemployed urban residents after the COVID-19 pandemic began. In a previously reported example, Addis Ababa adapted NGO school feeding into a city government-funded programme [9].

4.1.3. Multistakeholder Governance Can Enhance Coordination

Our study reinforces recent suggestions that participatory multistakeholder governance is important to food systems' transformation [39,88]. In particular, the Kiambu County Nutrition Action Plan is one such formal multistakeholder governance structure. At the hospital level, tender evaluation committees bring together input from nutritionists, catering staff, and procurement managers. Overall, there has been recent growth in formal multistakeholder governance, such as food policy councils in numerous LMIC cities [89,90]. These systems-based governance efforts align with the City Region Food System framework, which emphasizes multistakeholder governance for resilient, well-coordinated, and participatory food systems [17,91].

Our case studies also display coordination and networking across sectors, leading to problem-solving from novel angles. Food 4 Education (F4E) demonstrated how multistakeholder thinking can help identify non-traditional funding sources. F4E does not receive funding from typical food procuring departments (e.g., education, health, or agriculture), and instead secures public funding through an urban government construction department focused on public infrastructure renovation. By aligning on this mandate, F4E broadened the set of actors supporting school feeding.

Identifying champions can also strengthen multistakeholder governance [39]. We found that for Kiambu County's ECDE centre feeding, Education Department leader Esther Ndirangu and two county governors advocated and coordinated, which facilitated programme implementation.

4.1.4. Nutrition Can Be Prioritised

Across our case studies, programmes considered nutrition and culturally-relevant foods within their resource constraints. Menu design with consideration for target populations and food-based dietary guidelines has been identified as a best practise [92]. Kiambu and Machakos County hospitals provide nutritious patient meals, tailored according to medical needs. Kiambu's County Nutrition Action Plan will likely enable future food procurement nutrition improvements. Relatedly, F4E's founder is a nutritionist whose menu design prioritises dietary diversity and protein content as adapted from Kenyan dietary guidelines.

Some programmes provided nutrient-dense foods even without significant cold storage, despite its role in the food procurement infrastructure [11]. For F4E, frequent fresh ingredient purchasing reduces cold storage needs. For Kiambu's ECDE centre feeding, *uji* porridge does not require refrigeration and is formulated for increased nutrient density based on County Health Department advice.

A recent systematic review of randomised control trials in LMICs found that school feeding was positively associated with height and weight; although, they did not find significant changes in height-for-age, weight-for-age, or body mass index-for-age. This indicates a need for further long-term studies to fully measure anthropometric changes [93].

4.1.5. Sustainable Financing Is Necessary to Address Budgetary Constraints

Our case study programmes were vulnerable to budgetary constraints. Most notably, Kiambu County's ECDE centre feeding programme experienced a service interruption and lower meal frequency. A school feeding study in Kiambu and Murang'a counties pointed out that county funding is inadequate, and most programmes are run by parents who may have trouble affording their own children's meals [94]. A Machakos study suggested that school feeding suffers from inconsistent government funding and food supply [95].

However, our case study programmes have attempted to overcome budgetary constraints. The Kiambu County Nutrition Action Plan receives matching funds from Nutrition International, which intends to incentivise county resource mobilisation. F4E uses bulk-purchasing from a food aggregator to reduce operating costs. Nonetheless, further long-term political commitments could better protect funding.

4.2. Links to the Sustainable Development Agenda

Our third aim was to explore within our literature findings and case studies how urban public food procurement in LMICs may offer opportunities to work towards SDG2 (Zero Hunger) and additional SDGs. In doing so, we hope to describe benefits that may resonate among diverse sectors. This discussion is a starting point, but future studies are needed to strengthen the evidence base and put SDG-related reporting into practice.

For SDG 3 (Good Health and Well Being), Kiambu and Machakos County hospitals provide patient meals. Hospital meal provision can address hospital-related malnutrition, which is shown to lengthen hospitalisations and increase healthcare costs [96]. Public food procurement can also enable co-delivering other health interventions. For example, Kiambu's ECDE centre feeding included deworming, vitamin A supplementation, vaccinations, and tooth-brushing supplies. Similarly, Machakos County's COVID-19 food procurement programme distributed masks and sanitiser. This is consistent with other LMIC interventions that co-delivered food assistance and COVID-19-related goods including masks, hygiene supplies, and educational materials [55].

Kiambu County's ECDE centre feeding and F4E both enable more children to access education (SDG4, Quality Education). Kiambu County's ECDE centre feeding is framed in government documents as primarily an SDG4-related intervention, and indeed was associated with increased enrolment. Meanwhile, F4E found that their feeding programme was associated with higher exam scores. These trends are consistent with a Kiambu study that found NGO school feeding was associated with improved student enrolment and attendance [97].

At the intersection of education and SDG5 (Gender Equality), school feeding has been linked to improved school attendance and performance, especially for girls [93,98,99]. Food procurement can also economically empower female food producers, which is why the FAO recommends giving women producers preferential access to public food procurement markets [88,100]. In line with this, Kenya's Access to Government Procurement Opportunities (AGPO) programme sets a 30% target for procurement from youth, women, and people with disabilities. Kiambu County exceeds this target with 60% of ECDE meal providers coming from these groups. AGPO's interaction with public food procurement also helps break down common barriers between procurement authorities and institutions who procure food [5].

Public food procurement can also have positive SDG-related economic effects. For SDG8 (Decent Work and Economic Growth), food procurement programmes employ urban residents who deliver and prepare food. Relating to SDG8 and SDG12 (Responsible Consumption and Production), public food procurement can create guaranteed demand, increasing market predictability and reducing waste along the food value chain. One example of this is food aggregators who link farmers and urban procurers through regional supply chains. Twiga Foods (F4E's food aggregator) could be considered an example of "infrastructure of the middle", referring to market opportunities for farmers that occupy the space between vertically-integrated supply chains and direct-to-consumer sales [101].

4.3. Limitations

This study was limited in part by the small volume of literature on urban public food procurement in our study locations. We found relevant but insufficient information in Pakistan and Mozambique; hence, there is value in future studies that go into further depth, particularly without being limited by the COVID-19 pandemic.

We conducted searches in non-English languages and sought input from in-country stakeholders; however, some proposed interviews could not be completed after repeated contact attempts. Another limitation is that food procurement public tenders and other government documents may only be temporarily available online. They may be archived before being found in searches conducted within a specified timeframe. Given these constraints, some programmes' details were not fully captured.

5. Conclusions

Urban governments in LMICs can lead the way in public food procurement. Our case studies for Kiambu and Machakos display urban public food procurement innovations. The case studies highlight the importance of actionable data, public–private partnerships, and multistakeholder governance. They also show how inconsistent funding threatens these programmes. Urban public food procurement presents synergistic opportunities to contribute to SDGs and sustainability in all its forms: health and nutrition, gender equity through serving female beneficiaries and hiring women, environmental sustainability, community development, and sustainable consumption and production. These public food procurement innovations show how urban areas can build back better with resilient city regional food systems post-COVID-19.

Although procurement criteria on food quantity, nutritional content, food safety and quality, local community development, and prioritising procurement from vulnerable group-led food suppliers exist in the presented case studies, opportunities to integrate even more nutritious and safe foods into procurement programmes need to be explored. Indeed, public food procurement tender processes are an opportunity to articulate and mandate food specifications that promote nutrition, dietary diversity, and cultural adequacy [102]. However, a review of school feeding in 12 countries, including Kenya, identified that LMIC school feeding needs further development to have formal nutritional guidelines [103]. Even though local procurement may have a positive climate impact, our case studies did not have explicit environmental sustainability procurement criteria. Meanwhile, “value for money” procurement can force public institutions to choose cheaper options without considering the true costs of food [104]. Therefore, further work is needed to structure public food procurement to consider additional sustainability dimensions. Another theme to explore is funding stability in public–private partnerships that place financial responsibility on NGOs or businesses.

There is also a need for evaluations of how public food procurement shapes local and regional food markets. The recent systematic literature review by Molin et al. found that despite growing literature on the opportunities and potential relating to sustainable food procurement, a minority of articles in scientific literature include the quantitative or qualitative evaluation of sustainability impacts [32]. Hence, impact evaluations are needed to establish public food procurement's effects on all sustainability dimensions in urban LMIC settings.

Our paper shares experiences from Kenya and contributes to the literature on urban public food procurement in LMICs; this work also points towards opportunities for further research across multiple geographies, institution types, and research modalities to best understand how to implement and scale up sustainable public food procurement.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su14063341/s1>. A list of citations for the articles in the literature review are available as Supplementary Material.

Author Contributions: Conceptualization, J.Z.X., K.M.D., A.T.-J. and K.D.B.; methodology, J.Z.X. and K.M.D.; software, J.Z.X.; validation, J.Z.X. and K.M.D.; formal analysis, J.Z.X. investigation, J.Z.X.; resources, A.T.-J. and K.D.B.; writing—original draft preparation, J.Z.X.; writing—review and editing, K.M.D., A.T.-J. and K.D.B.; supervision, A.T.-J. and K.D.B.; project administration, J.Z.X. and A.T.-J.; funding acquisition, A.T.-J. and K.D.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Netherlands Ministry of Foreign Affairs (Application Number 400000622). The APC was co-funded by GAIN and the Duke World Food Policy Center.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Duke Institutional Review Board as an IRB-Exempt study (protocol code 2020-0253 approved on 24 November 2019)."

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: No new data were created or analysed in this study. Data sharing is not applicable to this article.

Acknowledgments: We thank GAIN's country officers and "Expert Advisory Panel" members including Charles Opiyo, Jane Wambugu, Farrah Naz, Umair Arshad, and Rafia Haider for their assistance in facilitating in-country stakeholder introductions and guidance on the paper. We thank Samantha Kaplan, Duke University Medical Center Librarian, for her assistance with developing the literature search strategy. We also thank Sarah Zoubek, Duke World Food Policy Center, and Sharelle Pollack for their contributions to this project's conceptualisation.

Conflicts of Interest: The authors declare no conflict of interest that would influence the representation or interpretation of research results. The funder was not involved in the study design; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Appendix A. Search Strings

The following databases and search strings were developed with a trained librarian iteratively. These strings were developed by testing out specific key words and discarding any searches where the first 20 results were not relevant. While the search included all six urban locations (Kiambu, Machakos, Rawalpindi, Peshawar, Beira, and Pemba) in which GAIN's KFMW programme operates, this article only focuses on the results for the two Kenyan urban counties.

Table A1. Search strings used in the literature review.

Search String	Databases Queried	Notes
((Machakos OR Kiambu OR (Pemba AND Mozambique) OR Beira OR Rawalpindi OR Peshawar OR Addis Ababa OR Pune) AND (procurement OR insecurity OR food insecurity OR provision)) AND (food or feeding OR feed OR fed OR feeds)	PubMed Embase Scopus Global Health Globus Index Medicus PAIS Index	A more general search was conducted initially, including Addis Ababa and Pune before project scope revision

Table A1. Cont.

Search String	Databases Queried	Notes
(((Machakos OR Kiambu OR (Pemba AND Mozambique) OR Beira OR Rawalpindi OR Peshawar)) AND ((procurement OR provision OR institution OR COVID-19 OR school OR hospital OR prison OR senior home OR nursing home OR military base OR university OR college OR education) AND (food OR feeding OR meals OR foodservice OR food delivery OR nutrition)))	PubMed Embase Scopus Global Health Globus Index Medicus PAIS Index CAB Abstracts Consumer Health Database	Peer-reviewed and grey literature on health and agriculture. Searched titles/abstracts/keywords with terms such as “food insecurity” removed to avoid general results, except for full-text search in PubMed
noft (((Machakos OR Kiambu OR (Pemba AND Mozambique) OR Beira OR Rawalpindi OR Peshawar)) AND ((procurement OR provision OR institution OR COVID-19 OR school OR hospital OR prison OR senior home OR nursing home OR military base OR university OR college OR education) AND (food OR feeding OR meals OR foodservice OR food delivery OR nutrition)))	International Newsstream Newspaper Source Plus	Multi-language international newspaper databases. Searched for titles/abstracts/keywords (excluded full text)
(((Machakos OR Kiambu OR (Pemba AND Mozambique) OR Beira OR Rawalpindi OR Peshawar)) AND ((government OR govern* OR legislation OR legislat* OR agency OR procurement) AND (food OR feeding OR meals OR foodservice OR food delivery)))	PubMed Embase Scopus Global Health Globus Index Medicus PAIS Index CAB Abstracts Consumer Health Database	Searched for titles/abstracts/keywords (excluded full text)
“noft(((Machakos OR Kiambu OR (Pemba AND Mozambique) OR Beira OR Rawalpindi OR Peshawar)) AND ((government OR govern* OR legislation OR legislat* OR agency OR procurement) AND (food OR feeding OR meals OR foodservice OR food delivery)))”	International Newsstream (a multi-language international newspaper database) Newspaper Source Plus	Searched for titles/abstracts/keywords (excluded full text) using operator “noft”
“food procurement”, “institutional food”, “school food”, “school meals”, “hospital food”, “prison food”, “senior food”, “elderly food” in combination with each city	AllAfrica	Only contains English- and French-language articles

Table A1. Cont.

Search String	Databases Queried	Notes
((Beira OR Pemba) AND Mozambique) AND (comida OR alimentação)	PubMed	Full-text search in Portuguese
	Embase	
	Scopus	
	Global Health	
	Globus Index Medicus	
	PAIS Index	
	CAB Abstracts	
	Consumer Health Database	

Search Strings for Government Documents

Within government documents, searches were conducted for “food”, “feed”, “meal”, “procurement”, “nutrition”, “cater”, “kitchen”, “cafeteria”, “canteen”, and (procurement) “tenders”. Searches were also conducted by using Google’s “search within site” function for these terms. Searches for Rawalpindi, Peshawar, Beira, and Pemba were also conducted with keywords translated to Urdu and Portuguese.

Appendix B. Interview Guide

Stakeholders verbally consented, and the following semi-structured interview questions were used:

1. Tell me about the work that you do and the people that you serve.
2. What was the process that led to developing your food procurement programme?
3. How was the menu of foods provided in your programme decided?
4. Where do you get information about nutrition and making procurement nutrition-sensitive?
5. What evaluation criteria do you use to decide who to procure food from?
6. Tell me about the partners you work with? What was the role of other government departments? NGOs? Donors? Private sector? Community members?
7. Who were the champions that helped advocate for the policy?
8. How are you conducting monitoring and evaluation, as well as measuring success?
9. What funding was required to implement and sustain the policy, and what were those funds used for?
10. How did you balance potentially competing priorities, such as keeping food low-cost and affordable for the consumer vs. making sure there were healthy and fresh options?
11. What enabling factors helped with programme success?
12. What challenges have you faced?
13. Who else would be important to discuss with to learn more about this issue?

Appendix C. Summary of Findings in Pakistan and Mozambique

This section summarises examples yielded from the initial literature search including Rawalpindi, Peshawar, Beira, and Pemba. However, the findings are not included for case studies. Their themes are summarised in Table A2.

Table A2. Articles in literature search categorised by location and topic for public food procurement in Pakistan and Mozambique (n = 80 articles).

	School Feeding	Hospital Feeding	Social Welfare Institutions	Staple Food Procurement	COVID-19 Response	Limiting SSBs, Non-Nutritious Foods	Prison Feeding
Beira	1	2	0	0	0	0	0
Pemba	1	0	0	0	0	0	0
Peshawar	1	8	7	13	3	2	0
Rawalpindi	2	5	3	17	2	6	8
Total	4	15	10	30	5	8	8

Appendix C.1. School Feeding

In Pakistan, we did not find literature showing active school feeding. According to stakeholder interviews, most Pakistani schools have cafeterias, but no government-funded free meals. In 2015, the Khyber Pakhtunkhwa (KP) provincial government announced a school feeding programme [105]. Despite the mention in the KP 2015–2016 and 2016–2017 Annual Development Programmes, no literature was found indicating it as active [106–111]. Punjab’s Education Sector Plan proposes school meal pilots and as of 2021, Punjab School Education Department and Dr Sania Nishtar, the Prime Minister’s Assistant on Social Protection and Poverty Alleviation, have begun designing a pilot school meal programme [112,113].

For the two Mozambique cities, no articles on school feeding met the inclusion criteria; although, Mozambique runs a national school feeding programme with WFP. International aid programmes have conducted emergency school feeding after natural disasters. The Milan Urban Food Policy Pact performed a feasibility study in Pemba and Maputo for establishing city school feeding, but only mentions two NGO school feeding programmes in Maputo [114].

Appendix C.2. Punjab Food Authority’s School Sugary Drink Ban

In 2017, the Punjab Food Authority (PFA) banned sugar-sweetened beverage (SSB) sales at and around educational institutions, from primary schools through universities under the 2017 Punjab Educational Societies Food Standard Regulation [115]. Data showing that 27% of SSB sales in Punjab occur in schools motivated the PFA to create this policy [116]. The PFA’s ban inspired Khyber Pakhtunkhwa [117,118] and Islamabad to pass similar school SSB bans [119].

Appendix C.3. Hospital Feeding

Among limited literature on Mozambique, a 2015 news article mentions meal provision at Beira Central Hospital in the context of poor food quality, without further details [120]. Between 2017 and 2019, funding shortages led the hospital to have trouble guaranteeing food for all patients [121,122].

Most meal programmes in Pakistani public hospitals are partnerships where hospitals give NGOs access to kitchen space. NGOs handle funding, food procurement, preparation, and meal delivery to patients. Hospital nutritionists and physicians help set the menu. For instance, the Rawalpindi Armed Forces Institute of Cardiology provides dietitian-tailored meals and dietary counselling [123].

In 2010, Rawalpindi Medical College began providing meals to patients and their visitors at three Rawalpindi public hospitals [124]. In Peshawar, the Aziz Foundation provides meals in Lady Reading Hospital’s Cardiology and Internal Medicine wards. The Aziz Foundation is linked with Pakistani Senator Mohsin Aziz, and additional funding comes from Tarakai Trust, a philanthropic organisation associated with Health Minister Shahram Tarakai [125].

Appendix C.4. Food Procurement at Social Welfare Institutions

The Khyber Pakhtunkhwa and Punjab Social Welfare Departments (SWD) feed beneficiaries at social welfare institutions in Peshawar and Rawalpindi, respectively. These include Darul-Aman (crisis centres for women), Darul Kafala (rehabilitation for unsheltered people), orphanages [126], and senior homes [127].

Punjab SWD runs a Kashana (Home for Destitute Girls) in Rawalpindi and other cities. Staff serve meals based on a menu created in consultation with the shelter's girls [128]. The Punjab Child Protection and Welfare Bureau gives meals through its Child Protection Institutes [129].

Punjab SWD feeds patients at a drug rehabilitation centre at Rawalpindi General Hospital [130]. In 2019, the KP government opened a drug rehabilitation centre in Peshawar that gives food and shelter for people seeking rehabilitation services [131].

SWD institutions use a public tender process to source staple ingredients, and staff also purchase fresh ingredients from local markets. In 2013, a lapse in the KP food procurement tender process led to closures for multiple SWD institutions. During this time, employees supplied food using personal donations [132].

Appendix C.5. Ehsaas Saylani

Pakistan's Poverty Alleviation and Social Security Division (PASSD) operates multiple social safety nets under the Ehsaas programme, including the Ehsaas Saylani food distribution network. Ehsaas Saylani was launched in 2019 as a public–private partnership between PASSD and Saylani Welfare International Trust (SWIT), formalised through a memorandum of understanding (MOU) [133]. Ehsaas Saylani serves meals to unhoused people, workers at public transport hubs, and people accompanying family members in the hospital in Rawalpindi, Peshawar, and other cities [134,135]. Ehsaas Koi Bhooka Na Soye (“No One Sleeps Hungry” or “Ehsaas Langar on Wheels”) is a meal delivery offshoot launched in March 2021 [136]. In Lahore, they deliver meals to COVID-19 quarantine centres [137]. Under the MOU, SWIT handles food procurement and provision [138]. PASSD provides logistical support, publicity, and collaboration with provincial and municipal governments [138]. The MOU requires meals to follow PASSD nutrition guidelines, including prohibiting trans fats and minimising salt [139].

Ehsaas Saylani benefits indirectly from agricultural subsidies. The city-level (Rawalpindi and Peshawar) District Commissioner and Provincial (Punjab and KP) Food Department City Office work together to set the subsidised wheat price for private sector flour millers [140]. Food distribution networks like Ehsaas Saylani purchase flour from these millers or sometimes receive donations. Additional literature findings discussed wheat procurement by provincial governments; however, it did not discuss the meal distribution aspect of urban food procurement.

Appendix C.6. Rawalpindi Central Prison

Though some articles discussed Rawalpindi Central Prison's meal programme, we chose not to conduct an in-depth case study as there were few independently verifiable sources.

References

1. EAT-Lancet Commission Brief for Cities; EAT-Lancet Commission: Stockholm, Sweden, 2020.
2. Willett, W.; Rockström, J.; Loken, B.; Springmann, M.; Lang, T.; Vermeulen, S.; Garnett, T.; Tilman, D.; DeClerck, F.; Wood, A.; et al. Food in the Anthropocene: The EAT–Lancet Commission on Healthy Diets from Sustainable Food Systems. *Lancet* **2019**, *393*, 447–492. [CrossRef]
3. New Coalitions Announced at the UN Food Systems Summit to Increase Access to Healthy Diets from Sustainable Food Systems. Available online: <https://www.who.int/news/item/23-09-2021-new-coalitions-announced-at-the-un-food-systems-summit-to-increase-access-to-healthy-diets-from-sustainable-food-systems> (accessed on 18 November 2021).
4. Swensson, L.F.J.; Hunter, D.; Schneider, S.; Tartanac, F. Public Food Procurement as a Game Changer for Food System Transformation. *Lancet Planet. Health* **2021**, *5*, e495–e496. [CrossRef]

5. FAO, Alliance of Bioversity International and CIAT. *Public Food Procurement for Sustainable Food Systems and Healthy Diets—Volume 1*; FAO, Alliance of Bioversity International and CIAT and Editora da UFRGS: Rome, Italy, 2021; ISBN 978-92-5-135475-9.
6. Djankov, S. *How Large Is Public Procurement in Developing Countries?* Peterson Institute for International Economics: Washington, DC, USA, 2016.
7. Torres-Pruñonosa, J.; Plaza-Navas, M.A.; Díez-Martín, F.; Beltran-Cangrós, A. The Intellectual Structure of Social and Sustainable Public Procurement Research: A Co-Citation Analysis. *Sustainability* **2021**, *13*, 774. [CrossRef]
8. Mid Day Meal Scheme. Available online: http://mdm.nic.in/mdm_website/ (accessed on 24 April 2021).
9. Xie, J.; Brownell, K. Nutritious Food Procurement in Cities in Low and Middle Income Countries. *Glob. Alliance Improv. Nutr. Work. Pap.* **2020**. [CrossRef]
10. E Silva Noll, P.R.; Noll, M.; de Abreu, L.C.; Baracat, E.C.; Silveira, E.A.; Sorpreso, I.C.E. Ultra-Processed Food Consumption by Brazilian Adolescents in Cafeterias and School Meals. *Sci. Rep.* **2019**, *9*, 7162. [CrossRef]
11. WHO. *Action Framework for Developing and Implementing Public Food Procurement and Service Policies for a Healthy Diet*; World Health Organization: Geneva, Switzerland, 2020.
12. Cheikh, M.; Rosenzweig, C. *Chapter 5: Food Security—Special Report on Climate Change and Land*; UN IPCC: Geneva, Switzerland, 2019.
13. Goldstein, B.; Birkved, M.; Fernández, J.; Hauschild, M. Surveying the Environmental Footprint of Urban Food Consumption. *J. Ind. Ecol.* **2017**, *21*, 151–165. [CrossRef]
14. Kitaoka, K. The National School Meal Program in Brazil: A Literature Review. *Jpn. J. Nutr. Diet.* **2018**, *76*, S115–S125. [CrossRef]
15. Soares, F.V.; Nehring, R.; Battaglin Schwengber, R.; Guimarães Rodrigues, C.; Lambais, G.; Balaban, D.S.; Jones, C.; Galante, A. *Structured Demand and Smallholder Farmers in Brazil: The Case of PAA and PNAE*; International Policy Centre for Inclusive Growth: Brasília, Brazil, 2013.
16. Kelly, S.; Swensson, L. *Leveraging Institutional Food Procurement for Linking Small Farmers to Markets: Findings from WFP's Purchase for Progress Initiative and Brazil's Food Procurement Programmes*; FAO Agricultural Development Economics Technical Study; Food and Agriculture Organization of the United Nations: Rome, Italy, 2017; ISBN 978-92-5-109864-6.
17. Blay-Palmer, A.; Santini, G.; Dubbeling, M.; Renting, H.; Taguchi, M.; Giordano, T. Validating the City Region Food System Approach: Enacting Inclusive, Transformational City Region Food Systems. *Sustainability* **2018**, *10*, 1680. [CrossRef]
18. Food Systems. Available online: <https://www.c40.org/what-we-do/scaling-up-climate-action/food-systems/> (accessed on 1 April 2021).
19. *Milan Urban Food Policy Pact Monitoring Framework*; FAO, MUFPP, RUAF: Rome, Italy, 2019.
20. Gyoeri, M.; Mirando, A.C.; Soares, F.V. *Linking Vulnerable Smallholder Farmers to School Feeding Programmes: The Experience of PAA Africa*; International Policy Centre for Inclusive Growth, UNDP: Brasília, Brazil, 2016; p. 12.
21. Swensson, L.; Klug, I. *Implementation of Decentralised Food Procurement Programmes and the Impact of the Policy, Institutional and Legal Enabling Environment: The Case of PRONAE and PAA Africa in Mozambique*; FAO and International Policy Centre for Inclusive Growth: Brasília, Brazil, 2017; Working Paper 161.
22. Popkin, B.M.; Corvalan, C.; Grummer-Strawn, L.M. Dynamics of the Double Burden of Malnutrition and the Changing Nutrition Reality. *Lancet* **2020**, *395*, 65–74. [CrossRef]
23. Vilar-Compte, M.; Burrola-Méndez, S.; Lozano-Marrufo, A.; Ferré-Eguiluz, I.; Flores, D.; Gaitán-Rossi, P.; Teruel, G.; Pérez-Escamilla, R. Urban Poverty and Nutrition Challenges Associated with Accessibility to a Healthy Diet: A Global Systematic Literature Review. *Int. J. Equity Health* **2021**, *20*, 40. [CrossRef]
24. Antonelli, M.; Cecchin, C.; Florence, E.; Magarini, A.; Porreca, E. *Food & Cities: The Role of Cities for Achieving the Sustainable Development Goals*; Barilla Center for Food & Nutrition Foundation and Milan Urban Food Policy Pact: Milan, Italy, 2018.
25. Pilas con Las Vitaminas se Consolida en la Comunidad Educativa Municipal. Available online: <http://www.quitoinforma.gob.ec/2019/06/12/pilas-con-las-vitaminas-se-consolida-en-la-comunidad-educativa-municipal/> (accessed on 18 November 2021).
26. Oyuela, A. *Building Food and Nutrition Resilience in Quezon City a Case Study on Integrated Food Systems*; EAT and UNICEF: Seoul, Korea, 2020.
27. Food and Agriculture Organization of the United Nations; World Food Programme. *Home-Grown School Feeding: Resource Framework*; FAO and WFP: Rome, Italy, 2018; ISBN 978-92-5-130846-2.
28. Government Takes over School Meals in Kenya from the World Food Programme. Available online: <https://www.wfp.org/news/government-takes-over-school-meals-kenya-world-food-programme> (accessed on 4 July 2021).
29. *National School Meals and Nutrition Strategy 2017–2022*; Kenya Ministry of Education, Ministry of Health, and Ministry of Agriculture, Livestock and Fisheries: Nairobi, Kenya, 2018.
30. FAO, Alliance of Bioversity International and CIAT. *Public Food Procurement for Sustainable Food Systems and Healthy Diets—Volume 2*; AO, Alliance of Bioversity International and CIAT and Editora da UFRGS: Rome, Italy, 2021; ISBN 978-92-5-135479-7.
31. Westbury, S.; Ghosh, I.; Jones, H.M.; Mensah, D.; Samuel, F.; Irache, A.; Azhar, N.; Al-Khudairy, L.; Iqbal, R.; Oyeboode, O. The Influence of the Urban Food Environment on Diet, Nutrition and Health Outcomes in Low-Income and Middle-Income Countries: A Systematic Review. *BMJ Glob. Health* **2021**, *6*, e006358. [CrossRef] [PubMed]
32. Molin, E.; Martin, M.; Björklund, A. Addressing Sustainability within Public Procurement of Food: A Systematic Literature Review. *Sustainability* **2021**, *13*, 13395. [CrossRef]

33. 68% of the World Population Projected to Live in Urban Areas by 2050, Says UN. Available online: <https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html> (accessed on 4 July 2021).
34. Population Living in Slums (% of Urban Population)—Kenya. Available online: <https://data.worldbank.org/indicator/EN.POP.SLUM.UR.ZS?end=2018&locations=KE&start=2018&view=map> (accessed on 18 November 2021).
35. Ministry of Agriculture, Livestock, and Fisheries; Kenya Climate Risk Profile for Machakos County. *Kenya County Climate Risk Profile Series*; CGIAR Research Program on Climate Change, Agriculture, and Food Security: Nairobi, Kenya, 2018.
36. Ministry of Agriculture, Livestock, and Fisheries. *Kenya County Climate Risk Profile: Kiambu County*; CGIAR Research Program on Climate Change, Agriculture, and Food Security: Nairobi, Kenya, 2021.
37. *Informal Food Retail in Urban Areas*; Global Alliance for Improved Nutrition (GAIN): Geneva, Switzerland, 2020.
38. Hagen-Zanker, J.; Mallett, R. *How to Do a Rigorous, Evidence Focused Literature Review in International Development*; Overseas Development Institute: London, UK, 2013.
39. Polack, S.; Platenkamp, L.; Mduduzi, N.N. *Mbuya. Strengthening Governance for Better Nutrition in Cities: A Framework for Assessment and Action*; GAIN: Geneva, Switzerland, 2019.
40. Braun, V.; Clarke, V. Using Thematic Analysis in Psychology. *Qual. Res. Psychol.* **2006**, *3*, 77–101. [CrossRef]
41. Kavila, W. Kenya: Sh17 Million Given to Schools for Feeding. Available online: <https://allafrica.com/stories/201106130119.html> (accessed on 24 April 2021).
42. Consultative Group on Early Childhood Care and Development. *Education for All*; Haydenville, M.A., Ilfeld, E.M., Eds.; ERIC Clearinghouse: Washington, DC, USA, 1994.
43. Wanjohi, E.W. An Evaluation of the Impact of Community Support Grants on the Development of Early Childhood Education, In Kiambu District, Kenya. Master's Thesis, University of Nairobi, Nairobi, Kenya, 2010.
44. Mpekethu, N.M. Parental and School Characteristics Influencing Children's Participation in Pre-Primary School in Mlolongo Slum, Machakos County, Kenya. Master's Thesis, Kenyatta University, Nairobi, Kenya, 2019.
45. Erukudi, L.; Edabu, P. Influence of Food Adequacy on Enrolment in ECE Centres in Turkana Central Sub County, Turkana County, Kenya. *Afr. J. Educ. Pract.* **2020**, *6*, 29–46. [CrossRef]
46. Wangila, V.M. The Challenges Facing the Implementation of Early Childhood Development and Education Policy in Bungoma County, Kenya. *J. Educ. Pract.* **2017**, *8*, 217–223.
47. Ngaira, Gilbert. Pay More Attention to Early Childhood Learning. *Standard* **2020**. Available online: <https://www.standardmedia.co.ke/opinion/article/2001357710/pay-attention-to-early-childhood-learning> (accessed on 30 April 2021).
48. Feeding Programs See Surge in Kiambu School Enrolment. *CAP News*, 2014.
49. Ndung'u Wa Gathua County Government Lauded for Introducing Feeding Programme in ECDEs. *Hivisasa*, 2016.
50. Njenga, S. ECDE Classrooms for Kiambu Subcounties. *Star*, 2016.
51. FAO, I. *The State of Food Security and Nutrition in the World 2021: Transforming Food Systems for Food Security, Improved Nutrition and Affordable Healthy Diets for All*; The State of Food Security and Nutrition in the World (SOFI); FAO: Rome, Italy, 2021; ISBN 978-92-5-134325-8.
52. Clapp, J. *Impacts of COVID-19 on Food Security and Nutrition: Developing Effective Policy Responses to Address the Hunger and Malnutrition Pandemic*; Committee on World Food Security High Level Panel of Experts: Rome, Italy, 2020.
53. Carducci, B.; Keats, E.C.; Ruel, M.; Haddad, L.; Osendarp, S.J.M.; Bhutta, Z.A. Food Systems, Diets and Nutrition in the Wake of COVID-19. *Nat. Food* **2021**, *2*, 68–70. [CrossRef]
54. Naja, F.; Hamadeh, R. Nutrition amid the COVID-19 Pandemic: A Multi-Level Framework for Action. *Eur. J. Clin. Nutr.* **2020**, *74*, 1117–1121. [CrossRef]
55. Dodd, W.; Kipp, A.; Bustos, M.; McNeil, A.; Little, M.; Lau, L.L. Humanitarian Food Security Interventions during the COVID-19 Pandemic in Low- and Middle-Income Countries: A Review of Actions among Non-State Actors. *Nutrients* **2021**, *13*, 2333. [CrossRef]
56. Covid-19 Donations. Available online: <https://machakosgovernment.co.ke/covid-19-donations/> (accessed on 24 April 2021).
57. *Machakos Annual Development Plan 2021–2022*; County Government of Machakos: Machakos, Kenya, 2020.
58. *County Government of Kiambu County Annual Development Plan 2021–2022*; County Government of Kiambu: Kiambu, Kenya, 2020.
59. Ongaro, L. Serikali Ya Kaunti Ya Kiambu Yapata Mbinu Ya Kugawa Chakula Kwa Walioathiriwa Zaidi Kiuchumi Na Janga La Covid-19 (Kiambu County Government Finds A Way To Distribute Food To Those Most Affected By The Covid-19 Epidemic). *Taifa Leo*, 2020.
60. About JKUATES. JKUAT Enterprises LTD. 2022. Available online: <https://jkuates.co.ke/index.php/the-company.html> (accessed on 28 February 2022).
61. Ryckman, T.; Beal, T. *Affordability of Nutritious Foods for Complementary Feeding in Kenya*; GAIN and UNICEF: Geneva, Switzerland, 2021.
62. Mohammed, R. *Progress on the Economic Empowerment of Female Entrepreneurs in Kenya's 30% Preferential Public Procurement Policy*; Walden University Dissertations and Doctoral Studies: Minneapolis, MN, USA, 2019.
63. Stanley Njenga Kiambu Upgrades ECDE Centres Ahead of January Reopening. Available online: <https://www.the-star.co.ke/counties/central/2020-11-24-kiambu-upgrades-ecde-centres-ahead-of-january-reopening/> (accessed on 24 April 2021).
64. Mwangangi, J. Machakos County Assembly Approves Free School Milk Program. *Mauvoo*, 2019.
65. *Concept Note on the Proposed National School Milk Conference*; Kenya Dairy Board: Mombasa, Kenya, 2015.

66. Eric Wainaina Governors Want Sh4b for ECDE Programme. *People Dly*, 2020.
67. Food4Education—Feeding The Future. Available online: <https://food4education.org/> (accessed on 24 April 2021).
68. Our COVID-19 Impact Highlights. Available online: <https://food4education.org/our-covid-19-impact-highlights/> (accessed on 24 April 2021).
69. *We Launched Something Great*; Food 4 Education: Nairobi, Kenya, 2020.
70. Ann Wawira Njiru—Kenya. Available online: <https://archive.ids.ac.uk/tn/what-we-do/nutrition-champions/ann-wawira-njiru-kenya/index.html> (accessed on 24 April 2021).
71. *Soko Yetu—Twiga Foods Marketplace, Revolutionizing African Retail*; Twiga Foods: Nairobi, Kenya, 2021.
72. Kahongeh, J. Her Initiative Feeds 3000 School Children Daily. *Nation*, 2019.
73. Omulo, C. Will Proposed National School Lunch Bill End Child Hunger? Available online: <https://www.businessdailyafrica.com/bd/data-hub/will-proposed-national-school-lunch-bill-end-child-hunger--3320638> (accessed on 8 August 2021).
74. Wainaina, J. Kenya: Food, Medicine for Patients. Available online: <https://allafrica.com/stories/201402070967.html> (accessed on 24 April 2021).
75. Wainaina, E. Cry of Patients in Kiambu as They Share Beds. *Nation*, 2018.
76. *Kiambu County Health Magazine*; Kiambu County Department of Health Services: Kiambu, Kenya, 2017.
77. *Kiambu County Nutrition Action Plan*; County Government of Kiambu: Kiambu, Kenya, 2021.
78. Stanley Njenga Kiambu Intensifies War on Malnutrition via Strategic Action Plan. *Star*, 2021.
79. *National and County Consultative Report August 2016*; Government of Kenya: Nairobi, Kenya, 2016.
80. *Kiambu County Launches Five-Year Nutrition Action Plan*; Nutrition International: Ottawa, QC, Canada, 2021.
81. *Kiambu County Nutrition Investment Case*; Nutrition International: Ottawa, QC, Canada, 2021.
82. Kiambu County Nutrition Action Plan Launch. Available online: https://www.facebook.com/watch/live/?v=1091783157952637&ref=watch_permalink (accessed on 4 July 2021).
83. *Framework Contract for Supply and Delivery of Food and Ration*; Government of Machakos County Ministry of Health and Emergency Services: Machakos, Kenya, 2020.
84. *Kenya National Clinical Nutrition and Dietetics Reference Manual*; Kenya Ministry of Health: Nairobi, Kenya, 2010.
85. Fanzo, J.; Haddad, L.; Schneider, K.R.; Béné, C.; Covic, N.M.; Guarin, A.; Herforth, A.W.; Herrero, M.; Sumaila, U.R.; Aburto, N.J.; et al. Viewpoint: Rigorous Monitoring Is Necessary to Guide Food System Transformation in the Countdown to the 2030 Global Goals. *Food Policy* **2021**, *104*, 102163. [CrossRef]
86. Marshall, Q.; Bellows, A.L.; McLaren, R.; Jones, A.D.; Fanzo, J. You Say You Want a Data Revolution? Taking on Food Systems Accountability. *Agriculture* **2021**, *11*, 422. [CrossRef]
87. Sweet, L.; Mafe, E.; De Cleene, S.; O'Halloran, D. *Data-Driven Food Systems for Crisis Resiliency*; World Economic Forum: Cologny, Switzerland, 2020.
88. *Sector Policies for Better Food Security and Nutrition Results: Public Food Procurement*; FAO: Rome, Italy, 2018.
89. A multi-stakeholder forum to develop the Food Security and Nutrition Action Plan—Surabaya, Indonesia. *Foodactioncities*, 2021.
90. Raja, S.; Sweeney, E.; Mui, Y.; Frimpong Boamah, E. *Local Government Planning for Community Food Systems: Opportunity, Innovation and Equity in Low-and Middle-Income Countries*; FAO: Rome, Italy, 2021; ISBN 978-92-5-133904-6.
91. Blay-Palmer, A.; Santini, G.; Halliday, J.; Malec, R.; Carey, J.; Keller, L.; Ni, J.; Taguchi, M.; van Veenhuizen, R. City Region Food Systems: Building Resilience to COVID-19 and Other Shocks. *Sustainability* **2021**, *13*, 1325. [CrossRef]
92. Caldeira, S.; Storcksdieck, B.S.; Bakogianni, I.; Gauci, C.; Calleja, A.; Furtado, A. *Public Procurement of Food for Health: Technical Report on the School Setting*; European Commission: Brussels, Belgium, 2017.
93. Wang, D.; Shinde, S.; Young, T.; Fawzi, W.W. Impacts of School Feeding on Educational and Health Outcomes of School-Age Children and Adolescents in Low- and Middle-Income Countries: A Systematic Review and Meta-Analysis. *J. Glob. Health* **2021**, *11*, 04051. [CrossRef] [PubMed]
94. Karaba, M.W.; Gitumu, M.; Mwaruvie, J. Effect of School Feeding Programme on ECDE Pupils' Class Participation in Kenya. *Pedagog. Res.* **2019**, *4*, em0029. [CrossRef]
95. Awuor, A.C. Institutional Factors Influencing Implementation Of School Feeding Programme In Public Primary Schools In Matungulu Subcounty, Machakos County, Kenya. Master's Thesis, University Of Nairobi, Nairobi, Kenya, 2016.
96. Lim, S.L.; Ong, K.C.B.; Chan, Y.H.; Loke, W.C.; Ferguson, M.; Daniels, L. Malnutrition and Its Impact on Cost of Hospitalization, Length of Stay, Readmission and 3-Year Mortality. *Clin. Nutr.* **2012**, *31*, 345–350. [CrossRef] [PubMed]
97. Kariuki, J.K. Effects of School Feeding Programme by Non Governmental Organizations on Access to Education in Public Primary Schools in Drought-Stricken Kakuzi Division, Kiambu County, Kenya. Thesis, University of Nairobi, Nairobi, Kenya, 2013.
98. Bundy, D.; Horton, S.; de Silva, N.; Jamison, D.; Patton, G. *Re-Imagining School Feeding: A High-Return Investment in Human Capital and Local Economies*; World Bank: Washington, DC, USA, 2018.
99. Gelli, A. School Feeding and Girls' Enrollment: The Effects of Alternative Implementation Modalities in Low-Income Settings in Sub-Saharan Africa. *Front. Public Health* **2015**, *3*, 76. [CrossRef]
100. Miranda, A.; Klug, I. *Beyond Global Rankings: Benchmarking Public Food Procurement*; International Policy Centre for Inclusive Growth: Brasilia, Brazil, 2021.
101. Stahlbrand, Lori M. "A Typology of 'Infrastructure of the Middle' in University Food Procurement in England and Canada: Elaborating the 'To' in 'Farm to Cafeteria.'" *Raizes* **2017**, no. 2. [CrossRef]

102. Swensson, L.F.J.; Tartanac, F. Public Food Procurement for Sustainable Diets and Food Systems: The Role of the Regulatory Framework. *Glob. Food Secur.* **2020**, *25*, 100366. [CrossRef]
103. Aliyar, R.; Gelli, A.; Hamdani, S.H. A Review of Nutritional Guidelines and Menu Compositions for School Feeding Programs in 12 Countries. *Front. Public Health* **2015**, *3*, 148. [CrossRef]
104. de Schutter, O. *Advancing Health and Well-Being in Food Systems: Strategic Opportunities for Funders, Institutional Food Purchasing as a Tool for Food Systems Reform*; Global Alliance for the Future of Food: Toronto, ON, Canada, 2015.
105. Pakistan: Construction of 150 Primary Schools, 500 IT Labs, School Feeding Programme for Children Planned: Official. *Right VIS News* **2015**.
106. *Annual Development Programme 2015–2016*; Government of Khyber Pakhtunkhwa Planning & Development Department: Peshawar, Pakistan, 2015.
107. *Annual Development Programme 2016–2017*; Government of Khyber Pakhtunkhwa Planning & Development Department: Peshawar, Pakistan, 2016.
108. *Annual Development Programme 2017–2018*; Government of Khyber Pakhtunkhwa Planning & Development Department: Peshawar, Pakistan, 2017.
109. *Annual Development Programme 2018–2019*; Government of Khyber Pakhtunkhwa Planning & Development Department: Peshawar, Pakistan, 2018.
110. *Annual Development Programme 2019–2020*; Government of Khyber Pakhtunkhwa Planning & Development Department: Peshawar, Pakistan, 2019.
111. *Annual Development Programme 2020–2021*; Government of Khyber Pakhtunkhwa Planning & Development Department: Peshawar, Pakistan, 2020.
112. Sania Supports: ‘One Meal’ Programme for Schoolchildren. Available online: <https://www.thenews.com.pk/print/839231-sania-supports-one-meal-programme-for-schoolchildren> (accessed on 24 April 2021).
113. *Punjab Education Sector Plan 2019/20–2023/2024*; Punjab School Education Department: Lahore, Pakistan, 2019.
114. *Feasibility Study on School Nutrition Service*; Milan Urban Food Policy Pact: Milan, Italy, 2020.
115. *Punjab Educational Institutions Food Standards Regulation, 2017*; Punjab Food Authority: Lahore, Pakistan, 2017.
116. Bring It on: PFA’s Fight against Fizzy Drinks—Pakistan. *Dunya News*. Available online: <http://dunyanews.tv/en/Pakistan/402536-Bring-it-on-PFAs-fight-against-fizzy-drinks> (accessed on 24 April 2021).
117. KP Food Authority Bans Chips, Energy Drinks in Schools. *Dawn*, 2018.
118. Khyber, M.A. Pakhtunkhwa Food Authority Launches Clean Drinking Water Campaign In Schools. *UrduPoint*, 2018.
119. Hassan, A. Carbonated & Energy Drinks Banned in Educational Institutions Across Islamabad. *ProPakistani*, 2018.
120. Mozambique: Taipo Disappointed By Beira Central Hospital. Available online: <https://allafrica.com/stories/201502110336.html> (accessed on 24 April 2021).
121. Falta de Dinheiro Dificulta Alimentação de Mais de 700 Doentes No Hospital Central Da Beira. *TVM Notícias*, 2017.
122. Comunidade Indo Doa Produtos Alimentares Ao Hospital Central Da Beira. *O Pais*, 2019.
123. Nutrition—Armed Forces Institute of Cardiology & National Institute of Heart Diseases. Available online: https://afic.gov.pk/?page_id=948 (accessed on 24 April 2021).
124. Plan Ready to Upgrade Health Services. *Dawn*, 2010.
125. Philanthropists to Provide Food to Patients in Peshawar Hospitals. *Dawn*, 2014.
126. Model Children Homes (Orphanages). Available online: https://swd.punjab.gov.pk/model_children_homes (accessed on 24 April 2021).
127. Old Age Homes (Aafiat). Social Welfare Department. Available online: <https://swd.punjab.gov.pk/aafiat> (accessed on 5 April 2021).
128. Home for Destitute Girls (Kashana) Social Welfare Department. Available online: <https://swd.punjab.gov.pk/kashana> (accessed on 24 April 2021).
129. *Food Menu*; Punjab Child Protection and Welfare Bureau: Lahore, Pakistan, 2020. Available online: https://cpwb.punjab.gov.pk/food_menu (accessed on 30 April 2021).
130. Model Drug Abuse Centers. Available online: https://swd.punjab.gov.pk/model_drug_abuse_centres (accessed on 24 April 2021).
131. The International News. “CM KPK Formally Inaugurates Ice Drug Rehabilitation Centre Equipped with All Latest Facilities.” *Asianet-Pakistan*. 29 January 2019. Available online: <https://www.thenews.com.pk/print/424965-cm-inaugurates-ice-drug-rehabilitation-centre> (accessed on 24 April 2021).
132. Pakistan: Non-Supply of Food for Four Months. *Right VIS News*, 2013.
133. Sania Nishtar Logic behind the Langar. Available online: <https://www.thenews.com.pk/print/541193-logic-behind-the-langar> (accessed on 30 June 2021).
134. Free Food Facility Opened at PIMS. *The Express Tribune*, 2020.
135. Khan, M.; Nishtar, S. Open Ehsaas Langar in Peshawar. *Pakistan Times*, 2020.
136. Sania Reviews ‘Ehsaas Koi Bhooka Na Soye’ Operations in Rawalpindi. *Dr Sania Nishtar*, 2021.
137. Ali Gulrez Ehsaas Langar Program Launched in Peshawar. *INCPak*, 2020.

-
138. Ehsaas Langars. Available online: <https://www.pass.gov.pk/Detail149923c9-7a8e-466a-952f-3cef069a8b9d> (accessed on 24 April 2021).
 139. *Ehsaas Langar Policy 2019*; Government of Pakistan Cabinet Secretariat Poverty Alleviation and Social Safety Division: Islamabad, Pakistan, 2019.
 140. Bonnard, P. *Pakistan Wheat Subsector and Afghan Food Security: A Special Report by the Famine Early Warning Systems Network*; FEWS NET: Washington, DC, USA, 2007.