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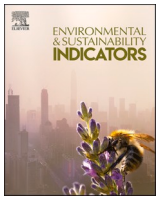

A system of process indicators for the implementation of sustainable food systems in the European Healthcare Services

Goiuri Alberdi, Mirene Begiristain-Zubillaga *

Department of Finance Economy II, Faculty of Economics and Business, University of the Basque Country (UPV-EHU), Plaza de Oñati 1, 20018, Donostia-San Sebastián, Spain

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ABSTRACT

The existing agro-industrial food system exerts a significant social and environmental toll, and is a major contributor to the current eco-social crisis. Urgent public policies are needed to foster sustainable food systems that recognise the interdependence between climate, ecosystems, biodiversity and societies. In this regard, hospitals, as "anchor institutions", can strategically exploit their position to influence beyond the hospital, by promoting healthy and sustainable diets and supporting the local community and economy through Sustainable Public Food Procurement. As such, reimagining foodservices in hospitals is a key part of the movement towards planetary healthcare. This study aims to develop a practical System of Indicators that will support decision-making in processes related to developing Sustainable Food Systems in European hospitals. The methodology is based on a multi-step analysis of qualitative research that includes Focus Groups, Delphi Analysis and a Panel of Experts, along with an empirical analysis via case study visits. A final System of Indicators is developed, comprising 4 principles, 10 criteria, and 31 indicators designed to stimulate processes for building frameworks of collective reflection. This system serves as an effective tool for self-evaluation, to improve the execution of projects and processes in order to move towards more Sustainable Food Systems.

1. Introduction

Today's food production methods have a profound impact on both society and the environment. The hegemonic industrial agri-food system practices, overly dependent on fossil fuels, are directly linked to greenhouse gas emissions (GHGE), causing global warming and climate change, imbalances in biogeochemical cycles, biodiversity loss, excessive freshwater use and social inequities, along with rising sea levels and climate-related natural disasters (Willett et al., 2019; Mbow et al., 2019; Díaz et al., 2019; Hernández-Lozano, 2022; Crippa et al., 2021; Secretariat of the Convention on, 2020; Richardson et al., 2023).

The economies of scale driving current industrialised food systems—focused primarily on reducing costs—incentivise the externalisation of costs while creating greater need for land and intensifying the competition for water, energy and inputs, in a context where the global food demand is expected to grow 50–100% by 2050 (Fanzo et al., 2022), and where the decline of biodiversity is likely to compromise agricultural yields (Hernández-Lozano, 2022; Secretariat of the Convention on, 2020).

The agro-industrial system treats food as a mere trade commodity, and the right to food is not guaranteed (Holt-Giménez, 2019). The Right to Food Guidelines underpin the CFS-RAI (Responsible Investment in Agriculture and Food Systems) endorsed in 2014, crucial for the realisation of all the core elements of the right to food: accessibility, sustainability, availability, adequacy (FAO, 2021a). However, even though there is enough food to feed the world it is not fairly distributed; globally 14–50% of the food is lost and wasted somewhere between farm and fork (Holt-Giménez, 2019; United Nations Environment Programme, 2021; FAO, 2019; Ministerio de Agricultura and Pesca y Alimentación). The latest Global Nutrition Report shows that, on the one hand, the number of people affected by hunger and malnutrition has increased significantly, especially since the COVID-19 outbreak but, on the other hand, obesity and diet-related non-communicable diseases (NCDs) keep on rising to epidemic levels (40% of all adults and 20% of all children are overweight or obese) (Global Nutrition Report, 2022).

The vulnerability of our food systems was made clear during the COVID-19 pandemic, highlighting the need to rethink our way of doing things to ensure we can be resilient to future situations, especially climate-related catastrophes. This points to the importance of territorialised food systems (IPES-Food, 2020). As Fanzo et al. (2022) argue,

* Corresponding author.
E-mail address: mirene.begiristain@ehu.eus (M. Begiristain-Zubillaga).

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"greater focus should be on the efficiency of the overall food systems transformation rather than the primary focus being on the efficiency of agricultural productivity". This shift calls for greater recognition of the values associated with food and its true cost, moving away from minimising food prices and maximising consumption (Fanzo et al., 2022).

Numerous studies point out the synergy between healthy diets rich in plant-based foods and reduced environmental pressures, supporting the concept of sustainable diets that benefit both humans and ecosystems (Willett et al., 2019; Steenson and Buttriss, 2020; Gonzalez Fischer and Garnett, 2016). Public policies promoting sustainable food systems that recognise the interdependence between climate, ecosystems, biodiversity and societies are urgently required.

The latest FAO report quantified the global hidden costs of agrifood systems as almost 10% of global GDP, with 73% associated with dietary patterns that led to obesity and non-communicable diseases (FAO, 2023). Additionally, the global carbon footprint of healthcare in 2016 represented an estimated 4–6% of all emissions (Salas et al., 2020).

The multiscale burden created by agro-industrial food systems needs to be transformed, and the nutrition and health communities have a significant role to play in this process (Fanzo et al., 2022). Hospitals, as "anchor institutions", can strategically exploit their position to influence beyond the walls of the hospital, by promoting the health of staff and patients and supporting the local community and economy (Cunningham et al., 2022). In fact, although aggregate data on the importance of hospital food in the European economy is not available, it is nonetheless seen as an important economic dimension in all EU countries (Cioci et al., 2016). Additionally, health professionals have tremendous potential as advocates, bridging environmental sustainability and health by shaping public opinion and influencing social narratives. Their role can promote a consistent public health message for a sustainable transition (Carino et al., 2021). There are both moral and practical reasons for placing health professionals at the forefront of climate action (Crowley, 2016).

Rethinking hospital foodservices is essential to advancing planetary health, yet it remains an often-overlooked aspect of healthcare systems. There is an urgent need to shift the culture of hospital foodservices towards patient-centred care that prioritises planetary health while promoting both healthy and sustainable diets for patients and the systems that deliver it (Carino et al., 2021). In this regard, at the 2021 United Nations Food System Summit, Sustainable Public Food Procurement (SPFP) was included among the key actions to foster the transformation of the global food systems and the adoption of healthy diets (FAO, 2021b). SPFP enhances access to healthy diets and promotes the development of more sustainable food systems. SPFP also has the potential to impact on local economies by stimulating the development of markets, providing a regular and reliable source of income for smallholder farmers and helping these farmers overcome barriers that prevent them from enhancing their productivity (FAO, 2021b). The Farm-to-Fork strategy highlights the importance of setting minimum mandatory criteria for sustainable food procurement to promote healthy and sustainable diets in institutional catering, as well as boost sustainable farming systems (i.e., organic) (European Commission, 2020). In this regard, numerous European groups endorsed the "*Manifesto for establishing minimum standards for public canteens across the EU*", demanding the fulfilment of seven criteria in SPFP: healthy food, organic and other agro-ecological products, small-scale farmers support, climate action, social economy and labour rights, fair trade, and animal welfare standards (ICLEI - Local Governments for Sustainability, 2022).

SPFP is recognised in the United Nations' Sustainable Development Goals (SDGs) as a key strategic component of the global effort towards sustainable consumption and production patterns. The specific target (SDG 12.7) promotes "public procurement practices that are sustainable, in accordance with national policies and priorities" (United Nations).

The scenario described above signals the need for significant changes in food production and consumption practices to mitigate climate change and other environmental impacts while improving the health of the population (Steenson and Buttriss, 2020). The aim of this study, therefore, is to explore the food system processes related to the economic (procurement) and educational (health promotion) channels of the European Healthcare Services from a sustainable perspective (including environmental, socio-economic and cultural dimensions). Using this knowledge, we aim to develop the first System of Indicators (SoI) to aid decision making in those processes essential for transitioning practices towards sustainable environments. In the present study a Sustainable Food System (SFS) is defined as "a food system that enables food safety, food security and nutrition for current and future generations in accordance with the three dimensions (economic, social and environmental) of sustainable development. In addition, SFS must be inclusive, equitable, and resilient" (Fanzo et al., 2022; WHO, 2021). Agroecology has also been used as a framework to explore the food system processes as it has a unique ability to reconcile the economic, environmental and social dimensions of sustainability while maximising the positive interrelations between people, farming and nature, and increasing the autonomy of farmers (Mbow et al., 2019; Díaz et al., 2019; Anderson et al., 2019; FAO, 2015; European Committee of the Regions, 2021). In addition, "sustainable diets are those with low environmental impacts which contribute to food and nutrition security and to a healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable, nutritionally adequate, safe and healthy while optimising natural human resources" (Food and Agriculture Organization of the United Nations; Bioversity International et al., 2012).

This study aims to develop a practical SoI that is accessible, straightforward and effective in measuring and encouraging a transition towards SFS. This is achieved through a robust methodological framework that employs a multi-step analysis with a process-orientated approach, incorporating real-life case studies for insights.

2. Methodology

The methodology is grounded in qualitative research, focusing on exploring and describing events to transform them into concepts, rather than simply quantifying frequencies or statistical probabilities. This qualitative approach to researching sustainable food strategies within healthcare systems is still in its early stages and calls for more research input (Van Maanen, 2011; Davis DF et al., 2011). The process of collaboratively generating the SoI for SFSs, tailored for healthcare organisations, along with its empirical evaluation, is carried out through a transdisciplinary approach centred on Participatory Action Research (Cornish et al., 2023). Deductive and inductive processes are applied for the generation of the SoI. The deductive process aims to generate a robust theoretical proposition of the SoI through the existing evidence, via Delphi analysis and a panel of experts. The inductive process aims to derive general conclusions from specific observations through a case-study approach. These processes will enable the triangulation of knowledge (García Merino et al., 2007) (Fig. 1). The fieldwork for this study was conducted between 2020 and 2022, largely during the COVID-19 pandemic. As a result, the first part of the collaborative generation and theoretical validation processes was carried out online.

2.1. Creation of the theoretical proposition of the SoI

The preceding step for the construction of the SoI involved a literature scoping review, which allowed the authors to identify a framework of processes aimed at promoting sustainable food procurement and sustainable diet guidance within healthcare institutions. The results have been published in other publications (Alberdi and Begiristain-Zubillaga, 2021a, 2021b).

From the knowledge gathered in this previous step two drafts of the SoI were designed—one for *sustainable food procurement* and one for *sustainable diet advice*—using the *Principles, Criteria & Indicators* (PC&I)

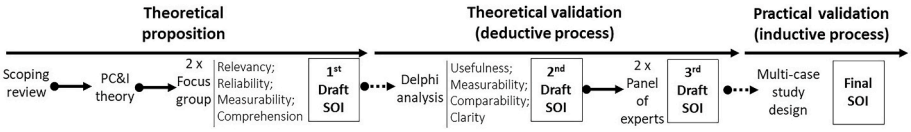

Fig. 1. Methodological process of RENASCENE research project for the co-generation of SoI.

Theory (Lammerts Van Bueren and Blom, 1996). These drafts were refined during two *online* Focus Group sessions held in June 2020. Within the field of *sustainable food procurement,* eight European experts participated in the focus group, while five experts participated within the *sustainable diet advice* focus group (one expert participated in both groups) (Table 1). As the focus group sessions were conducted online, participants received preparatory exercises to ensure smoother and more efficient discussions. The first focus group session aimed to establish, through shared expert knowledge, the principles of the SoI. Participants were sent a "traffic-light" exercise beforehand to familiarise with the proposed principles. The exercise involve participants assigning a red, orange or yellow light to each characteristic for each principle, which included objectivity, applicability at different spatial scales (global/local), relevance, integrality, specificity, and compressibility. The first online session began with a warm-up exercise that invited participants to share their expert opinion on the characteristics of an ideal food system in European health services. They then delved deeper into the principles of the SoI, discussing in small groups the essential elements required to determine whether dietary advice or food procurement is sustainable within the healthcare services. They also sought agreement on the principles and considered whether these could achieve their intended objectives. For the second focus group session, participants received a questionnaire in advance to familiarise themselves with the suggested set of criteria and indicators and at the same time to gather their feedback. This process also aimed to identify any additional criteria needed. During the second online session, participants were asked to discuss and assess the suitability of the criteria and the indicators in relation to the following characteristics: *relevance*, closely related to the sustainable food system processes; *reliability*, the SoI has to be robust and certain; *measurability*, the indicators can be measured in "reasonable" cost and time, in a simple and inexpensive way, through primary information coming from the organisations; *comprehension,* the SoI has to be easily understood by all the interested parties. To stimulate the online discussion and be more visually participatory, "the thermometer" exercise was carried out to visually consider each characteristic with the help of an interactive whiteboard software (*Miro online whiteboard, RealTimeBoard, Inc. 2020*).

These focus group sessions led to the development of the first two drafts—one for *sustainable food procurement* and one for *sustainable diet advice*. These then underwent a theoretical validation and a final phase of practical (empirical) validation.

2.2. Theoretical validation: delphi analysis and panel of experts

2.2.1. Delphi analysis

The validation phase commenced with the Delphi method, a well-known social research technique which allows data to be gathered from a large group of stakeholders across a wide range of disciplines linked in some way to the Food System, thus leading to a rich dataset (Landeta and Barrutia, 2011; Landeta, 1999). The aim was to collect insights of the integral nature and "systemic vision" of the food system through a questionnaire. During the Delphi process, three iterative rounds of questionnaires were carried out, aided by the information received from the answers from the rest of the stakeholders in each round. The DEPLHI process ran for 3 months, from November 2020 to January 2021. The stakeholders were asked to evaluate the indicators on a 5-level Likert scale [1 = Strongly Disagree; 5 = Strongly Agree] based on the following characteristics: *usefulness*, which evaluated the relevance of each indicator in measuring the criteria of interest; *measurability*, which assessed whether the indicator could be quantified, either quantitatively or qualitatively; *comparability*, which determined whether the indicators could be compared across different health centres; and *clarity*, ensuring that the indicators would be consistently understood by all users to promote their intended utility. A space was also left available on the questionnaire where participants could insert open-text comments.

For an indicator to be eligible to pass to the next validation phase, it needed to be evaluated positively on the characteristic of *usefulness* or at least not to be totally excluded according to the participants' opinion. Consensus for inclusion was deemed to have been reached if the answers for the item (indicator) studied in the *usefulness* category reached >70% of responses in 4 and 5. Consensus for exclusion of an indicator was reached if the median was 1 or 2 and > 70% of participants ranked the item in the bottom two categories (Willett et al., 2019; Mbow et al., 2019); no consensus was reached if neither of these conditions were met, and the indicators were therefore retained for the next phase. This level of agreement has been considered appropriate in previous Delphi studies (Vogel et al., 2019). Stability of consensus was considered to have been reached if the between-round group responses varied by ≤ 10% (Vogel et al., 2019). With these results a second draft of the SoI was created.

26 participants across a wide variety of professions connected to the Food System participated in the Delphi process (Table 2). The panel included academics (from various international universities), health organisation workers (such as kitchen management directors from

Table 1
Participant profile in the focus groups.

Public Institutions:
A technician at Instituto Canario de Calidad Agroalimentaria
A policy and legal specialist for sustainable public procurement at FAO
NGOs and associations:
Two members of the European Federation of Dietitians
A coordinator at Justicia Alimentaria Euskadi
A Policy Officer at Health Care Without Harm
Healthcare institutions
A general Services Manager at Osakidetza (Basque Healthcare System)
An environment technician at Osakidetza (Basque Healthcare System)
A Director of Kitchen Management (at Vienna Hospital Association)
A dietitian (Hospital Universitari Son Espases)
Others
A member of an association that specialises in technical advice for healthy and sustainable communities (i.e., catering)
A UK based registered Nutritionist, and member of One Blue Dot Planet of the BDA.

Table 2
Participant profile in the Delphi analysis.

Participant profile in the Delphi process	Number of participants
Academia (dietetics)	7
Professional dietitians	5
NGO and related bodies	3
Public institution technicians	5
Hospital foodservice manager	3
Food producers and food distributors	3
Participation level during the Delphi process	
First round	26
Second round	18
Third round	18

European hospitals), members of professional associations (i.e., dietetic associations), food producers (agro-pastoral sector), food policy officers (i.e., FAO) and NGO organisations (such as *Health Care without Harm*), among others. The response rate decreased by 30.8% from the first to the second round, while there was no change from the second to the third round. Although participation fell considerably, Landeta (2002) indicates that a response rate of between 7 and 30 experts is generally regarded as adequate (Landeta, 1999).

2.2.2. Panel of Experts

To finalise the theoretical validation, in June 2021 two online Panel of Expert meetings were held; five experts participated in the "food procurement" meeting and three experts in the "diet advice" one. International academics on transdisciplinary areas related to food systems and sustainability were included in the panels, as well as experts in indicators, planetary health or procurement and professionals from European hospital procurement and dietetic services departments (Table 3).

The panels of experts were asked to make an overall assessment of the second drafts, discussing the different indicators with a special focus on the indicators' *measurability* (SoI drafts were sent to the experts before the online meetings so they could familiarise themselves with the system). First, the participants individually evaluated the measurability of each indicator, using an interactive dashboard (*The Mural, Tactivos, Inc. 2020*) to promote interaction and make these evaluations more visual. In a subsequent plenary session, the panel discussed their collective vision of the tool and offered their expert advice for the final construction of the SoI.

Table 3
Participant profile in the Panel of experts.

Panel for Food procurement SoI		
Profession	Expertise	From
Researcher - Academia	Expert in adequate definition of indicators to characterise and analyse socio-metabolic systems.	Catalonia
Researcher - Academia	Research experience on public food procurement.	Ireland
Food manager at hospital	Extensive experience implementing a sustainable food strategy at hospital level.	Denmark
Sustainable Development Manager at hospital	Responsible for the sustainable practices at the hospital.	France
Sustainability Consultant in hospital	Expert supporting health services to develop and deliver effective food strategies.	England
Panel for Diet Promotion SoI		
Profession	Expertise	From
Researcher – Academia	Research associate specialised in Sustainable diets and Planetary Health (Climate Crisis and Health).	Switzerland
Registered dietitian	Experienced dietitian working within the health services and Chair of a Sustainable Diets Group.	England
Registered Dietitian-Nutritionist	Leader of the Public Health Group of the European Federation of the Association of Dietitians.	Spain

2.3. Practical validation: multi-case study design

The final phase of assessing the SoI involved identifying patterns in empirical data through a field-work sample. A descriptive case-study design (Yin, 2003) was employed to evaluate hospitals from different European countries, thus obtaining real-time insights and overall perceptions of the sustainability of the food system processes at each hospital. A semi-structured interview that included the various blocks of the SoI was used as a script that helped the researcher capture key topics while keeping the conversation open to allow new ideas to be brought up during the interview.

Cases were selected intentionally through purposive sampling. As a result, this selection does not constitute a representative sample with the capacity for statistical generalisation, but rather a theoretical and logical sample with the capacity for analytical generalisation. This approach ensures the best quantity (saturation) and quality (richness) of the information gathered (Yin, 2003; Ruiz Olabuénaga, 2007). The sample selection criteria are shown in Table 4.

Cases were identified through webinars about sustainable healthcare run by various sustainability networks such as *Healthcare Without Harm Europe*, as well as recommendations from colleagues, from relevant literature and reports available online, and through recognition from awards, such as the "Food for Life" from the Soil Association. Professionals related to general services management, sustainability departments or procurement departments from the hospitals were contacted via phone and email and invited to participate.

Five European case studies responded to our invitation to participate in the study and fell into the selection criteria as shown in Table 5. All visits were carried out between May 2022 and September 2022. The interviewed professionals had diverse profiles related to food processes within the hospitals, with work experience ranging from 3 years to up to more than 20 years. Of the 14 interviewees, 10 were female and 4 were male.

2.4. Reflection for the final SoI construction and the inference levels

2.4.1. Thematic analysis

Thematic analysis involves researchers taking an active role in identifying patterns/themes, selecting those of interest and reporting them. An analytic-synthetic process was used, based on the 6-steps of "Reflective Thematic Analysis" as described by Braun and Clarke, 2006, 2020. This consisted in breaking down the field-notes into simpler elements (analytical) and then organising the data in a systematic manner (synthetic) through Systematic Coding and Thematic Definition. Table 6 provides a step-by-step summary of this reflective thematic analysis. A second researcher reviewed the analysis, and consensus was reached. NVIVO software (*Lumivero, release 1.6.1., 2022*) was used to transcribe the audio recordings.

Table 4
The selection criteria for the purposive sampling of case studies.

Inclusion criteria	Exclusion criteria	Non-excluding criteria
Hospitals set in Europe. Some level of strategic progress towards sustainable food systems.	Hospitals outside Europe. Health institutions other than hospitals, i.e., care homes or other socio-sanitary centres. Hospitals in Europe that showed no action related to food strategy.	Size of hospital (meals per day). Geographical area in Europe (north, centre, south). Legal status (public or private). Availability of a central kitchen.

Table 5
Hospital cases and interviewed professionals that participated in the practical validation phase.

Hospital cases	Private/public	Number of beds	Type of cooking	Geographical location	Interviewed
1	Public with private management	600	Cook Chill	South Europe - Catalonia	Head of General Services Catering quality manager
2	Public	1303	Cook Fresh	Central West Europe - France	Sustainable Development Manager Dietitian and Nutritionist
3	Public	516	Cook Fresh	South Europe - Catalonia	General Service assistant Catering quality manager
4	Public	700	Cook Fresh	North Europe (Island) - Iceland	Head of General Services Operations Manager of the food court 2x Dietitian and Nutritionist
5	Public	1000	Cook Fresh	Central Europe (Island) - England	Sustainable Development Manager Executive chef Dietitian and Nutritionist Procurement manager

Table 6
6 Steps of Reflective Thematic Analysis based on Braun and Clarke (2006)

6 steps of Reflective Thematic Analysis	Description of the process undertaken in this study
1. **Familiarisation with the data** Transcribing data, reading and re-reading the data, noting down initial ideas.	One researcher reviewed the transcripts for accuracy, thus allowing familiarisation with the data.
2. **Generating initial codes** Coding interesting features of the data in a systematic fashion across the entire dataset, collating data relevant to each code.	Specific segments related to the implementation of Sustainable Food Systems (SFSs) in hospitals were identified, and underlying ideas or assumptions were examined within the transcripts that could be part of these segments. These segments were given codes.
3. **Searching for themes** Collating codes into potential themes, gathering all data relevant to each potential theme.	The codes were then organised into a small number of categories or themes regarded as relevant for their impact on the development of a hospital's SFS.
4. **Reviewing themes** Checking if the themes work in relation to the coded extracts and the entire dataset, generating a thematic 'map' of the analysis.	The themes were further checked for accuracy, looking for overlaps, redundancies or perceptions based on the research question. The themes were redefined based on the SoI draft, and the final analysis produced definitions of each theme (the map).
5. **Defining and naming themes** Ongoing analysis to refine the specifics of each theme and the overall scenario depicted, generating definitions and names for each theme.	
6. **Producing the report** Selection of vivid and compelling extracts followed by their final analysis, relating the analysis back to the research question and literature, and completion of a report.	To finalise the analysis, the main themes were reflected upon (inductive reflection), ending with the construction of the final SoI (phase 6).

2.4.2. *Inferential deliberation*

From the knowledge acquired through the inductive process (*in situ* observations and attempts of generalisation) within the fieldwork sample (i.e., European hospitals) and the thematic analysis reflection, the researchers developed inferences that assessed the adequacy and robustness of the SoI. The thematic analysis compiled the most relevant elements present in hospitals related to the development of the SFS, identifying measurable factors that could be used to evaluate progress. The criteria used to determine the capacity and analytical generalisation of each indicator for capturing Sustainable Food Strategy development assessment within the European hospitals were "relevance for developing successful sustainable processes" and to be "measurable". Since this SoI is an innovative idea that still lacks a solid scientific basis, it would be presumptive to set the rates to measure each indicator. Instead, to help visualise the level of performance of the indicators within the case studies and present an interpretation of the European situation at a glance, the traffic light visualisation approach was used (*Annex A*), where red means bad performance, yellow means average performance and green means good performance.

3. Results

Fig. 2 highlights the methodological and construction process up to the final SoI proposal. At an early stage, the focus groups produced SoI drafts containing a large number of indicators both for Food Procurement and for Diet Advice. The Delphi analysis reduced the number of indicators for the Food Procurement draft, and added one more indicator to the Diet advice SoI (*Amount of actions financed by the health institutions to facilitate public policies from "Farm to Fork"*). Lastly, the panel of experts agreed that the SoI would be more effective and easier to use with a reduced number of indicators. These experts pointed out that many of the enumerated indicators were actually criteria, representing a state or a process, rather than an indicator that measured impacts. Based on this suggestion, and focusing on indicators that measured impact, the number of proposed indicators was reduced significantly, leading to a SoI that combined elements of both food procurement and dietary advice. By the end of the Theoretical Validation, the third draft of SoI contained 5 principles, 11 criteria and 31 indicators, though some panel members still viewed this as too many indicators.

3.1. *Thematic map and empirical data from the case studies*

The thematic map resulting from the analysis identifies eleven themes that capture the main practice patterns within the health institutions, each with the potential to influence the SFS development process (Table 7).

One of the highlighted themes was the ***"Governance and Food Strategy Policy documents"***. None of the case studies visited had a specific interdisciplinary committee for governance. In three cases, governance was managed solely by the hospital's Food Department, while in the other two an interdisciplinary input was incorporated through their respective Environmental/Sustainability Management Departments. These latter two cases had established strategic documents for general sustainable development, including objectives directed towards the food system. However, none of the case studies had a specific Strategic Document for SFS development.

"***Legal Regulations***" was identified as a key theme for developing processes towards SFSs. Legal regulations mentioned included: The EGALIM law in France, which requires public catering to use 50% local products (meaning locally produced products, not only locally processed) or products from labels of origin and quality, including the suggestion that 20% of products should be organic (Loi n); The *Social Value Act* in the UK, which demands the tendering evaluation apply a 10% minimum weighting for social value (Government Commercial Function, 2020); and in Catalonia, Spain, the *Food Waste Law*, which asks for greater control and alternatives to prevent food waste. The French case commented that these regulations do not reflect the reality, making some obligations difficult to meet. For example, achieving

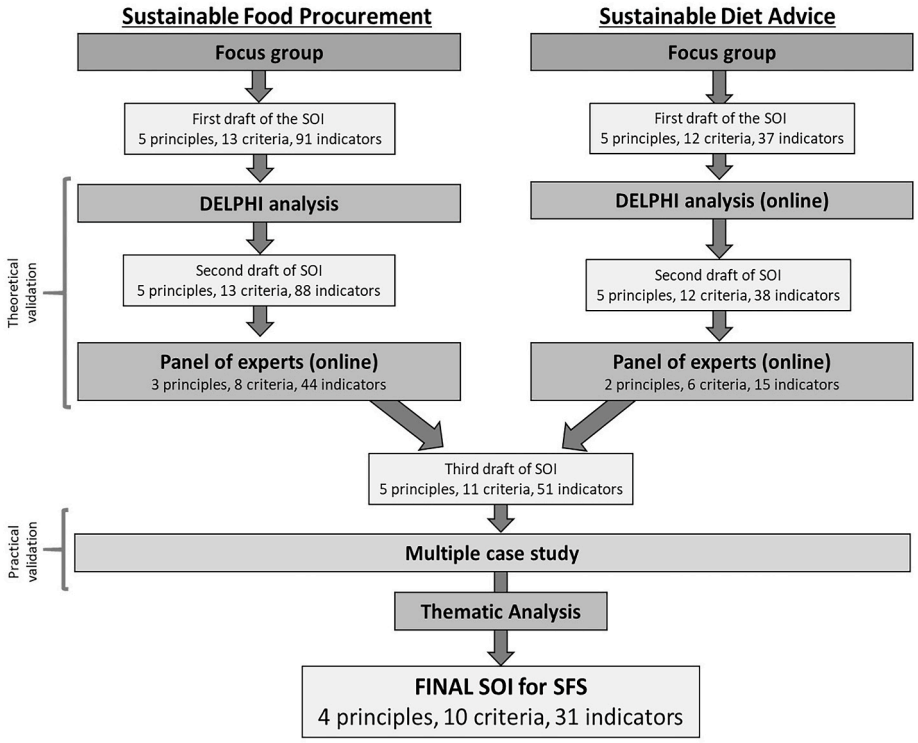

Fig. 2. Modification of the SoI through the research steps.

certain targets of local and organic products would require a significant increase in local organic production.

> "With the EGALIM law they would need to reach 20 percent of cost spent in ECO. But they have to face the reality that, in France, there has to be an increase in the production to fulfil the law. At the moment this production is not always there."(Hospital case #2)

Nevertheless, these compulsory regulations were considered efficient tools to inculcate sustainable criteria into **public tendering** procedures to catalyse transitions. Most of the hospitals visited had their tendering documents written up by the General Services Manager of the Food Departments, highlighting a unilateral governance and a breach in the application of a holistic view of the food system. Most institutions used a one-lot tender system and very intricate tendering procedures in place, which effectively restricted participation to large companies capable of meeting the criteria. In most cases the tendering documents did not include sustainability criteria; instead, they focused on the organoleptic quality of the product (i.e., standard weight, size, colour, etc.). Catering companies could choose to add more "sustainable" products and processes to their offer to gain additional points in the awarding process, but this was not compulsory. Moreover, in general, the economic value of a tender accounted for 50–60% of the total score while the quality criteria was set between 40 and 50%.

> "The quality and weight (grams) part is clear, but here (regarding sustainability) the tender is very generic, it does not tell you that they have to be organically produced foods, that is, the level of specification depends on the suppliers that the catering companies have approved, they have suppliers that have (organic product)(…)" (Hospital case #3)

One case study used alternative paths to include the **local and sustainable food supply networks**, enabling the participation of local SMEs and small producers in the food provision of the hospital. This hospital had a "second market" outside the public tender, targeting products that could be found in the region (i.e., fresh produce, fruit and vegetables, etc.), to which the Association of Producers of the local area could submit its application directly.

> ""When you want to buy local, you need to get out of the public markets (referring to public tendering) (…) For example, here in the region there are a lot of apples. Before, these were purchased from public markets, and the apples would actually come from Argentina. But nowadays they come from 15 km away. (…)" (Hospital case #2).

At the moment, local and organic produce is not a priority for the hospitals. They argue that it is expensive and there is not enough quantity to meet the needs of collective kitchens.

All case studies suggested the convenience of buying "fourth-range products", and the fact that there is limited availability of this type of transformed products within the local and organic production. This was a drawback in developing greater interest in small local suppliers.

> "There's a part that is missing in the middle that is called "legumery", the chopping and cleaning …. So there is a hole between the producer and whatever institution that is going to receive the produce. (…) So within the "Local organic food sustainability plan", led by the regional government (in France), they're trying to assess how many of those processing plants are going to be needed, to help the (local) producers to fulfil these needs" (Hospital case #2).

To enable the development, establishing a Local Supply Network is essential to open ***communication channels with local producers***. Most case studies relied on large food supplier companies to provide food, which overlooked small/medium producers. Moreover, there was a widespread lack of awareness regarding the length of the food chain in place or the type of production method used.

In France, the Regional Governmental Institution—not the hospital—has implemented a "local territory plan", to assess the alimentary needs of collective caterings. This aims to help regional producers plan their cultivation agenda. This plan also examines the number of processing plants for "fourth-range products" needed to supply public kitchens.

Food service is a theme that runs deep in the cases visited, and is constantly being reflected upon in an attempt to improve a variety of

Table 7
Thematic map and the practices observed in the cases visited.

Thematic "map"	Real context (case studies)	Impact on SFS development
Governance and Food Strategy Policy documents	Having a Food Strategy in place is not the norm. Food governance is led by: ➢ General services department. ➢ Sustainability department. ➢ None of the cases visited included the collaboration of agents from the Food System.	The definition of a clear strategy as a roadmap towards SFSs is essential to guide the actions and organise, implement and evaluate them. The strategy should have a "Systems-Based Approach" to contribute to a better understanding of the interdependencies between key parts of the food system, so it is advisable to generate a multidisciplinary and intersectorial governance team representing the food system.
Legal regulations	The legal regulations add compulsory sustainability criteria to public tenders.	These prove to be efficient instruments in promoting steps towards specific sustainability targets, since institutions are forced to comply [Ind. #2–10].
Public tendering processes	Sustainability criteria are not mandatory (only awardable). The economic factor is awarded the highest percentage. Single lot system in most cases. Considered simpler but only large companies have the potential to apply. Alternative markets: a second market outside tendering system. ➢ Giving opportunity to local producers.	Compulsory regulations are considered efficient tools to inculcate sustainable criteria into tendering procedures to catalyse transitions. Alternative markets are an efficient method for slowly including local and sustainable produce while matching demand with offer, another manifested barrier.
Local and sustainable products for hospital food	There are no established objectives for the inclusion of local and sustainable food products in hospital foodservice. Price is a main barrier. Interest for fourth-range product option.	Local producers need to collaborate in co-ops, to increase their capacity and continuity of delivering significant amounts of produce while sharing the resources necessary to distribute efficiently.
Communication with producers	Only one case study had direct communication with farmers. In general, there is a lack of knowledge about the "length" of the food chain.	Visits to hospitals by producers, to share needs and plan ahead. Knowing the needs aids in planning the cultivation agenda.
Foodservice	Predominance of seasonal menus, with less meat and more vegetables. The prevention of food waste is deeply rooted in all the institution's services. Communication with the ward staff is paramount to avoid food waste. Plastic, paper and energy use tightly controlled	This is a crucial factor to improve a range of clinical and organisational measures including patient nutritional intake, satisfaction, food waste and costs. Strategies for food waste prevention can trigger the process towards SFS development (efficient food ordering system, choosing portion size, alternatives for food leftovers, etc.) "cook and chill" system kitchens, water fountains, water vending machines with reusable bottles, ceramic tableware.
Training	Scarce, not mandatory. During induction period. Waste management training given.	A suitable training programme for health service workers should be a fundamental initial step to triggering the transition towards SFS.
	"Peer-to-peer" communication is a good option	
Nutritional advice from health professionals	The sustainability criterion is not included in the dietetic advice.	The need to included sustainability knowledge in higher education: theory and application.
Communication and dissemination of activities related to SFS	Promotional campaigns/ events, focused on healthy eating (not sustainable eating). Interesting awareness activities: gardens, organic food stalls in the hospital hall, etc. Low level of participation in councils for the development of public policies.	Health professionals as advocates for SFS. Health services as anchor institutions to promote SFS in their communities.
Funding for SFS implementation in the hospital	No funding given specifically to implement SFSs. External financing is needed to develop projects that catalyse transition processes.	Internal funding is a good indicator of the commitment of the managerial boards.

clinical and organisational measures (i.e., patient nutritional intake, satisfaction, food waste, and costs). All the cases visited offered rotational menus made up of seasonal produce, cooked mostly from scratch. There was a clear trend to reduce meat on the menu and add more vegetarian options. Cultural principles were also taken into account (i.e., one hospital replaced all the meat with Halal meat).

Food waste was a very ingrained topic and a main concern in all the hospitals visited. Strategies to avoid and manage food waste were implemented in all the hospitals, which in most cases were in response to compulsory law. Paper, plastic and energy use (controlled with meter readings) was also a general concern. However, the COVID-19 pandemic crisis reversed some of the progress made, with the main problem being the increase in the use of plastic material.

Training related with SFS development was not considered a priority, resulting in limited or voluntary options, such as lunch-time webinars, or simply no training at all. The need to train staff to change their ways of working towards sustainability-related behaviours was mentioned in some of the cases studied:

> "You've got a person that has worked here for 30–50 years, they don't care, you know what i mean … So it's a long process of getting the right people and educating them and saying, you know, this (change towards sustainable means) is good." (Hospital case #5).

> "The chefs, the cooks, were trained in food processing 15–20 years ago … quite industrial ways of processing. And now when you say that you have to take the cherry tomatoes and the carrots out of the menu of January, they say no, because they do not know what to use for decoration instead. (…) Whenever you tell them that something within the cycle needs to change they are lost. So it's very important to actually work with them." (Hospital case #2).

Some of the interviewees also voluntarily participated in national peer communication networks, out of personal motivation, to share experiences and learn from others.

> "(…) we're hoping that this way of working means that we can share things better across the different Trusts. So it's like one Trust is doing somewhat better than the other, then they can say how they did it and help a bit more. (…)" (Hospital case #5).

Nutritional advice from health professionals at the hospitals visited

consistently omitted sustainability criteria. The degree to which sustainability criteria are included in dietary advice depends on the personal beliefs of each healthcare professional and their knowledge in this regard.

> "I think that comes down to the dietitian's personal view. And if they were talking to the patient, the dietitian would always consider budget. (…) I mean, from a personal point of view, I would guide them to shop locally. It's cheaper. If you go to a fruit and vegetable shop it is cheaper than going to a supermarket. (…) But I would say that the dietitians are always guided by the person in front of them; where they shop, what their budget is and then we talk about what is best?" (Hospital case #5).

The ***Communication and dissemination of activities*** related to SFS within the hospitals visited focused mainly on healthy eating and lifestyle rather than sustainable eating. One case study in particular promoted significant environment and food-related activities for staff and the community, such as allotments or nature recovery events led by a ranger hired by the hospital, as well as a Food Hub with local organic produce at the entrance of the hospital hall. As for the commitment of health professionals in the development and advocacy of public policies, this was mostly circumstantial.

Funding serves as a crucial lever for change. The cases consistently stated that, while their Boards of Directors were happy to work towards sustainable processes, none of the hospitals visited had a budgetary upgrade to implement sustainable food systems. The hospitals that had taken steps towards SFSs were funded through external grants. Investing in SFS development is not currently a priority for hospitals.

> "The current inflation and financial times makes it very difficult to work on sustainability as there are other priorities." (Hospital case #5).

3.1.1. Final SoI proposal

The final SoI proposal developed, which is pivotal for the implementation of SFS, is the major contribution of this research study (Table 8). The number of indicators was reduced through a simplification of the system and validation based on real-world applications of the proposed framework. The thematic analysis sifted through the indicators, identifying the most relevant ones that could help initiate a process towards an SFS.

Appendix A shows the inference level of the indicators in each of the hospitals visited. It clearly shows that sustainability of the food supply system of the hospitals is almost non-existent. While menu design has begun to reduce meat consumption in favour of more vegetables and seasonal products (albeit not local or organic), and the use of resources such as plastic, water and energy is more controlled, with periodical assessments to avoid waste or overuse, the sustainability of the food systems is still not central to the hospital's nutrition and dietetic services or its food environment. Furthermore, all the food strategies carried out have vertical governance, hindering a comprehensive understanding of the food system.

4. Discussion

The urgency of the current eco-social crisis calls for a more strategic approach towards developing SFSs in healthcare institutions. As anchor institutions, hospitals can have significant and varied impacts on their community, aside from providing healthcare. However, although some hospitals have made substantial steps towards SFSs, this is not a generalised practice (Buller et al., 2023).

This study has collaboratively generated a System of Indicators (SoI) to help design and implement Sustainable Food Systems (SFSs) in European Health Institutions. Employing different qualitative methodologies, the final SoI comprises 4 principles, 10 criteria and 31 indicators. This SoI is a tool for transition, a roadmap to achieve a transformation

Table 8
Final proposal of the System of Indicators for the implementation of Sustainable Food Systems within the Health Services.

PRINCIPLE 1: To develop a food supplier network that delivers healthy and sustainable food. The health organisation must demand and meet targets (i.e., social, economic and/or environmental) with the food supplied. The supplier network must take into account not only what food is purchased (i.e., local, seasonal, healthy) but from whom (e.g., local smallholder farmers, small and medium food enterprises and other vulnerable suppliers), and from what type of production practices (e.g., ensuring environmental sustainability and biodiversity)	
Criterion 1.1: Development of a short supply chain network	1. Number of communication spaces used by the health organisation to interact with small-scale food producers and SMEs from the Short Supply Chain (i.e., meet-the-buyer events, one-to-one meetings, visits to farms, visits to the hospital, etc.) measured by an activity log (agenda, minutes of meetings, etc.). 2. Percentage (%) of procured products *(from the total volume)* from small-scale producer and/or SMEs (i.e., food Co-Ops) that use sustainable means for production (with certified organic or other types of certification) within the Short Supply Chain, in comparison to the total food procured. 3. Average distance (Km) travelled by the food procured from the farm (production), via the distribution and to the plate.
Criterion 1.2: Setting targets for sustainable and ethically responsible food supply	4. Percentage (% *from the total volume*) of certified organic fruits and vegetable products served per month in the health care settings. 5. Percentage (%) of certified organic milk and dairy products served per month in the health care settings. 6. Percentage (%) of sustainable meat and meat products served per month, according to animal welfare standards and certifications. 7. Percentage (%) of fish products from sustainable sources served per month, according to animal welfare standards. 8. Percentage (%) of eggs from free-range hens or organically sourced served per month in the health care settings. 9. Percentage (% *from the total volume*) of the total local and organic products. 10. Percentage (%) of products from ethically responsible sources and vulnerable groups of producers served per month (i.e., fair-trade products such as coffee or chocolate, social procurement, *etc*.).
PRINCIPLE 2: Healthy and Sustainable Foodservices. The **menu design** offered by the organisation must follow sustainable criteria while meeting the nutritional requirements for each patient, visitor and staff. It must also take into account the local production, the consumption patterns (i.e., traditions, seasonality, etc.), likes/dislikes of service users, in constant evaluation to optimize food intake. Adequate **foodservice** procedure reduces the food waste in the wards and cafeterias (ordering systems, communication between ward and kitchen, pleasant organoleptic characteristics, etc.). As part of the **food processing** the use of plastic, energy and water are considered as fundamental resources not to be misspent.	
Criterion 2.1: Sustainable and healthy menus are offered	11. Percentage (%) of dishes on the menu served per month that are freshly prepared from unprocessed (seasonal) ingredients (on-site or at a hub kitchen). 12. Percentage (%) of meat dishes *vs.* plant-based dishes served per month.
Criterion 2.2: A foodservice at ward level that considers patient's emotional and physical status	13. Percentage (%) of patients that are nutritionally assessed within 24 h of

(*continued on next page*)

Table 8 (*continued*)

	admission, with an approved assessment tool. 14. Percentage (%) of patients that receive nutritional advice and assistance by health professionals during menu decision, food selection and ordering. 15. Level of patient satisfaction on foodservice (level of liking, adequacy …). An evaluation questionnaire is implemented to measure the opinion of patients on the foodservices and menu design.
Criterion 2.3: Food, resources and packaging waste is prevented and reduced, in all departments of the hospitals related to food processes (i.e., wards and cafeterias)	16. Percentage (%) of food waste (kg/month). 17. Percentage (%) of plastic waste (kg/month) derived from food department. 18. Percentage (%) of paper waste (kg/month) derived from food department. 19. Percentage (%) of energy use per month derived from food department. 20. Percentage (%) of water use per month derived from food department.
PRINCIPLE 3: Sustainability approach is to be implemented as a transversal axis in hospital's nutrition and dietetic services and its food environment. Standardised language on SFS is to be included in protocols to effectively implement healthy and sustainable diet promotion in clinical, primary care and community settings.	
Criterion 3.1: The *Standard Operating Procedures* (SOPs) to promote, advise and prescribe sustainable healthy diets within dietetic services are ensured	21. Percentage (%) of patients to whom the SOP with a sustainability approach has been applied. This is to be measured based on the method established at each institution (i.e., by "ticking" a specific box in the patient's medical record).
Criterion 3.2: Improved professional competences, abilities and skills	22. Percentage (%) of health professionals and foodservice staff within the health institution that have undergone up-to-date training on healthy and sustainable diet promotion and sustainable food environments. 23. Percentage (%) of training offered by the hospital related to SFS
PRINCIPLE 4: Multi-level governance for the Sustainable Food Strategy development of the organisation and its dissemination and advancement. Agents from the **whole spectrum of the food system** are to be involved (from inside and outside the organisation) to assure **multidisciplinary and transversal governance** for Sustainable Food Procurement policy decision and strategy implementations **embedded in the territory**. The inclusion of those parties related to Sustainable Public Procurement policy development is advised, along with **external third parties** involved in SFS policy advocacy.	
Criterion 4.1: The establishment of a multi-level transversal and transdisciplinary food policy development team.	24. Level of profile diversity of the team members participating in the Food Strategy Policy development, measured by the percentage (%) of coverage of the potential agents (directive, health professional, hospital worker, civil society, food producer, food industry, external third parties, etc.). A registry should show the multidisciplinary level of the representatives from the food system within the region, from supply, consumption and decision-making bodies.
Criterion 4.2: Generation and development of the "food strategy" from a sustainable, social justice, innovative and health perspective.	25. Percentage (%) of compliance of the established annual objectives related to SFS development within the up-to-date Strategic Document. 26. Percentage (%) of criteria within the tender that is related to Principle 1 of this SoI. 27. Percentage (%) increase in participation of small producers and SMEs in food procurement tendering processes due to adding measures that promote their participation.
Criterion 4.3: Dissemination and engagement activity of the strategy to related and non-related sectors. A multidisciplinary group within the health organisation to engage with public policy decision making	28. Percentage (%) of budgetary upgrade over a year by the health organisation to encourage the economic viability of the sustainable food system strategy (machinery, personnel, infrastructure, food quality, SFS training, etc.). 29. Number of dissemination activities during the year (such as public meetings, awareness campaigns and presentations, appearances in the mass media, etc.), within and outside the health organisation managing the SFS 30. Number of awareness campaigns, educational activities or events (i.e., food events) that the health organisation has participated in within their community settings in relation to Sustainable Food Systems strategy. 31. Number of public/institutional consultations (national, regional, local) on public policy development that the health organisation has participated in.

from current practices towards SFSs with a process approach (Begiristain Zubillaga et al., 2021). This highlights the importance of concentrating efforts on the processes for driving change rather than the achievement of results. Alberdi et al. (2023) have proposed strategies for those institutions that are lagging behind in the design of an SFS strategy (Alberdi et al., 2023).

The four principles of the SoI encompass the means to influence actions within health service food systems with implications for local food production and supply, consumption of healthy and sustainable food, as well as democratisation of the food system through greater participation in governance and policy making.

The governance concept arises as an attempt to harmonise the relations between the institutional powers and the social actors in such a way as to change the traditional relationship of coercive hierarchy in favour of horizontal collaboration (González de Molina et al., 2019). Literature also highlights the importance of avoiding power relation issues that lead to "lock-ins" which prevent transitions from occurring (Wezel et al., 2020). Indeed, "Responsible Governance" defined as a transparent, accountable and inclusive mechanism that enables the environment to transform food systems is one of the four key entry points to build transformative change towards agroecology (Wezel et al., 2020). In this regard, the transition to SFSs is often intractable because the issue is not addressed in a sufficiently holistic manner and the fundamental significance of the widespread interactions of an extensive range of biological, socio-economic, cultural and political variables over time is not recognised (Barrios et al., 2020). Hence, the roadmap or strategy developed should adopt a "Systems-Based Approach" that acknowledges the interdependencies within the food system. It is also important for the strategies to have shared definition of key concepts to avoid confusion in the steps towards sustainability and not fall into mere rhetoric (Carlsson et al., 2019). As such, the multilevel governance principle within the present SoI is a critical tipping point that encompasses the importance of having a multidisciplinary and intersectorial governance team representing the food system to oversee the design of the strategy and the action plan for the SFS development from a holistic view (Alberdi and Begiristain-Zubillaga, 2021a; SAPEA-consortium, 2020; Tonello et al., 2023).

By fostering market systems that allow for small and medium-sized food enterprises, responsible governance also supports local and regional food systems (Wezel et al., 2020). Prioritising healthier and locally sourced food choices, while simultaneously minimising emissions in the food supply chain, is a vital strategy for achieving sustainability goals within the healthcare system (Verbruggen et al., 2024). In fact, sustainable public food procurement in the healthcare systems acts

as a catalyst in scaling up agroecology and sustainable food systems, creating synergies that serve as an alternative to the conventional model dominated by large retailers (Sanz-Cañada et al., 2023). However, the public tendering procedures observed in the case studies from this study introduce inequality parameters that hinder the full exploitation of the public procurement towards sustainable transitions. The single-lot tendering system is a well-documented barrier (FAO, 2021b; Goggins, 2017; European Commission), highlighting how the power imbalances of the food system hinder small and medium-sized farmers from competing against large producers (Tonello et al., 2023).

In the case studies examined, the majority adhered to the traditional 'low-price' model, which prioritises the lowest bid without considering other factors. In contrast, the Most Economically Advantageous Tender (MEAT) model takes into account multiple values, such as quality and other criteria, to determine the most economically advantageous bid. This shift in procurement practices aligns with the broader goal of promoting sustainability in food systems and improving the environmental and nutritional impact of public food procurement (Molin et al., 2024).

Legal regulations may help to add compulsory sustainability criteria in strategic documents and public tenders. However, as illustrated by the EGALIM law in France, it is essential for legal regulations to align with public policies that actively promote local and organic agriculture. Without a sufficient number of farmers, developing a local and organic food supply is unfeasible. In this context, all hospitals visited acknowledged a shortage of organic and local products on offer, highlighting the urgency to increase this type of production. According to *La Vía Campesina*, efforts to develop public policies supporting farmer agroecology are still scarce (Sachet et al., 2021). The main agricultural subsidy system in Europe, the Common Agricultural Policy (CAP), has faced criticism for favouring large-scale, intensive farming operations at the expense of small-scale, sustainable farming (Slow Food, 2024). Consequently, while the number of small farms continues to decline, the number of large farms (with more than 100 ha) has increased by 20% (Alessandrini et al., 2024).

Collective kitchens, such as those in hospitals, require substantial resources and a steady supply of goods, and this is difficult for an individual producer to accomplish (i.e., transport, packaging, quality certifications, and continuity of product availability, etc.). de Souza et al. (2023) explained that family farmers without any type of association with similar entities often face significant barriers to building the necessary infrastructure for economic production, technological innovation and access to markets (de Souza et al., 2023). In this context, cooperative models emerge as the most effective and sustainable institutional models of social interaction (González de Molina et al., 2019). Therefore, by joining together, small producers could organise themselves to apply for tendering processes in hospitals, as this would help guarantee the continuous food provision large institutions require. Also, by sharing the resources, they can enhance their capacity to compete.

Developing a network of local food suppliers involves opening lines of communication between the health institution and food producers. Effective communication is crucial for understanding the hospital's demand and the available supply from producers. This understanding can help producers determine the hospital requirements and, consequently, plan their production in advance. However, this requires a lot of workhours and responsibilities to handle procurement tasks and gather information, and many hospitals do not have the workforce available for this. This emphasises the need for additional resources (Molin et al., 2024; Guillaumie et al., 2023). In this study, communication channels were found to be limited.

Reimagining foodservices in hospitals is also a key part of the movement toward planetary healthcare (Carino et al., 2021). "*Food Is Medicine*" is a concept where there is a provision of healthy food to prevent, manage, or treat specific clinical conditions in a way that is integrated with the health care sector (Volpp et al., 2023). Sustainable food choices encompass a holistic approach that not only prioritises the health and well-being of patients but also acknowledges the environmental implications of dietary selections playing an active role in promoting a resilient and ecologically-oriented food system (Prosen et al., 2023). Hospital food services offering plant-based protein means clear advantages over animal-based protein, as it generates lower levels of GHG emissions and requires less land, water and energy, all resulting in a lower climate footprint, while itself brings added health benefits (Verbruggen et al., 2024). It is important to emphasise that animal protein should come from extensive livestock rather than intensive animal farming, as the former has proven to be more environmentally sustainable, since it contributes to biodiversity, regulates cycles, and is resilient to climate change. Additionally, products from extensive farming often have a superior nutritional profile (Pateiro et al., 2020; Alibés et al., 2020).

Food waste in hospitals is estimated to range from 6% to 65%, and is a major generator of GHG emissions (Verbruggen et al., 2024; Amicarelli et al., 2021; Chatzipavlou et al., 2024). Although this wastage can occur at any point in the foodservice process, the greatest losses are often at the point of consumption, referred to as plate waste (McCray et al., 2018). Food waste is a deep-rooted issue in hospitals, and can serve as a catalyst for the transition towards the development of SFS. In addition to food waste, single-use meal containers and packaging of raw materials, such as boxes and pallets, significantly contribute to the waste generated in hospitals (Chatzipavlou et al., 2024). Training programmes can increase awareness of the environmental impact of food waste and offer practical strategies for waste prevention and segregation (Verbruggen et al., 2024). In fact, education and training of kitchen staff has been a crucial component in supporting collective kitchens in introducing organic foods and fostering a mind-set shift in staff to achieve sustainability goals (Guillaumie et al., 2023; Chatzipavlou et al., 2024; Schulze et al., 2024).

Indeed, healthcare professionals and other allied health professionals, such as dietitians, play a crucial role in driving transition towards more sustainable food systems and advocating for planetary health. They can stimulate a paradigm shift by making people aware of the consequences related to unsustainable food practices for their health and the preservation of the environment (Prosen et al., 2023; Carlsson and Callaghan, 2022a; Guillaumie et al., 2020; Hubbert et al., 2020). However, their current role and influence in the health systems is undervalued and unexploited (Alberdi and Begiristain-Zubillaga, 2021b).

In the past 12 years, at least six national professional associations have formally acknowledged SFS and sustainable diets as an integral part of dietetic practice (Wegener et al., 2024). Despite the increasingly formal inclusion of SFS in the scope of practice, research with dietitians from 30 countries indicates that, collectively, they perceive themselves to be inadequately trained to practise competently in this area (Carlsson and Callaghan, 2022b). In our study, we found no evidence of sustainable diet advice being implemented in clinical practice. One significant barrier hindering progress towards sustainability by the hospital system and its health professionals is their limited understanding of sustainable food systems (Hubbert et al., 2020; Guillaumie et al., 2023).

One study showed that conveying sustainability messages relied on dietetic professionals and their personal beliefs (Guillaumie et al., 2020). Recently, MacKenzie et al. (2023) developed a conceptual framework to support dietitians and nutrition professionals in promoting personal, population and planetary health (Mackenzie-shalders et al., 2023). There are also strategies in place such as the One-Blue-Dot (The association of UK dietitians, 2019), but these are not effectively implemented in practice, resulting in a lack of sustainable nutrition advice. This is a general pattern, and is linked to the lack of inclusion of sustainability criteria in undergraduate studies and ongoing professional training (Carlsson and Callaghan, 2022a; Pettinger, 2018). By integrating concepts of SFSs and diets into curricula, professionals in healthcare and allied services can expand their impact beyond traditional patient care and address broader public health challenges related

to food security and environmental sustainability (Prosen et al., 2023). However, implementation must be carefully considered, as entrenched conservative mental attitudes and traditions in higher education, such as strict discipline orientation and inflexible institutional constructions, may hinder the evolution of educational approaches (Salminen et al., 2024).

The root of the current environmental crisis lies in the institutional rules regulating and governing the existing system. The causes should not be confused with the consequences. Transitioning to SFSs and agroecology requires a fundamental redesign of the economic structures that underpin these systems. However, agroecological movements are characterised by the scarcity of political proposals that reach beyond the local sphere, yet meaningful change must necessarily be political (González de Molina et al., 2019). In this context, healthcare professionals should embrace the role of active advocates in public policy debates on SFS topics, defending policies that support the ability to develop local and sustainable food systems (Carino et al., 2021; Guillaumie et al., 2023; Verbruggen et al., 2024).

All of the above points indicate that each health institution will have a unique approach and different reasons for implementing an SFS. Therefore, each institution must develop its own agenda and strategy. Indicators are crucial for holistic sustainability assessments, tracking progress in the food system transition, and guiding policy and strategy makers on where to focus efforts towards sustainable actions. In this regard, longitudinal secondary data will be needed to measure these indicators over time (Robling et al., 2023).

5. Conclusions

The sustainability of hospitals' food systems is incipient and far from being consolidated. But this is not just the responsibility of the hospitals and health institutions; governments and other external agents (i.e., NGOs, private sector) should be partners in the transition towards sustainable food systems. As SAPEA explained (2020), accepting collective responsibility is paramount, as it is unlikely that any single actor can achieve even modest steps towards sustainability (SAPEA-consortium, 2020). Health services across the world face the challenge of delivering high-quality care within economically constrained environments. Governmental institutions have to step up to guarantee that SFSs are implemented in healthcare systems, by supporting local supply networks, investing in training and increasing the local production capacity to meet the food needs of these institutions, and this means investing in the primary sector. It is also up to governmental institutions to make certain legal regulations compulsory to force the transition in those health institutions which still do not view SFSs as a priority.

This study has generated a SoI tool to guide, evaluate and design a food strategy proposition from a sustainable perspective for those working in health services. The development of an SFS should be seen as a process, acknowledging the importance of a step-by-step transition. The process of developing an SFS requires objectives that are clearly defined and a multi-level governance team to design and implement the food strategy within the institutional structures. The lack of data in different areas of the hospital food systems regarding different dimensions (economic, labour, social, etc.) reinforces the need to propose tools such as the SoI to encourage an effective progress towards an SFS.

The climate emergency is more pressing than ever and effective tools are needed to make the eco-social transition as fast and as efficiently as possible, particularly within healthcare systems.

CRediT authorship contribution statement

Goiuri Alberdi: Writing – original draft, Visualization, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Mirene Begiristain-Zubillaga:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.indic.2024.100538.

Data availability

The data that has been used is confidential.

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