Mapping the Co-Creation Landscape and Exposing the Methodological Gap between Researchers and Practitioners: A Health CASCADE Systematic Methods Overview

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Submitted to: Interactive Journal of Medical Research
on: April 23, 2024

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Abstract

Background: Co-creation has emerged as a strategy for cultivating collaboration and driving innovation across diverse fields, proving particularly promising in addressing complex and wicked problems in public health. There is a growing recognition of co-creation as a valuable methodology, yet, to date there is no standardized methodology or recommendations for methods appropriate for use in co-creation. While some studies have examined specific methods, a comprehensive overview of co-creation methods is still lacking, hindering conceptual clarity and collective understanding of methods appropriate for diverse contexts and research objectives.

Objective: To enhance transparency and understanding about how to co-create, this study aimed to comprehensively and systematically assess methods used in co-creation.

Methods: To ensure a thorough approach, the Systematic Methods Overview approach was applied. This was completed in two parallel processes, one within the Health CASCADE Co-Creation Database, and one within grey literature. To filter out irrelevant information, an artificial intelligence-assisted recursive search strategy and a two-step screening process were applied. Method names were extracted from the included literature and combined for analysis. We conducted textual analysis, comparative analysis, and bibliometric analyses to assess the content and relationship between the extracted methods and the methodological underpinnings of the included sources.

Results: We examined a total of 2627 academic articles and grey literature sources. The literature primarily represented fields such as health sciences, medical research, and health services research, and the dominant research methodologies were the co-approaches (co-creation, co-design, co-production), the participatory research methodologies, and public and patient involvement. We extracted and analyzed 956 co-creation methods, with only 10.2% (97/956) of the methods overlapping between those found in academic literature and grey literature. The most frequent methods in academic literature were surveys, focus group, photo voice, and group discussion, while in grey literature they were world café, focus group, role playing, and persona. Among the methods extracted from academic literature, 91.3% (230/252) were found to co-occur, with a predominant combination of multiple qualitative methods.

Conclusions: This study produced a high-quality systematic inventory of co-creation methods. Our analysis of the sourced methods reveals a methodological gap between researchers and practitioners and offers insights into the relative prevalence of individual methods, and how they are combined. This study initiates the process of bridging this methodological gap by fostering an increased understanding and recognition of co-creation methods and their relative presence in both research and practice. Bridging this gap is crucial for advancing co-creation as a reliable methodological approach. This systematic exploration of

knowledge of the various methods applied in co-creation can facilitate individuals embarking on a co-creation process, or similar participatory methodologies, by illuminating the diverse landscape of methods used in co-creation.

(JMIR Preprints 23/04/2024:59772)
DOI: https://doi.org/10.2196/preprints.59772

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Keywords

co-creation; co-production; co-design; methods; participatory; inventory; text mining; artificial intelligence; methodology; research methods

Introduction

Co-creation has emerged as a powerful approach for fostering collaboration and innovation across various disciplines [1]. Co-creation has the potential to produce new or improved tailored practices and solutions, which address complex challenges and generate meaningful outcomes for a defined

need [2,3]. In health care, it is thought of as a potential way to bridge the bench-to-bedside divide [4]. In urban planning or politics, co-creation is used as a means to increase engagement, while in business and design it is seen as a methodology to design better and more attractive products and services [5,6]. At the core of co-creation is the active engagement of multiple stakeholders in a collective intelligence process to collaboratively design and implement projects, processes, services, and solutions [7,8]. Rooted in the potential for tapping into diverse perspectives, skills, expertise, and experiences, co-creation stands as a dynamic approach to fostering innovation and stakeholder engagement [9].

There is a growing recognition of co-creation as a valuable methodology, yet, to date, there is no common practice or standardized methodology [1,10]. Co-creation has increasing traction in terms of involving stakeholders, but the extent to which this creates a fundamental change in practices is still unclear, and there is a strong potential that it will remain tokenistic [11]. Major challenges remain and need to be confronted to make co-creation trustworthy and unlock its full potential [1,2,10–12].

Methods Used in Co-Creation

Research methods provide a structured and systematic approach to gathering and analyzing data, and they ensure that research findings are valid, reliable, and generalizable. Detailed insight into processes and procedures is required to truly understand and assess the quality of the research [13–15]. Furthermore, research methods enable others to replicate the study and build on the findings, which is essential for the advancement of knowledge in a field [13]. Additionally, using appropriate methods allows researchers to control potential biases that might affect their results, making their findings more trustworthy and credible [16]. More than any other aspects of research, methods have the potential for adaptation or reuse in different contexts and across a broad range of research questions and disciplines [13,17]. Consequently, poor reporting or restricted access to trustworthy methods creates inefficiencies and can slow progress.

Considering all the benefits of co-creation as a research methodology, it is astonishing that there are no recommendations regarding methods appropriate for accurate, impactful, and trustworthy co-creation. Methods are highly transferable, and methods used in co-creation have the potential for adaptation of the co-creation process to different contexts and across a broad range of research questions. Consequently, this lack of awareness about methods used in co-creation makes it difficult to contextualize research, compare and replicate studies, or scale up co-creation processes. It can also limit the ability of researchers to build on existing knowledge and apply best practices [18].

While individual studies have showcased select methods for co-creation, a comprehensive inventory, or systematic overview, of the entire range of methods used in co-creation, is lacking. An overview of methods can increase clarity and enhance collective understanding of specific methods that may work for varying contexts and purposes [19]. Researchers who strive to apply co-creation typically lack the time to systematically search, retrieve, review, and compare all the available literature to develop a thorough and critical sense of the varied methods [1,19]. Finally, identifying methods needed to promote power and meaningful engagement of co-creators in the co-creation process is key for evaluating where the engagement processes sit along the engagement-to-tokenistic continuum [2,20].

This study aims to address this gap by systematically reviewing the methods applied in co-creation in both academic and grey literature, to provide transparency and boost collective understanding regarding methods used in co-creation.

Methods

Working Definitions

Co-Creation Methods: we expanded on Vaughn et al definition of participatory methods [21] to

establish a definition of methods used in co-creation. *Co-creation methods encompass a diverse range of tools, activities, approaches, and techniques strategically employed across the entirety of the co-creation process. These methods serve various purposes, including but not limited to data collection, facilitation, recruitment, reflection, data analysis, and dissemination. Notably, these methods can be quantitative, qualitative, mixed, participatory, ethnographic, or a blend of these, allowing for flexibility in achieving diverse objectives.*
Co-Creation: we used the Agnello and Loisel et al definition of co-creation. *Co-creation is any act of collective creativity that involves a broad range of relevant and affected actors in creative problem-solving that aims to produce a desired outcome* [1].

Systematic Methods Overview

To ensure an exhaustive and systematic approach to creating an inventory of co-creation methods, the systematic methods overview was selected as the most appropriate methodology to investigate methods used in co-creation [19]. This methodology aims to synthesize guidance on methods from methods literature or methods-relevant sections of empirical research. Therefore, principles and strategies for a rigorous systematic approach to reviewing the literature on methods were sourced from a paper by Gentles et al [19]. Gentles et al emphasize all methods overviews do not need to be conducted to the same standard, as the level of rigor may need to be tailored pragmatically to the specific review objectives [19]. Therefore, strategies 1-7 from Gentles et al were applied in this study. These strategies and how they were applied in this study are described in (Table 1).

Table 1. Gentles et al methods overview steps and how they were applied in this study

Strategy	Description	Applied in this study
1. Manageable set of publications	Delimit a manageable set of methods-relevant publications in accordance with the objectives of the methods overview. It may be appropriate to select the methods-relevant sections of empirical study reports [19].	Identified the Health CASCADE Co-Creation Database as the main source for relevant publications. Included only the methods-relevant sections from empirical study, protocol, exploratory study, or case study that applied co-creation.
2. Non-journal publication types	Considering that important sources of methods guidance can be located in non-journal publication types, it is important to consider alternative search methods for identifying relevant publications to be further screened for inclusion [19].	Conducted a grey literature search to source methods from websites, books, book chapters, and other non-journal publications.
3. Determine publication type	One approach to identifying potentially useful books and similar publication types is to consider what classes of such publications are likely to contain relevant content, then identify, retrieve, and review the full text of corresponding publications to determine whether they contain information on the topic of interest [19].	For the academic literature search, relevant literature was determined with a second screening to sort the articles by study type. For the grey literature search, relevant publication types were identified for retrieval according to non-keyword-dependent criteria. Their full text was obtained and hand-searched for relevant content to determine eligibility.
4. Broad Scope	One strategy for choosing the purposeful approach to use in selecting the literature according to the review objectives is to explore the concepts at a broad overview level. Researchers	We determined that a combination of a systematic review in the Health CASCADE Co-Creation Database [1], plus criterion sampling and snowball sampling of grey literature was

	need to consider the full range of purposeful literature sampling approaches at their disposal in deciding what best matches the specific aims of their own reviews [19].	employed in this study [22] to cast a broad net and capture a range of relevant literature.
5. Iterative data abstraction	Researchers can develop an initial form or set of concepts for abstraction purposes according to standard methods and remain attentive to the need to iteratively revise them as concepts are added or modified during the review [19].	For the academic literature, a recursive search strategy was used to iteratively[a] identify methods. Papers were grouped by the presence of a method and then screened for the presence of additional methods. For grey literature, identical methods were combined iteratively, based on their names and descriptions.
6. Rely on definitions	An important complication affecting the abstraction process in methods overviews is that the language used by authors to describe methods-related concepts can easily vary across publications. There may also be cases where no identifiable term, phrase, or label for a methods-related concept is used at all, and a description of it is given instead. Since accepted terms may not be used consistently to refer to methods, it is necessary to rely on the definitions for concepts, rather than keywords, to identify relevant information in the publication [19].	Pre-determined extraction forms were used and methods with similar names were compared to each other and merged based on their descriptions. We compared methods to each other based on the definition rather than solely the name and built this into a matrix of the different methods and their various names. This is reflected in the final extracted set of methods, where each method name representing one method is separated by a slash symbol.
7. Select an analytic method that matches the selected literature	Considering the qualitative nature of the analysis required in systematic methods overviews, it is important to select an analytic method whose interpretations can be verified as being consistent with the literature selected, regardless of the level of abstraction reached [19].	Textual analysis and bibliometric analysis were applied in this study to provide clarity about the methods used in co-creation of the selected literature. These analytic methods are well-suited for examining qualitative data and extracting meaningful insights from textual sources, which is likely necessary for understanding the co-creation processes discussed in the literature.
[a]*This iterative approach allows for a comprehensive analysis of the literature, ensuring that all relevant information is captured and categorized effectively.*		

Gentles et al strategies 1 to 4 were applied to this study by designing two separate searches to source co-creation methods [19]. The first search sourced empirical research that provided examples of applying co-creation methods and extracted data from methods-relevant sections. The second search aimed to investigate grey literature to identify non-journal publication types that provide guidance on co-creation methods, or include the use of co-creation methods, and extract data about each method.

Search 1: Empirical Research

Gentles et al strategy 5 was applied in the two-step screening process. Health CASCADE, a Marie

Skłodowska-Curie Innovative Training Network created a database of literature that represents co-creation in all sectors [1]. The final database, the Health CASCADE Co-Creation Database (HC-CCDB) version 1.5 contains 13,501 articles about co-creation [23]. Since we are investigating the methods used in co-creation, it was logical to source the methods from that database. However, since it contains a vast number of articles with different study types, a two-step screening process was applied. The first was a recursive search strategy to group the literature by method, to decrease the number of articles for title and abstract screening. The second was a title and abstract screening to sort the papers by study type.

Recursive Screening

Recursive searching can be used to find certain words or phrases in titles and abstracts during a literature review process**.** This is often referred to as a text mining approach, where the goal is to identify relevant studies based on specific keywords or phrases [24]. Text mining is a technique that can be used during a literature review to analyze large amounts of text data, such as the titles and abstracts of relevant studies. We used Rayyan (Qatar Computing Research Institute), a systematic review manager [25], to investigate the most frequently occurring words and phrases in the titles and abstracts. This approach was designed to be used in Rayyan and includes four steps, plus a stop rule. Steps: (1) title and abstract screening, (2) grouping by method name, (3) screening of grouped literature, and (4) iterative cycles of steps 1 to 3 until the stop rule is met. The recursive search process and the stop rule applied in Rayyan to screen the titles and abstracts of the HC-CCDB in June 2023 is described in (Table 2).

Table 2. Recursive screening steps and associated description

Step		Description
1	Title and abstract screening	The researcher began screening the title and abstracts, looking for the name of a method used in the study. If a method name is found, such as ‘qualitative interview’ the researcher moves to the next step.
2	Grouping by name	When a keyword, such as the name of the method, is input into the *keywords for include* function of Rayyan, the software will automatically find all the literature that contains that keyword and group them.[a] Therefore, when the name of a method is found in the title or abstract, then the researcher used the *keywords for include* function of Rayyan to find any other literature that includes that method in the title or abstract.
3	Screening	Once the literature was grouped around a certain method name, the researcher screened the grouped literature looking for the presence of the keyword in the title or abstract, to ascertain whether the word was referring to a method.
	Inclusion criteria	If the method name (eg, photo voice, focus group, meeting) was referenced as a method and not an action verb, then it was included.
	Exclusion criteria	If the method name was in the article as an action verb, for example, “they were *meeting* to discuss…” rather than “conducting a participatory *meeting*…” and there was no reference to it as a method, then this is considered a false hit, and it was excluded.
4	Iterative cycles	After steps 1-3 above were completed, the researcher returned to the ‘undecided’ literature and repeated steps 1 - 3 for each new method name identified in the remainder of the literature.[b]
5	Stop rule	When the researcher screened the unscreened literature, and there did not find any new methods for 100 papers in a row, then the screening was considered finished, and the screener moved on to the data extraction phase.

[a] *It is important to note that Rayyan is sensitive to the exact spelling of the keywords, therefore if a method such as*

'interview' was found, then different forms of that word needed to be added to the 'keywords for include' field: eg, Interviews, Interviewing, etc. These different keyword results will be combined in the analysis step. This caveat is also true for hyphens, so if a method can be written with or without a hyphen, both forms need to be added to the 'keywords for include' function. For example, 'semi-structured interview' versus 'semi structured interview' were both added as separate keywords and were combined in the analysis step.

[b] *An important feature of Rayyan is that if a new method name is added to the 'keywords for include' function, it will also search all the literature in the dataset including those that were already included in a different 'method group.' This allows the researcher to find all literature that contains the method name whether they were included, excluded, or undecided.*

Sorting by Study Type

The recursive search was conducted in the titles, abstracts, and keywords, of the literature in the co-creation database. The literature that was included in the recursive screening step was extracted in a Microsoft Excel format and then re-uploaded into Rayyan to screen the literature by study type. The literature was screened for inclusion based on the following study types that applied co-creation: an empirical study, protocol, exploratory study, or case study. The full set of inclusion and exclusion criteria can be found in (Textbox 1). The literature that passed this screening step was exported in a Microsoft Excel format and then taken to the analysis step.

Textbox 1. Selection criteria for sorting the included literature by study type.

Inclusion	Exclusion
Uses at least one of the key terms in the final co-creation database set: participatory, co-creat*, co-production, user involvement, co-design, public participation, citizen science, public and patient involvement, collaborative design, and experience based design.	Does not include any of the key terms present in the Health CASCADE Co-Creation Database version 1.5.
The title and abstract are in English	Written in any other language than English.
There is an abstract.	Does not have an abstract.
Is any of the following study types: an empirical study, protocol, exploratory study, or case study that applied co-creation (according to the definition of the co-creation database).	Is any of the following study types: a qualitative study, review, literature review, systematic review, scoping review, comparative analysis, ethnographic study, ethnographic case study, commentary, a randomized control trial, rapid review, observational study, meta-analysis, interview-based study, review article, theoretical review, critical review, empirical review, retrospective record review, qualitative data analysis, realist review, narrative review, a delphi study, qualitative case study, umbrella review, critical methodological review, qualitative inquiry, qualitative investigation, longitudinal study, longitudinal case study, qualitative meta summary, ethnographic meta-synthesis, A bibliometric study, mixed methods study (mixed-methods study), mixed-method approach, comparative study, a qualitative interview study, a guideline, or a qualitative descriptive study.

Is a co-creation study.	A study investigating, discussing, or assessing co-creation.

Method Frequency

Gentles et al strategy 6 was applied in the extraction step. The recursive search strategy resulted in a list of method names, which was cross-checked with the final set of included literature to generate a set of methods and their relative frequency in the academic literature. Following the extraction of the method names two approaches were used, one to deduce the frequency of the method names and one to validate the results.

The first approach employed pattern analysis through the use of regular expressions, regular expressions are used to search, match, and manipulate text, and this strategy was used to deduce the frequencies. The second approach employed to evaluate the results of the first one was a more complex algorithm, Best Match 25 (BM25), which is a ranking function often used by search engines to estimate the relevance of articles to a given search query, or paragraphs and method names in our case. The first approach consisted of four steps. The first step was preprocessing and cleaning the method names text, identifying acronyms, and then handling them as separate entries and tokenizing the method names. The second step involved the creation of a regular expression pattern to ensure that all occurrences are correctly identified. The third step involved iterating through the final set of literature that was included in this study, identifying, matching, and recording any occurrences of the method names in the literature. Finally, this information was compiled back into the original method names.

The second approach aimed to evaluate our results. We used the BM25 search algorithm again to search through the literature and see if the number of article hits matches the number of method occurrences we identified. This approach provided us with the frequency that each method name appears in the set of literature and a mapping of the method names and article text that can be used to derive more information. Analyzing the presence and frequency of occurrence across the included literature aimed to provide a clearer understanding of which methods were commonly utilized in co-creation projects, and which ones were less frequently employed.

Search 2: Grey Literature Search

An important first step in a Systematic Methods Overview approach is the identification and selection of literature that contains the desired methods. Gentles et al highlight the possibility that methods literature, or empirical research, are in other sources, and tend to be poorly indexed in standard bibliographic databases. In that case, additional searches in Google Scholar or websites are recommended [19]. Therefore, an online search aiming to source co-creation guidelines and toolkits, books, and non-journal publications was conducted to identify potentially relevant text. However, it is not possible to employ a standard title and abstract screening as the content of interest is frequently located in the subsection of the publication. Unlike traditional literature searches where standard title, abstract, and keyword database screening can be employed, researchers often face challenges in accessing and selecting publications in the grey literature [19]. To address this, (Table 3) outlines the steps involved in conducting a grey literature search, selection, and extraction process, providing a structured approach for this aspect of the study.

Table 3. Grey literature selection and extraction process

Step	Description
1	A search strategy was designed to closely align with the search strategy used to generate the Health CASCADE Co-Creation Database (eg, keywords, year), which can be found in Table 4.
2	The four sets of keywords were used to search in Google's Advance Search tool

	(Google Inc.).
3	The search results were screened for relevancy using a set of selection criteria, which can be found in Textbox 2.
4	Literature that adhered to the criteria was downloaded and saved in a One Drive folder.
5	The full-text screening was conducted on the final set of literature to determine relevancy.
6	Methods were extracted from the literature that passed the full-text screening step.
7	If the included material referenced a relevant source, then that reference material was also screened for relevancy and extraction.

The following search strategies were developed to align with the approach used in generating the HC-CCDB, which encompasses literature dating back to January 1, 1970 [1]. To manage the volume of search results, specific site domains were targeted, and only co-creation and methods terms were employed. The complete grey literature search strategy is detailed in (Table 4) and provided in (Multimedia Appendix 1).

Table 4. Grey literature search strategy

	Search 1	Search 2	Search 3	Search 4
This exact word or phrase	"co-creation methods"	"co-creation methods"	"co-creation methods"	co-creation AND methods AND guideline
Language	English	English	English	English
Region	any region	any region	any region	any region
Last Updated	anytime	anytime	anytime	anytime
Date	1/1/1970 to 6/16/2022	1/1/1970 to 6/16/2022	any time	6/16/2012 to 6/16/2022
Domains	.org	.edu	.gov	.org
Terms appearing	anywhere in the pages	anywhere in the pages	anywhere in the pages	anywhere in the pages
File type	any format	any format	any format	any format

Inclusion and Exclusion Criteria

During the screening process of the grey literature search results, we utilized a set of inclusion and exclusion criteria to determine the relevance of the literature, which are outlined in (Textbox 2).

Textbox 2. Selection criteria for initial screening of grey literature search results

Inclusion Criteria	Exclusion Criteria
The material is an article, report, guideline, book, or online tool.	The material is a conference proceeding, conference abstract, or dissertation.
The material is suitable for, or about, co-creation, based on the Agnello and Loisel et al definition of co-creation [1].	The material is not suitable for, or about, co-creation, based on the Agnello and Loisel et al definition of co-creation [1].
The literature is not included in the Health CASCADE Co-Creation Database v1.5 [1].	The literature is already accessible in the Health CASCADE Co-Creation Database v1.5 [1].
Language	
The full text is written in English.	The content is not written in English.

Literature meeting the inclusion criteria was selected, and their full documents were downloaded. Subsequently, the full-text documents were screened for relevancy based on a new set of selection criteria, detailed in (Textbox 3).

Textbox 3. Selection criteria for the full-text selection process in grey literature

Inclusion Criteria	Exclusion Criteria
The text introduces at least one co-creation method.	The text does not mention any co-creation methods.
The text describes the method, gives an example of the application, or introduces how it can be used in co-creation.	A co-creation method was introduced, but there is no information about how it was applied, what it is, or how it can be used.
Language	
The full text is written in English.	The content is not written in English.

During the full-text screening of the included grey literature, a snowballing approach was utilized to ensure the comprehensive inclusion of relevant literature. This involved tracing the citations and references of the included literature to identify additional resources that might contain relevant information. Specifically, we analyzed the in-text references, and reference lists, of the included literature to identify any additional documents that met the selection criteria outlined in (Textbox 2). We conducted a full-text screening of the literature that adhered to those criteria, and if they passed the selection criteria presented in (Textbox 3), they were included in the final set of literature. This citation tracing process was conducted iteratively, extending the search to each newly identified material. The iteration continued until no new relevant resources were identified, indicating a saturation point in the search process.

Extraction

Literature that passed both screening steps was subjected to the extraction process. Relevant information was extracted using a pre-defined Microsoft Excel extraction table designed for this purpose. The extraction table included the following fields: the extraction date, source title, type of material, source hyperlink, first author's name, source company, and the name of each identified method. The extracted data was validated by cross-checking the extracted method names with those sourced in academic literature and in grey literature, to verify their accuracy and completeness before further analysis, and the results were discussed among the co-authors. Once all the extraction tables were completed, a list of methods and frequency of appearances across the included literature was generated, to ascertain the relevant prevalence of each method.

Analysis

In systematic methods overviews, the analysis plays a crucial role in achieving the overarching objective of providing clarity and enhancing collective understanding of the methods. Therefore, Gentles et al strategy 7 was applied through the various analysis steps [19]. To delve deeper into the methods utilized in co-creation, we calculated the co-occurrence of methods. This calculation helps give a sense of how people are designing and executing their co-creation projects in terms of the combination of methods. We visualized the results of the co-occurrence analysis in a Sankey diagram to provide a clear representation of the relationships between different methods. Additionally, we conducted a bibliometric analysis of the included literature, to provide insights into the methodological underpinnings and fields represented by the included literature. Finally, as part of our analysis, we explored the overlap between the methods used in academic literature and those sourced from grey literature. This investigation aimed to ascertain whether practitioners, who may not focus on distributing their work through academic publications, engage in co-creation in similar ways to those documented in academic research, and vice versa.

Co-occurrence of Methods in Academic Literature

To enhance comprehension of how the methods were combined, we conducted an additional analysis focusing on the set of methods extracted from academic literature. This analysis involved assessing which methods co-occurred in the same title or abstract of an article. This approach offered insight into the common combinations of methods as well as instances where methods were used independently of others. Using Python to map method names within the literature, we recorded and listed all the method names in each title and abstract. We were then able to accurately extract the number of co-occurrences of each method name. Additionally, when a combination of two method names was already identified, it was marked as such and skipped, thus ensuring that results were counted accurately.

An online open-access tool, RAWGraphs 2.0 (DensityDesign Research Lab) [26] was utilized to generate a Sankey diagram illustrating the co-occurrence of methods sourced from academic literature. To ensure the quality of the diagrams, method names with no co-occurrence were removed. The extracted methods were categorized into three groups based on known method types: (1) qualitative methods, (2) participatory methods, and (3) quantitative, mixed, and ethnographic methods. Subsequently, these three groups were each visualized in separate Sankey diagrams. This approach aimed to generate manageable-sized Sankey diagrams, enabling a more comprehensible depiction of the co-occurrence of methods within each method type. Furthermore, by splitting the diagrams based on method types, we aimed to enhance understanding of the methodological landscape, delineating the prevalence and interrelationship of different method types in co-creation research.

Bibliometric Analysis of the Academic Literature

To align with the bibliometric analysis conducted on the source database (the HC-CCDB), and to gain deeper insights into the types of included empirical research, we performed a bibliometric analysis of the academic literature. We aimed to understand the prevalence of various methodological paradigms and fields across these studies. We employed VOSviewer (The Centre for Science and Technology Studies), a tool designed for constructing and visualizing bibliometric networks, for this analysis [27]. By utilizing VOSviewer, we aimed to examine the source landscape and various methodologies, thereby identifying potential dominant fields and methodological approaches represented in the included academic literature. This approach facilitated a comprehensive understanding of the co-creation landscape. The detailed steps for conducting this process in VOSviewer can be found in (Multimedia Appendix 2).

Academic Versus Grey Literature

To ascertain whether individuals engage in similar co-creation practices regardless of whether they published their co-creation project in academic literature or grey literature, we compared the methods sourced from the two literature sources. To discern the variances and potential overlaps between methods sourced from academic literature in search 1 and grey literature in search 2, a Venn diagram was constructed. This was achieved by identifying duplications between the two lists of methods using the Conditional Formatting feature of Microsoft Excel. Upon identifying duplicate and non-duplicate methods, the extracted methods were categorized into three lists: (1) found exclusively in academic literature, (2) found exclusively in grey literature, and (3) found in both academic and grey literature. Subsequently, the number and relevant percentage of methods within each list were calculated, and these findings were visualized in a Venn diagram. This comparative analysis allowed for an examination of the methodological landscape across academic and practitioner-focused literature, highlighting similarities and differences in co-creation approaches.

Results

Search 1 and 2

For academic literature, the full set of literature from the HC-CCDB version 1.5, 13,501 papers were identified as relevant for screening. There were two subsequent screening processes for this literature: (1) grouping the papers by whether a method was present or not (n=13,501), and, (2) screening the papers by study type (n=6472). During this two-step screening process, a total of 10,905 papers were excluded, and 2590 papers were included.

A parallel search was conducted in grey literature, and a total of 605 materials were identified. As shown in (Figure 1), there were two steps to screening the grey literature: (1) screening for relevance based on one set of selection criteria (n=56), and (2) screening the extracted full text based on a different set of selection criteria (n=37). These two screening steps resulted in the exclusion of 568 materials and the inclusion of 37 materials.

A total of 2590 articles were included, and the grey literature search resulted in the inclusion of 37 materials. The adapted PRISMA flowchart of this parallel process is shown in (Figure 1), and a filled-in PRISMA checklist is provided in (Multimedia Appendix 3).

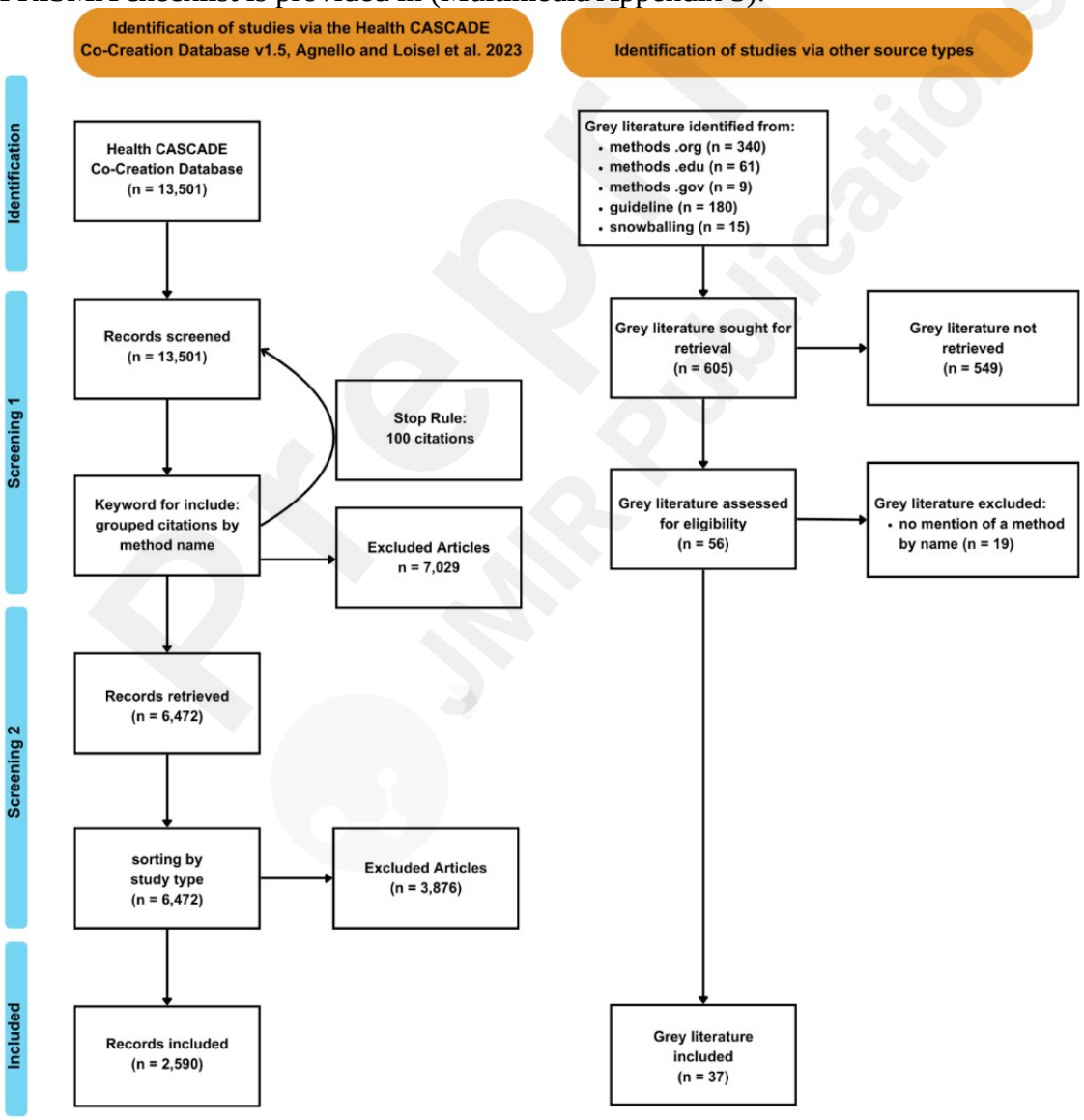

Figure 1. *PRISMA-like flow chart of the screening processes for the systematic methods overview with two sources: (1) academic literature and (2) grey literature.*

Method Extraction

The extraction of methods from academic literature proceeded in two steps: initially, method names were extracted from the recursive search strategy in Rayyan. Subsequently, these names were employed to extract the frequency from the final set of included literature. The extracted methods were then progressed to subsequent co-occurrence analysis. Conversely, for the grey literature, method names were manually extracted from the included literature using a pre-determined extraction form. The frequency of methods in the grey literature was determined by counting how many times each method appeared across the included materials. For instance, if a method was present in five different materials, its frequency was recorded as 5.

Analysis

Method Frequency

We evaluated the relative presence of the methods in the different types of literature by assessing the frequency of occurrence. In academic literature sources, the frequency ranged from 349 to 1. This variance may stem from the nature of the method names, as some are more broad than others. For instance, while *interview* appeared in 124 articles, a more specific method *Lego serious play* was found in only one article. Examples of the most and least frequent methods in the included academic literature are provided in (Table 5). The full set of methods sourced from academic literature and their relative frequency can be found in (Multimedia Appendix 4).

Table 5. Examples of the most and least frequent methods that were sourced from academic literature. The percentage represents the percentage of total method hits.

Most frequent methods		**Least frequent methods**	
Method name	**Frequency (n=3,520), n (%)**	**Method name**	**Frequency (n=3,520), n (%)**
Survey	349 (9.91)	Consensus workshop	1 (0.03)
Focus group	337 (9.57)	Social mapping	1 (0.03)
Photo voice	189 (5.37)	Participatory theme elicitation	1 (0.03)
Group discussion	150 (4.26)	Lego serious play	1 (0.03)
Questionnaire	142 (4.03)	User persona	1 (0.03)
Semi-structured interview	139 (3.95)	Emotional touchpoints	1 (0.03)
Interview	124 (3.52)	Structured brainstorm	1 (0.03)

In terms of grey literature, frequencies were manually tallied based on the extraction tables, ranging from 12 to 1. Examples of the most and least frequent methods sourced from grey literature can be found in (Table 6). The full set of methods sourced from grey literature and their relative frequency can be found in (Multimedia Appendix 5).

Table 6. Examples of the most and least frequent methods that were sourced from grey literature. The percentage represents the percentage of total extracted method hits.

Most frequent methods		**Least frequent methods**	
Method name	**Frequency (n=1151), n (%)**	**Method name**	**Frequency (n=1151), n (%)**
World café	12 (1.04)	What if brainstorming	1 (0.09)
Focus group	10 (0.89)	Trigger storming	1 (0.09)

Role playing	9 (0.78)	The blue sky vision exercise	1 (0.09)
Persona	8 (0.7)	System Mapping	1 (0.09)
Brainstorming	7 (0.6)	Sorting important to/for	1 (0.09)
Card sorting	7 (0.6)	Sky the limit brainstorm	1 (0.09)
Storyboarding	7 (0.6)	Service safari	1 (0.09)

Co-occurrence of Methods in Academic Literature

91.3% (230/252) of the methods extracted from academic literature co-occurred together in the same title or abstract. The Sankey diagram visualizing this co-occurrence is too large to be presented in this manuscript as a figure and is therefore presented as an open-access figure on Zenodo [28]. This allows readers to delve into the intricate details of method co-occurrence and gain a deeper understanding of the methodological landscape in co-creation research. The full dataset of co-occurrence can be found in (Multimedia Appendix 6). For this manuscript, the methods extracted from academic literature were categorized into three groups based on known method types: (1) qualitative methods, (2) participatory methods, and (3) quantitative, mixed, and ethnographic methods, which are visualized in separate Sankey diagrams.

The co-occurrence analysis of the qualitative methods is visualized as a Sankey diagram in (Figure 2). This Sankey diagram includes 22 source methods (qualitative), which are visualized on the left side, and 149 target methods (multiple types) that are visualized on the right side of the Sankey diagram. This analysis revealed that one of the most frequent methods, *focus group*, also has the most co-occurrences with other qualitative methods such as *group discussion*, *interview*, and *in-depth interview*. *Focus group* also grouped with different forms of qualitative analysis such as *content analysis* and *thematic analysis*. The main participatory methods it is co-occurring with are *prototyping*, *photo voice*, *storytelling*, and various ethnographic methods such as *participant observation*, *field notes*, and *narrative*.

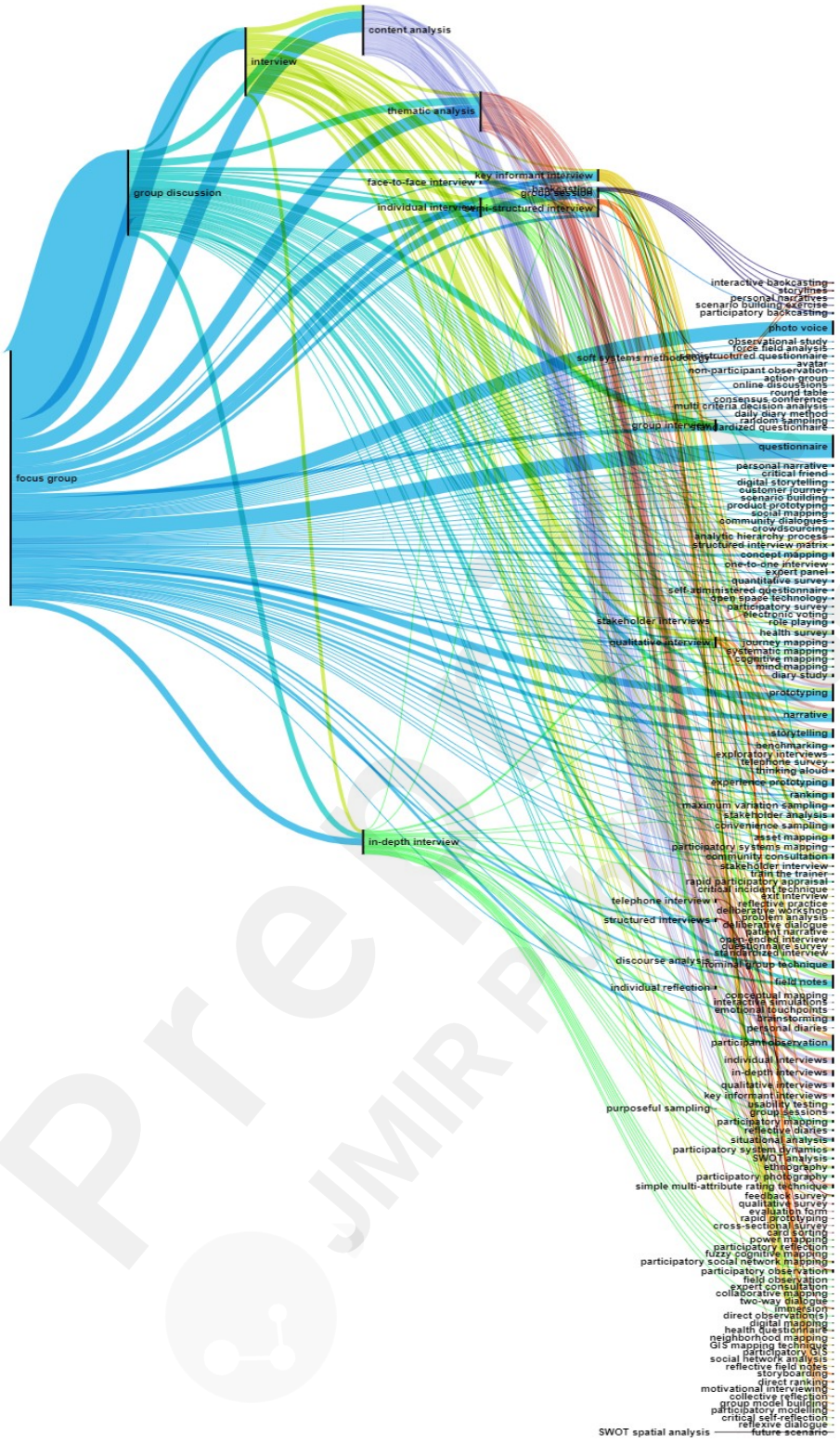

Figure 2. *Sankey Diagram illustrating the co-occurrence of qualitative methods with other research methods in academic literature. Source methods are displayed on the left side (n=22), and target methods on the right (n=149). The thickness of the line indicates the frequency of co-occurrences across the literature, with thicker lines representing more frequent co-occurrences between methods.*

The co-occurrence analysis of the participatory methods is visualized as a Sankey diagram in (Figure 3). This Sankey diagram includes 42 source methods (participatory) that are visualized on the left side, and 132 target methods (multiple types) that are visualized on the right side of the Sankey diagram. This analysis revealed that some of the most frequent methods, *photo voice*, and *prototyping*, also have the most co-occurrences with other participatory methods such as *experience*

prototyping, *concept mapping*, and *participatory mapping*. *Photo voice* is also linked to *narrative* and *group discussion*, and a mix of ethnographic and qualitative methods such as *thematic analysis*, *field observation*, and different types of *interviews*. Additionally, *deliberative workshops* co-occur with other deliberative or participatory methods such as *user committee*, *participatory budgeting*, *fuzzy cognitive mapping*, and *collective reflection*.

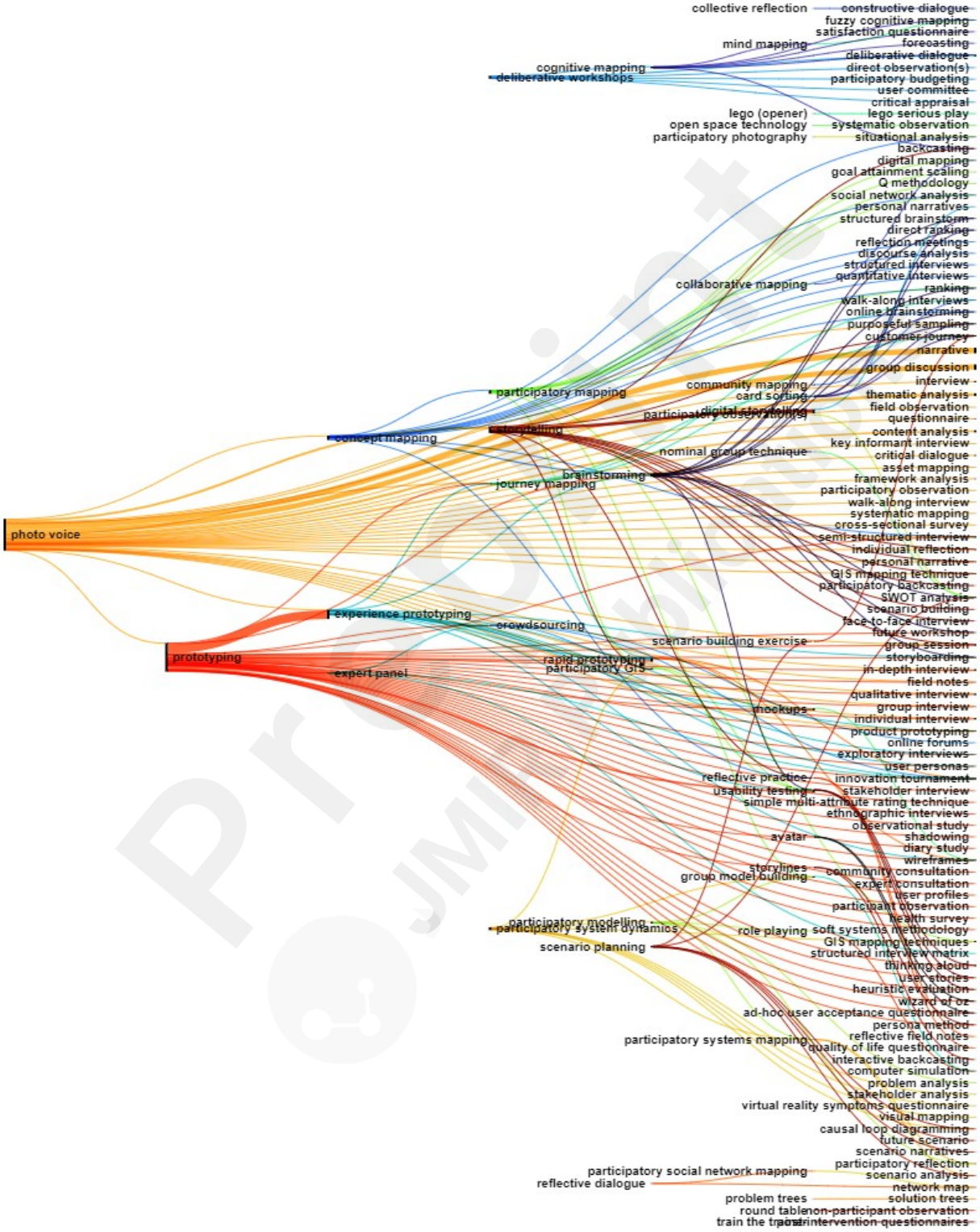

Figure 3. *Sankey Diagram illustrating the co-occurrence of participatory methods with other research methods in academic literature. Source methods are displayed on the left side (n=42), and target methods on the right (n=132). The thickness of the line indicates the frequency of co-occurrences across the literature, with thicker lines representing more frequent co-occurrences between methods.*

The co-occurrence analysis of the quantitative, mixed, and ethnographic methods is visualized as a Sankey diagram in (Figure 4). This Sankey diagram includes 24 source methods (quantitative, mixed, and ethnographic) that are visualized on the left side, and 156 target methods (multiple types) that are visualized on the right side of the Sankey diagram. This analysis revealed that the most frequent method, *survey*, has the most co-occurrences with other high-frequency methods such as *questionnaire* and *narrative*. *Survey* is also strongly linked with other qualitative methods such as *focus group*, *group discussion*, different types of interviews, and qualitative analysis methods. The ethnographic method, *field notes*, was linked to a mix of ethnographic and participatory methods such as *participatory observation*, *participatory reflection*, and *group model building*.

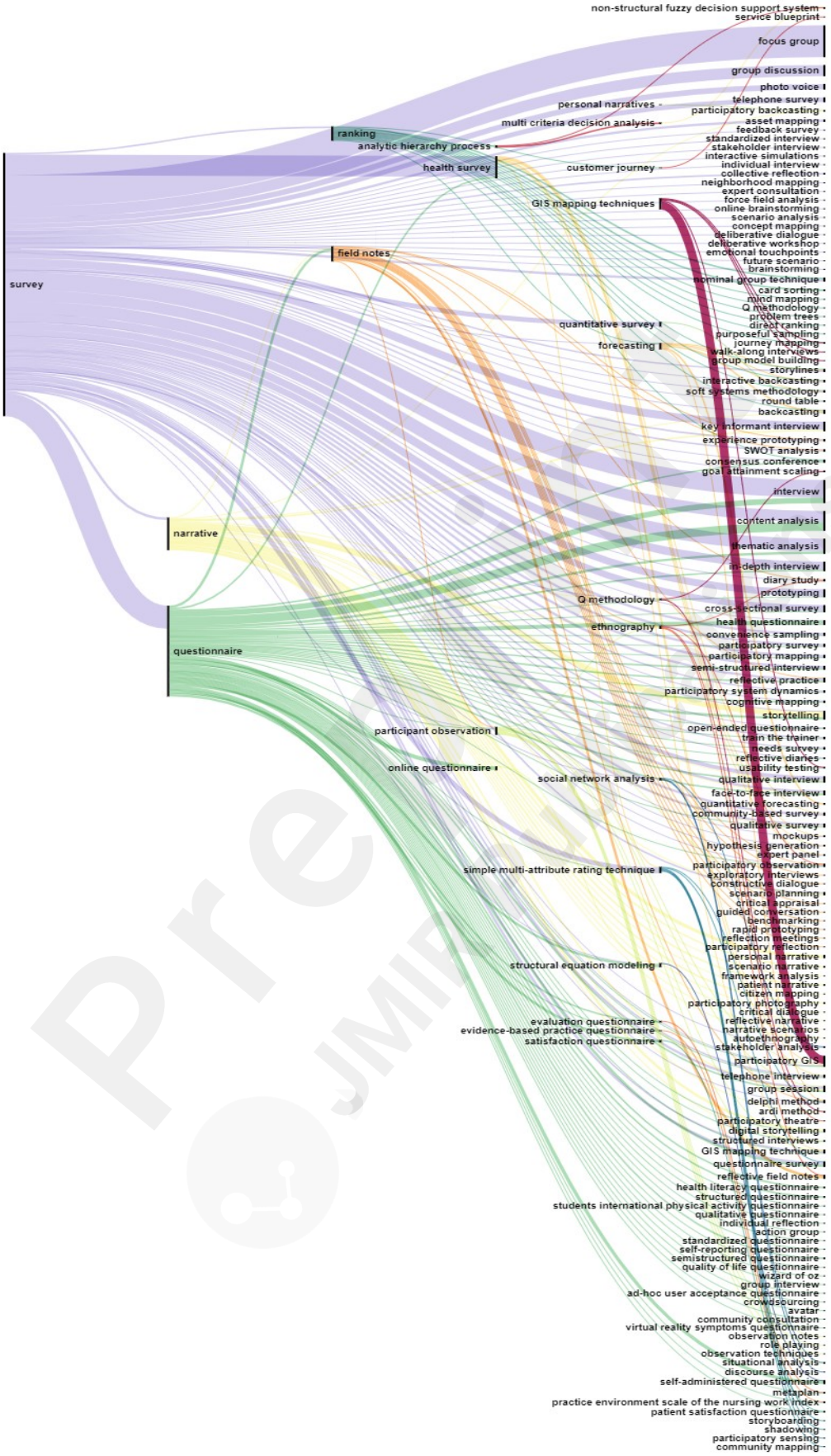

Figure 4*. Sankey Diagram illustrating the co-occurrence of quantitative, mixed, and ethnographic methods with other research methods in academic literature. Source methods are displayed on the left side (n=24), and target methods are on the right (n=156). The thickness of the line indicates the frequency of co-occurrences across the literature, with thicker lines representing more frequent co-occurrences between methods.*

Bibliometric Analysis of Academic Literature

The VOSviewer co-occurrence analysis of the keywords related to methodologies in the title and abstracts of the academic literature is visualized as a network map in (Figure 5). The network map includes 34 keywords linked to each other a total of 385 times. VOSviewer grouped the keywords into four clusters [27]. Cluster 1 (in yellow) contained all forms of *participatory research*, *community based participatory research*, and *community engagement* or *participation*. Cluster 2 (in teal) contained different forms of *co-creation*, *value co-creation*, and *design methodology approach*. Cluster 3 (in pink) contained *co-production*, *co-design*, *public and patient involvement*, and *user involvement*. Cluster 4 (in blue) contained different forms of *participatory action research* and *action research*. In addition, among these clusters, the main terms are *co-creation*, *co-production*, *co-design*, *participatory action research*, and *participatory research*. Further details about these clusters can be found in (Table 7).

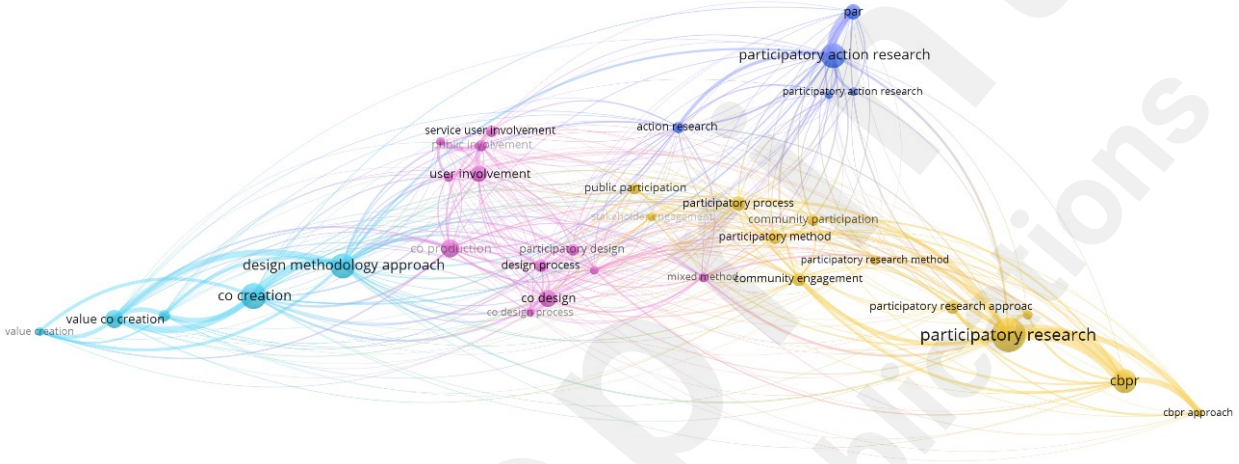

Figure 5*. VOSviewer generated an image representing the co-occurrence of keywords representing methodologies across the title and abstracts of the academic literature. The size of the keyword bubble represents its importance in the number of co-occurrences. Each line represents a co-occurrence of the terms. cbpr: community-based participatory research; par: participatory action research; ppi: public and patient involvement.*

Table 7. Co-occurrence of methodologies in academic literature

Methodology (Cluster)	Co-occurrence links (n=385), n (%)	Related methodologies
Participatory Research (yellow)	31 (8.05)	Participatory process, participatory method, participatory research approach, participatory research method, participatory research project, community-based participatory research, community-based participatory research approach, public participation, stakeholder engagement, community engagement, and community participation.
Co-creation (teal)	29 (7.53)	Co-creation process, design methodology approach, value co-creation, and value creation.
Co-production (pink)	28 (7.27)	Co-design, co-design process, design process, iterative process, mixed method, participatory design, patient involvement, public and patient involvement, public involvement, and user involvement.

Participatory action research (blue)	25 (6.49)	Action research, participatory action research, participatory action research project, and participatory action research approach.

The VOSviewer co-occurrence analysis of the keywords related to fields in the title and abstracts of the papers in the database is visualized as a network map (Figure 6). The network map includes 150 keywords linked to each other a total of 181 times. VOSviewer grouped the keywords into 48 clusters [27]. The clusters with at least five keywords or more were considered the most prominent, resulting in a focus on the eight most prominent clusters. Cluster 1 (in red) contained *health service research*, *community health services*, *medical education*, *occupational therapy*, *primary health care*, and *social work*. Cluster 2 (in blue) contained *health promotion*, *health policy*, and *school health services*. Cluster 3 (in green) contained *dementia*, *emergency nursing*, *home care services*, *home nursing*, *long-term care*, and *terminal care*. Cluster 4 (in purple) contained *palliative care*, *emergency medical services*, and *hospital emergency service*. Cluster 5 (in orange) contained *women's health*, *maternal welfare*, *rural health*, and *supported employment*. Cluster 6 (in yellow) contained *humanities*, *pediatric hospitals*, *organizational innovation*, *quality health care*, and *vaccinations*. Cluster 7 (in brown) contained *health and nursing education*. Cluster 8 (in teal) contained *family health*, *child development disorder*, *learning disorders*, and *self-evaluation programs*. Full details on these clusters can be found in (Table 8).

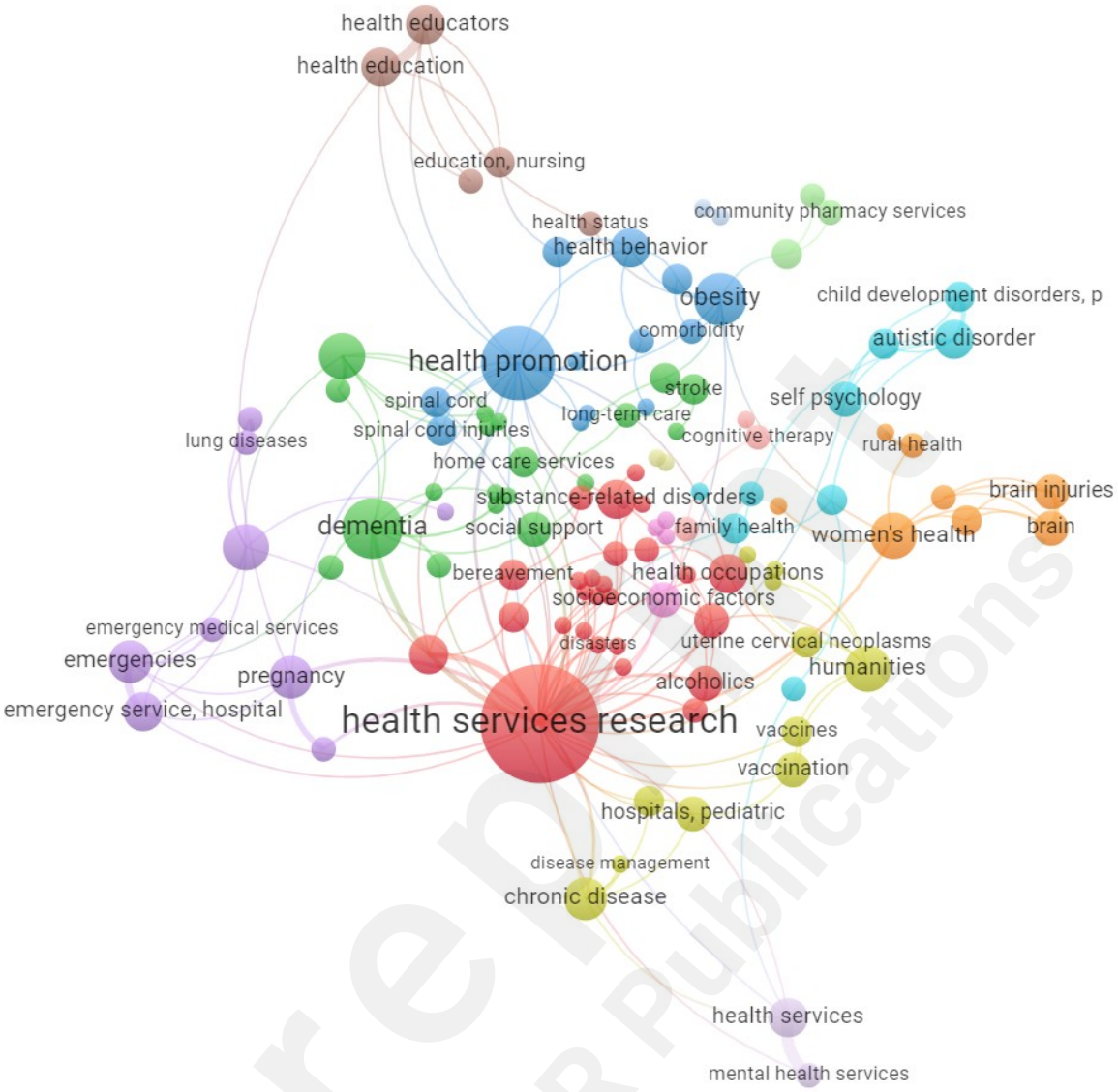

Figure 6. *VOSviewer generated an image representing the co-occurrence of keywords representing fields across the titles and abstracts of the academic literature. The size of the keyword bubble represents its importance in the number of co-occurrences. Each line represents a co-occurrence of the terms.*

Table 8. Co-occurrence of fields and diseases in academic literature

Field (cluster)	Co-occurrence Links (n=181), n (%)	Related topics
Health services research (red)	46 (25.41)	Community health services, medical education, health service accessibility, occupational health, occupational therapy, primary health care, social work, and substance-related disorders.
Health promotion (blue)	18 (9.94)	Health policy, mental health, professional practice, school health services, rheumatic diseases, and spinal cord injuries.

Dementia (green)	12 (6.63)	Emergency nursing, home care services, home nursing, long-term care, community health nurses, social support, and terminal care.
Palliative care (purple)	7 (3.87)	Emergencies, emergency medical services, hospital emergency services, pregnancy, and lung diseases.
Women's health (orange)	7 (3.87)	Brain injuries, maternal welfare, rural health, and supported employment.
Humanities (yellow)	7 (3.87)	Disease management, pediatric hospitals, chronic disease, organizational innovation, quality health care, and vaccinations.
Health education (brown)	5 (2.76)	Nursing education, health educators, and health status.
Family health (teal)	3 (1.66)	Anxiety, autistic disorder, child development disorder, disabled persons, learning disorders, and self-evaluation programs.

Academic Versus Grey Literature

This study resulted in the extraction of a total of 956 methods used in co-creation. Subsequently, the cross-comparison of the two sets of methods resulted in three distinct categories. Among these, 16.2% (155/956) of the methods were sourced from academic literature, 73.6% (704/956) were sourced from grey literature and 10.2% (97/956) methods were sourced from both academic literature and grey literature. This comparison is visualized in (Figure 7), and a full list of methods per source type can be found in (Multimedia Appendix 7).

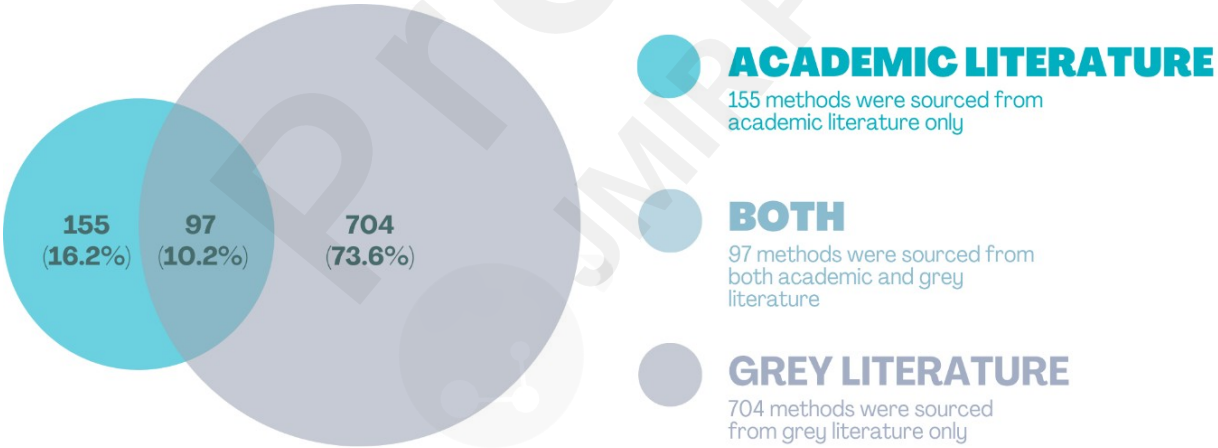

Figure 7. *Venn diagram of methods sourced from academic, grey literature, or both. Percentages represent the portion of the total methods (n=956).*

Discussion

This study is the first systematic methods overview of co-creation, systematically identifying and delving into both academic and grey literature to extract and analyze the methods employed, along with their interrelationships within these studies and across source types. This study can facilitate the identification of methods suitable for co-creation endeavors, while also highlighting discrepancies

between co-creation in research and non-academic contexts. By offering a comprehensive and reliable snapshot of co-creation and its associated methods, this research enhances transparency regarding how co-creation is executed in both research and practice. The study serves as a foundational resource, providing an evidence-based and systematic inventory of methods, as well as shedding light on which methods are commonly used in conjunction with one another. This innovative approach to conducting a systematic methods overview enables the comprehensive analysis of a vast amount of literature and methods, offering valuable insights into the landscape of co-creation practices and methodologies globally and across disciplines.

Principle Results

Greenhalgh et al state, "...methods can fruitfully travel, albeit gaining new purposes and meanings… transformations occur when methods cross disciplinary border" [11]. This emphasizes the value of understanding not only what methods are used, but also how methods are adapted and applied in new disciplines. A notable strength of this study lies in its utilization of methods sourced from a published and high-quality database of co-creation literature spanning from 1970 to 2022. This literature represents the largest known dataset about co-creation in various disciplines and contexts. This study serves as a foundational work that can be used to elucidate the interrelationships between different co-creation methods and co-creation processes. This study adopts an unbiased approach by providing a comprehensive overview of current co-creation practices, without prescribing specific methods or recommendations. By providing an overview of current co-creation practices, this study establishes a platform for further research and analysis into the various ways in which people design and execute co-creation. Furthermore, this study reveals a stark difference between academic and practitioner approaches to co-creation, highlighting the importance of understanding and bridging these disparities.

Multimethod approach

In the realm of research methodologies, each type has its unique characteristics and applications. For instance, approaches such as qualitative, quantitative, and ethnographic studies offer different lenses through which to explore phenomena. Qualitative methods delve into the subjective experiences and perspectives of individuals, capturing rich narratives and deep insights. Quantitative methods, on the other hand, focus on numerical data and statistical analysis to uncover patterns and relationships. Ethnographic methods immerse researchers in the cultural context of their subjects, providing a holistic understanding of social phenomena. Finally, participatory methods emphasize collaboration between researchers and stakeholders. Unlike traditional research methods, which prioritize objectivity and distance, participatory methods prioritize engagement and collective decision-making.

This study reveals that co-creation, as a methodology, represents a fusion of various types of methods. Co-creation combines methods for qualitative inquiry and analysis, quantitative analysis, ethnographic observation, and participatory collaboration. This amalgamation offers great potential for generating innovative solutions, fostering stakeholder engagement, and addressing complex challenges. However, the convergence of multiple methods also introduces challenges, including potential divergences in processes and outcomes between co-creation projects. Overall, the mixed nature of co-creation presents both opportunities and challenges.

The Gap Between Academics and Practitioners

While analyzing the data within this study, a clear gap exists between the practices documented in academic literature and those employed by practitioners in non-academic settings. This divergence may stem from various factors, including differences in reporting styles, publication platforms, and the emphasis placed on outcomes versus process documentation. Academic publications often

prioritize the reporting of research outcomes and their impact, allocating limited space for detailing the intricacies of the co-creation process method by method. Conversely, practitioners may opt to disseminate their co-creation endeavors through alternative channels, such as reports, case studies, or online platforms, where they have more flexibility to document their methods. However, this discrepancy in reporting practices poses a significant challenge for the scientific community. Without detailed documentation of each method employed in the co-creation process, replication and validation of findings become challenging. Furthermore, the lack of transparency in documenting co-creation methods hinders knowledge sharing and collaboration among researchers and practitioners.
This gap underscores the importance of adopting standardized reporting guidelines and best practices for documenting co-creation, regardless of the publication platform. One notable observation is the prevalence of co-creation methods outside of academic literature. While academic research may provide valuable insights into theory and methodology, it appears that the majority of the co-creation methods are published on non-academic platforms. This raises questions about the transparency and documentation of co-creation processes. Efforts to bridge the divide between academic and practitioner perspectives on co-creation are essential for advancing knowledge, promoting collaboration, and maximizing the impact of co-creation initiatives. By fostering greater transparency, documentation, and knowledge sharing, researchers and practitioners can enhance the rigor and reproducibility of co-creation.

Limitations

Although we achieved our objectives by conducting a systematic overview of methods, our approach has some limitations including single screening of the grey literature and the lack of full-text screening of the academic literature. However, we recognize that this work was conducted in a peer-reviewed pre-curated database of co-creation literature, and the complexity of the screening of grey literature was not high enough to necessitate double screening and extraction.

Comparison with Prior Work

Grindell et al emphasize the distinctiveness of collaborative approaches, such as co-creation, co-design, and co-production, in contrast to traditional methodologies of applied health research. They emphasized that these collaborative methods foster meaningful engagement with co-creators, including those who are not traditionally involved in research. Studies favoring creative methods found that design and participatory approaches effectively engaged co-creators with their emotions, and abilities, and retained their involvement throughout the process [29]. Furthermore, prototyping methods were found to be valuable for translating knowledge into tangible objects, while visual design methods facilitated the rapid communication of ideas in an accessible manner. The utilization of creative methods was observed to promote a shared understanding of the problem and identify critical needs, thus addressing power differentials and fostering a sense of ownership among stakeholders [29].
Furthermore, Louise and Annette highlight the significance of employing participatory methods, emphasizing their potential applicability to intervention development and their capacity to transcend traditional boundaries [11]. When executed effectively, participatory methods offer numerous benefits, including genuine stakeholder involvement, a holistic understanding of multiple perspectives, an iterative and investigative approach, and a commitment to enacting meaningful change for those directly affected by the outcomes [11]. Additionally, Grindell et al emphasized the importance of documenting the methods used in co-creation research, as researchers rely on qualitative research methods (such as focus groups, observations, and interviews) when other, more creative methods, can achieve the same aim (such as role playing, personas, user journeys) [29]. These conclusions underscore the importance of employing participatory and creative approaches in co-creation processes to build trust, confidence, and collaborative solutions.

Considering the documented benefits of using these types of methods, this study reveals that the way people are currently co-creating is leaning heavily on qualitative methods. While qualitative methods provide rich insights into individual subjective experiences and perspectives, incorporating diverse approaches such as creative or participatory methods could further enhance stakeholder engagement, understanding, and problem-solving in co-creation processes.

There is a growing concern regarding participation fatigue in co-creation, alongside the risk of heightened inequity when only specific demographic groups engage, potentially leading to disengagement [30,31]. Hegna et al stress that co-creation should empower individuals to participate actively as citizens with the chance to genuinely influence outcomes [31]. Various methods, including focus groups, one-on-one discussions, and creative workshops, are utilized for involvement and engagement. However, patients increasingly advocate for greater autonomy in determining the extent and nature of their involvement in research processes. In contexts like co-production and participatory action research, traditional distinctions between researchers and participants are challenged, resulting in blurred boundaries and a reassessment of power dynamics [11]. This study underscores that the multi-method approach to co-creation primarily integrates various qualitative methods, with the more creative or participatory methods often found in non-academic grey literature. Consequently, academics appear to solely rely on qualitative methods, creating a lack of using non-academic sources for guidance and inspiration. This heavy reliance on qualitative methods may increase the risk of disengagement, reassessment of power dynamics, or participation fatigue.

Next Steps

Moving forward, it would be valuable to delve deeper into characterizing the methods used in co-creation in a manner that aligns with key co-creation characteristics. This involves exploring how each method contributes to the principles of collaboration and shared decision-making inherent in co-creation processes. Also, given the wide array of methods employed in co-creation, there is a pressing need to develop a systematic framework for organizing and categorizing these methods. Such a framework could facilitate better understanding and navigation of the vast landscape of co-creation methods, enabling researchers and practitioners to identify relevant methods more efficiently and effectively.

To gain a deeper understanding of why people choose certain methods over others in co-creation, further research is needed to explore the factors influencing method selection. This includes investigating the role of contextual factors, individual needs, organizational constraints, and project objectives in shaping decisions. By gaining insights into the decision-making processes behind method selection, we can develop more tailored and effective approaches for supporting the design of co-creation projects. Finally, there is a need to develop tools and resources that enable stakeholders to quickly search, select, and adapt methods for co-creation projects. By streamlining the method selection process and providing guidance on method implementation, we can enhance the efficiency and effectiveness of co-creation efforts across diverse contexts and domains.

Conclusions

This study has yielded the first systematic overview of methods utilized in co-creation, intending to provide researchers and practitioners with a nuanced understanding of methods used in co-creation to date. By increasing awareness of co-creation methods, we seek to unlock the full potential of co-creation and contribute to its advancement as a transformative methodology for research and practice. The analysis of methods sourced from both academic and grey literature revealed a rich array of methods employed in co-creation, spanning participatory, qualitative, quantitative, mixed, and ethnographic approaches. This diversity underscores the versatility of co-creation methods, which can adapt to varying study objectives, target groups, contexts, and other influencing factors. However, it also highlights the need for more detailed guidance on method selection, method

grouping, and application to ensure co-creation remains effective and meaningful.
This systematic exploration of co-creation methods offers valuable insights for individuals engaged in, or aspiring to be involved in, co-creation. By illuminating the diverse landscape of co-creation methods, this study aims to enable researchers and practitioners to make informed decisions and enhance methodological rigor and innovation in co-creation. Through continued research and collaboration, we can further advance co-creation as a dynamic and impactful methodology for addressing some of the most pressing complex or wicked public health challenges.

Acknowledgments

The authors would like to thank Julie Smith, Librarian at Glasgow Caledonian University, for her input on the grey literature search strategy. This study was funded by the European Union's Horizon 2020 Research and Innovation Program under the Marie Skłodowska-Curie grant agreement 956501. The views expressed in this manuscript are the author's views and do not necessarily reflect those of the funders.

Data Availability

The inventory of methods sourced from both academic and grey literature is available on Zenodo under the name *Co-Creation Methods Inventory: Sourced from Academic and Grey Literature* [32]. The Sankey diagram is available on Zenodo under the name, *Co-occurrence of Methods in Co-Creation: A Sankey Diagram* [28].

Authors' Contributions

DMA, AS, and SC conceived the study, and DMA led the study. DMA wrote the manuscript. AS, DMA, GB, and SC edited the manuscript. DMA developed the search strategy. DMA conducted the search in academic and grey literature. DMA executed the screening steps, and extraction, conducted the bibliometric analysis, and generated all the figures. GB conducted the method frequency and co-occurrence analysis. The manuscript was then reviewed and approved by all authors.

Conflicts of Interest

None declared.

Abbreviations

BM25	Best Match 25
HC-CCDB	Health CASCADE Co-Creation Database

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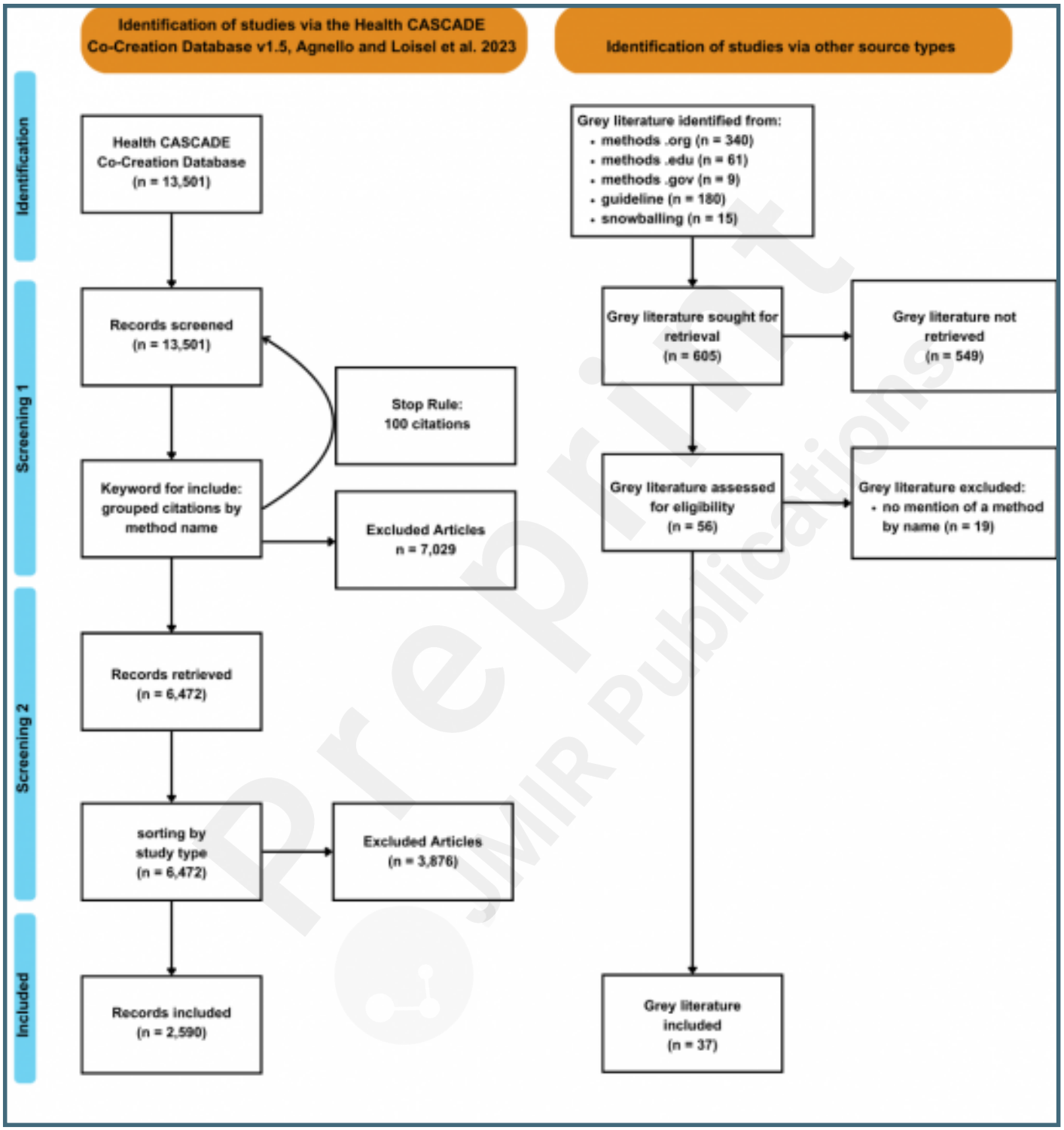
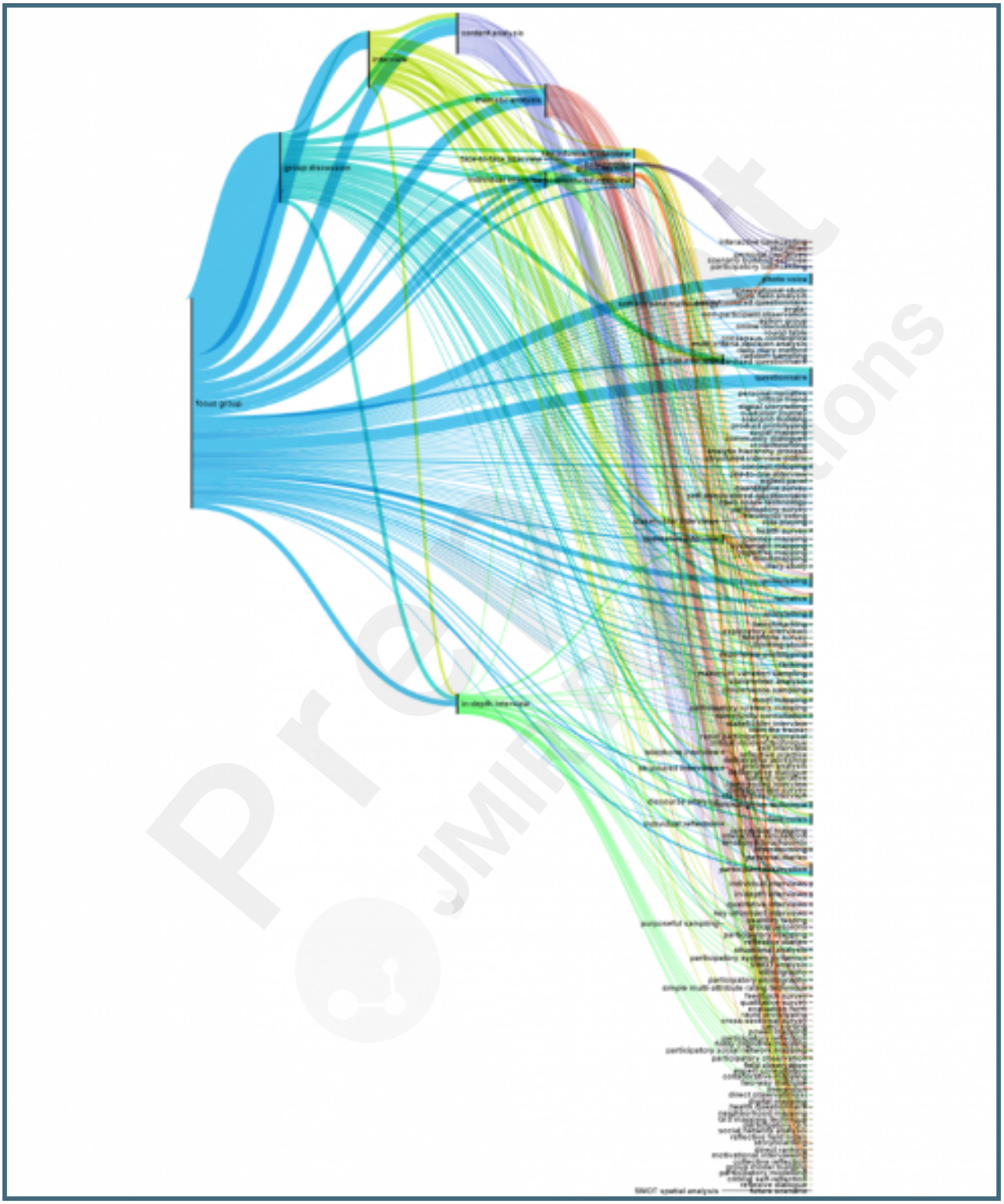
Supplementary Files

Figures

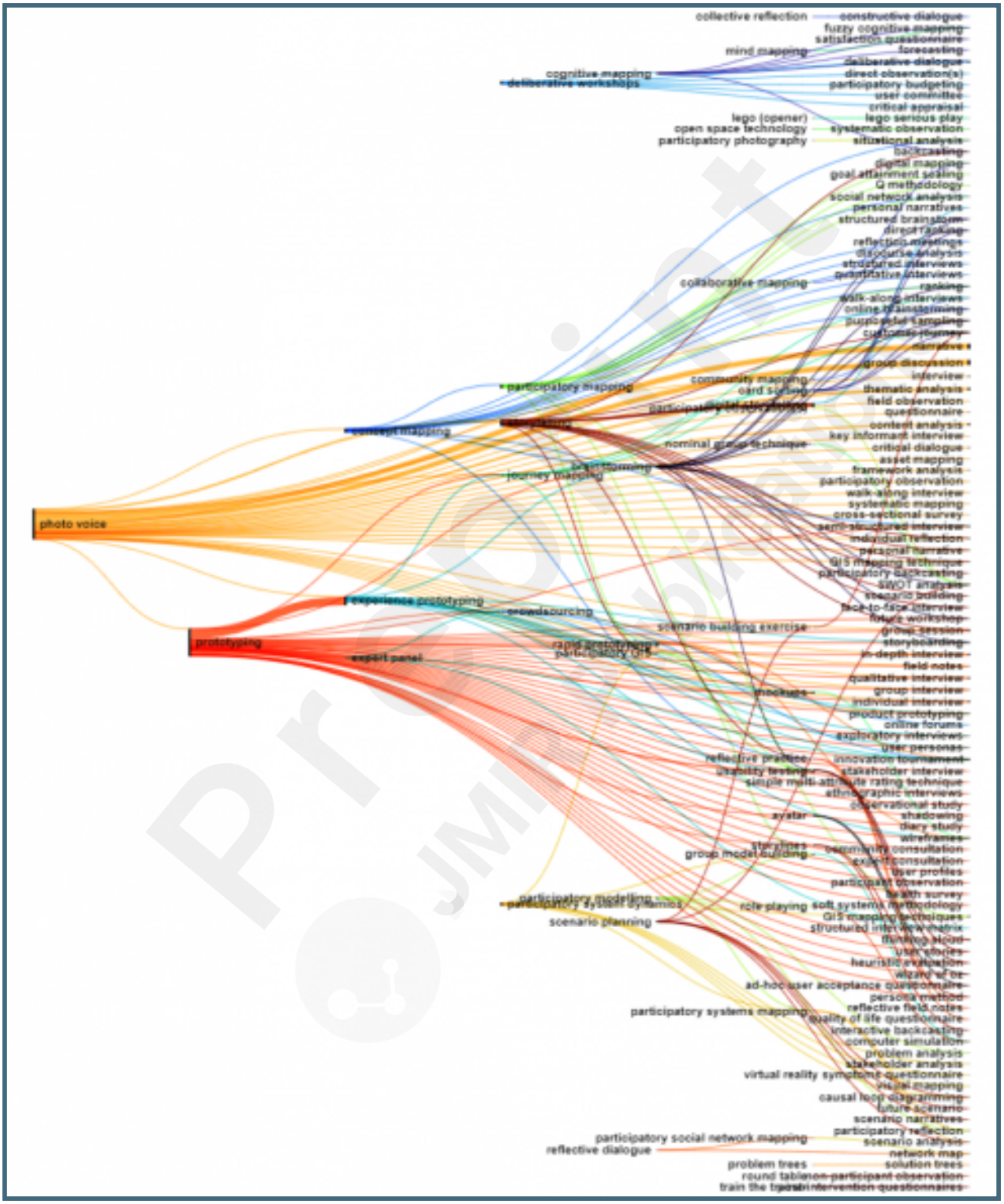
PRISMA-like flow chart of the screening processes for the systematic methods overview with two sources: (1) academic literature and (2) grey literature.



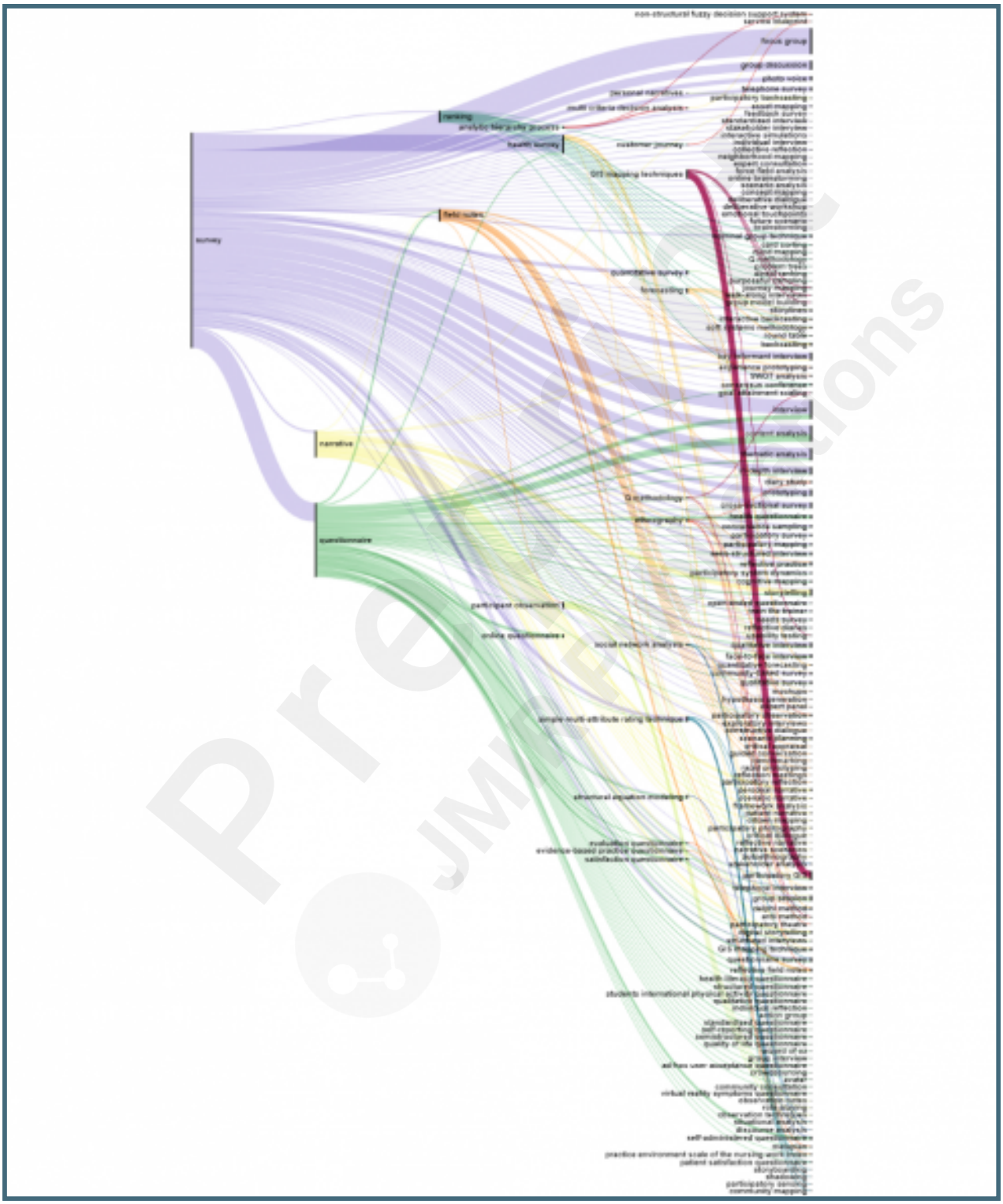
Sankey Diagram illustrating the co-occurrence of qualitative methods with other research methods in academic literature. Source methods are displayed on the left side (n=22), and target methods on the right (n=149). The thickness of the line indicates the frequency of co-occurrences across the literature, with thicker lines representing more frequent co-occurrences between methods.



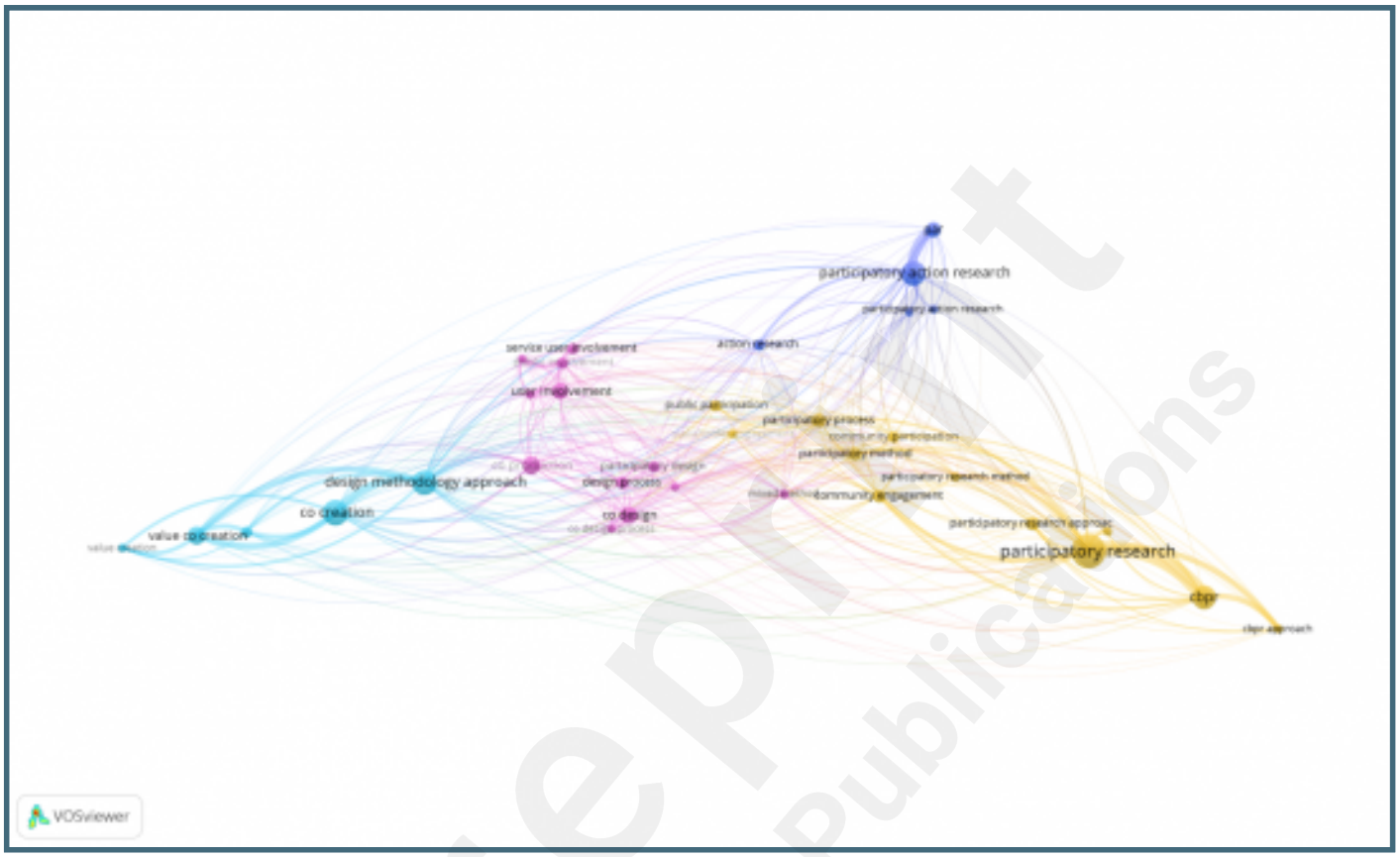
Sankey Diagram illustrating the co-occurrence of participatory methods with other research methods in academic literature. Source methods are displayed on the left side (n=42), and target methods on the right (n=132). The thickness of the line indicates the frequency of co-occurrences across the literature, with thicker lines representing more frequent co-occurrences between methods.



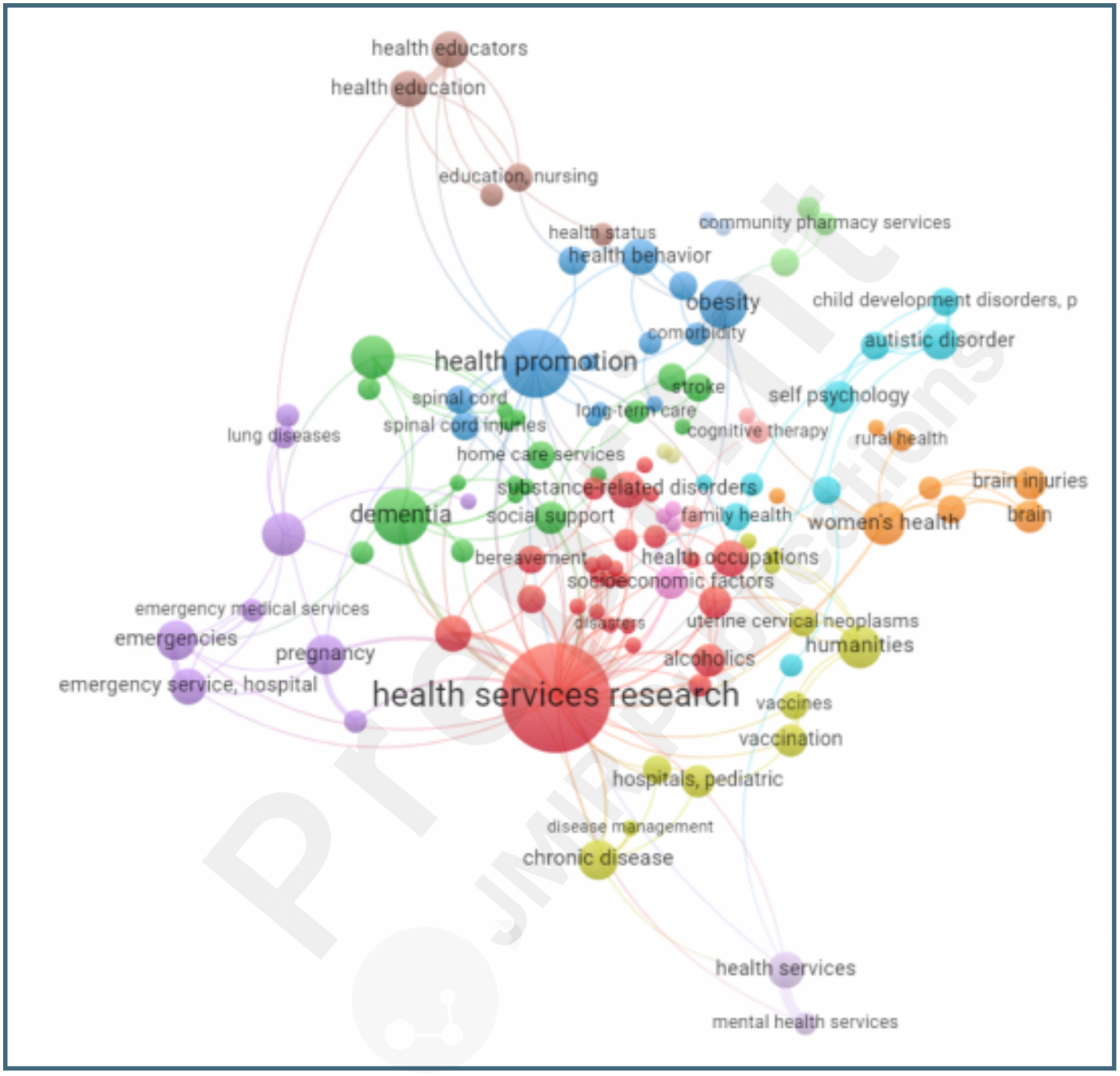
Sankey Diagram illustrating the co-occurrence of quantitative, mixed, and ethnographic methods with other research methods in academic literature. Source methods are displayed on the left side (n=24), and target methods are on the right (n=156). The thickness of the line indicates the frequency of co-occurrences across the literature, with thicker lines representing more frequent co-occurrences between methods.



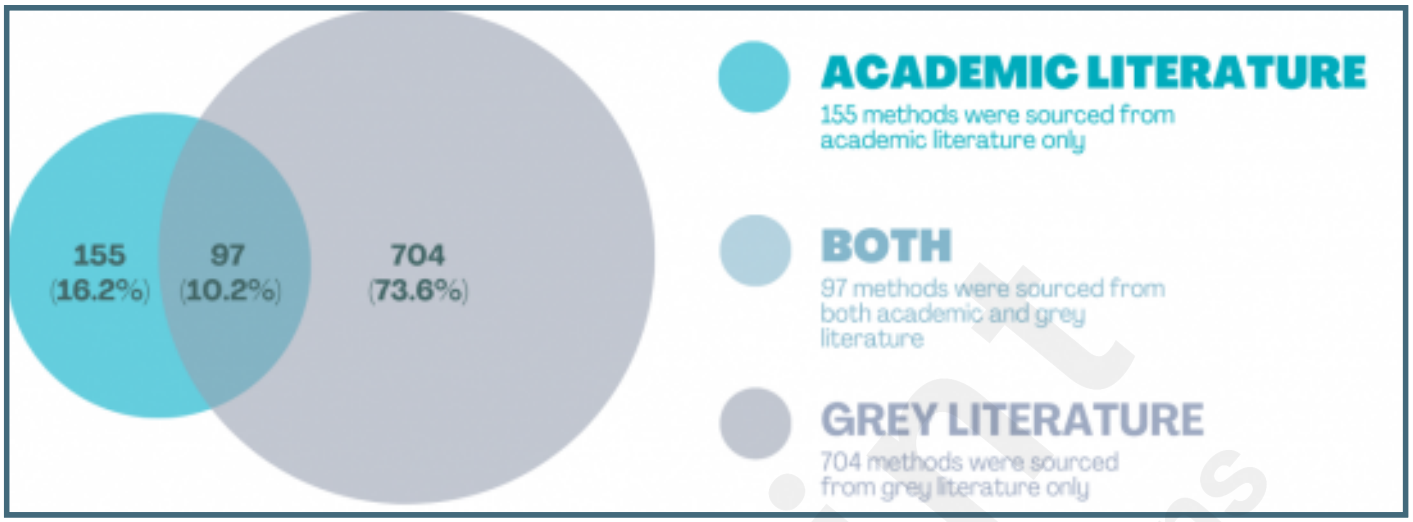
VOSviewer generated an image representing the co-occurrence of keywords representing methodologies across the title and abstracts of the academic literature. The size of the keyword bubble represents its importance in the number of co-occurrences. Each line represents a co-occurrence of the terms. cbpr: community-based participatory research; par: participatory action research; ppi: public and patient involvement.



VOSviewer generated an image representing the co-occurrence of keywords representing fields across the titles and abstracts of the academic literature. The size of the keyword bubble represents its importance in the number of co-occurrences. Each line represents a co-occurrence of the terms.



Venn diagram of methods sourced from academic, grey literature, or both. Percentages represent the portion of the total methods (n=956).



Multimedia Appendixes

Grey literature search strategy and results.
URL: http://asset.jmir.pub/assets/2232dd124ad159dcdbd178857a1ccc71.docx

VOSviewer Analysis.
URL: http://asset.jmir.pub/assets/c4c18c3c6345bd7e9cc58b4bb9fbc8d2.docx

PRISMA 2020 Checklist.
URL: http://asset.jmir.pub/assets/fca5d0421c1f697db92da95b08bb932e.docx

Academic literature methods extraction.
URL: http://asset.jmir.pub/assets/90c9fd264a6d9cbb4fb990269fde2b46.xlsx

Grey literature extraction results.
URL: http://asset.jmir.pub/assets/125aad4dc5608f084d81dcd83cf90ee1.xlsx

Sankey diagram of co-occurrence of methods in academic literature.
URL: http://asset.jmir.pub/assets/45776391a69051fae1205b1ae25ede12.xlsx

Academic versus grey literature.
URL: http://asset.jmir.pub/assets/106866182ab14bb8ec3bd3f34f444d17.xlsx

TOC/Feature image for homepages

Co-creation is a collective intelligence process.