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ARTICLE

Mapping the evolution of sampling design in large-scale surveys: A comprehensive systematic analysis of global trends, methodological dynamics, and journal impact in survey research and data science

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Abstract

An accurate and efficient sampling design plays a vital role in ensuring the reliability, validity, and representativeness of data collected through large-scale surveys. As survey research and data science have developed, the ways of planning and carrying out sampling have steadily evolved to keep up with new challenges and technologies. This study presents a comprehensive systematic analysis of the evolution of sampling design, exploring global trends, methodological developments, and thematic progressions within this essential field. Drawing on 262 publications published between 1979 and 2024, the research maps the trajectory of scholarly contributions, highlighting both established and emerging areas of interest. The analysis of country contributions demonstrates long-standing leadership from particular high-output nations, as well as increased engagement from developing countries. Thematic findings highlight a consistent increase in scholarly output over recent decades, with a focus on methodological issues such as variance estimates, sampling weights, and probabilistic design techniques. Network, factorial, and trend studies demonstrate these concepts' interconnection and changing importance within the subject. This study not only synthesizes decades of academic discourse but also underscores the need for continuous methodological refinement to address the complexities of modern data environments. The findings offer valuable direction for future research and contribute to strengthening the foundations of survey methodology.

Keywords: Sampling Design; Survey Research; Variance Estimation; Multi-stage Concept; Bootstrap.

1. Introduction

Sampling design is a cornerstone of large-scale survey research, directly shaping the accuracy, reliability, and interpretability of collected data. As surveys have expanded to address increasingly diverse populations and complex social, demographic, and health issues, the methods used to select representative samples have evolved considerably (Rao & Fuller, 2018). Early applications of simple random and systematic sampling have gradually given way to more sophisticated multi-stage and stratified designs, which improve efficiency while ensuring adequate representation across varied population subgroups (Kalton, 2019).

Over the years, developments in statistical methodologies and advancements in technology and data science have transformed the landscape of survey design. Techniques such as variance estimation,

weighting adjustments, and probabilistic sampling have become essential tools in addressing bias, non-response, and sampling error issues (Srivastava, 2017). These methodological improvements are crucial in national and international health, demographic, and economic surveys, where accurate data underpin evidence-based policymaking. Furthermore, the growing emphasis on inclusivity and coverage of marginalized or hard-to-reach populations has placed additional demands on sampling frameworks, requiring continuous methodological adaptation (Einax *et al.*, 1997). At the same time, the proliferation of data sources and digital tools has opened new possibilities for integrating traditional sampling methods with innovative approaches. As a result, sampling design has emerged as a dynamic and multidimensional field, critical to the ongoing advancement of survey research and data science (Roy, 2016).

The evolution and improvement of the multi-stage design in large-scale surveys such as the World Fertility Survey (WFS), Multiple Indicator Cluster Surveys (MICS), Demographic and Health Surveys (DHS), District Level Household and Facility Survey (DLHS), and National Family Health Survey (NFHS) have revolutionized data collection methods and improved the accuracy and reliability of survey results over time. The multi-stage design involves a systematic process that divides the survey area into clusters, randomly selects a representative sample of clusters, and then selects households followed by individuals within those selected clusters (Verma *et al*., 1996; Demarest *et al*., 2013). This approach allows for efficient data collection, especially in complex and diverse settings. With technological advancements and statistical methodologies, these surveys have benefited from increased precision, reduced costs, and improved representativeness. Moreover, the multi-stage design has facilitated the inclusion of marginalized populations and remote areas, ensuring more inclusive and comprehensive survey coverage (Aromaa *et al*., 2003)**.** These ongoing developments have played a vital role in generating high-quality data for evidence-based decision-making, policy formulation, and program evaluation, ultimately contributing to improved social and public health outcomes (Berchtold, 2007).

Despite the advancements in multi-stage design, large-scale surveys face challenges and limitations. Non-response and sampling errors are persistent concerns that need to be addressed. Ensuring coverage and representativeness, particularly in hard-to-reach populations, remains a challenge (Van Der Heyden *et al*., 2014). Methodological issues in complex settings, such as conflict-affected areas or urban slums, require tailored approaches. Looking ahead, future directions for developing and improving multi-stage design in large-scale surveys include integrating new technologies, such as mobile data collection and geospatial mapping (Bruin *et al*., 1996; Quataert *et al*., 1998). Strengthening survey methodologies through capacity-building initiatives and research collaborations can further enhance the quality and relevance of survey data. Addressing emerging challenges, such as data privacy and the ethical use of technology, will be crucial for maintaining public trust and ensuring the continued value of large-scale surveys in evidence-based decision-making (Tanur, 1983).

In academic research, literature reviews are critical for gathering current information and assessing the condition of an area**.** Prior to performing the new study, researchers often gather accessible evidence on a topic or issue to assess the condition of the existing evidence. Several important studies on survey design research have been conducted over the years. The survey design was established as a basic discipline rather than a particular topic from the beginning of design studies (Archer, 1979). Many study subjects centered on design have emerged along the way. Furthermore, themes like robust design, design optimization, and tool support are gaining traction (Liu & Boyle, 2009) . To the best of our knowledge, no researcher has used a quantitative technique to thoroughly examine the field of design research. In line with Pilkington & Meredith (2009), this study analyses the area of survey design research using bibliometrics, citation, co-citation, and social network analysis

methodologies. One popular method for doing a quantitative examination of the literature is bibliometrics. It's one of the few quantitative methods that look at citations, co-citations, or the combination of the two and may offer an unbiased perspective (Ramos-Rodrígue & Ruíz-Navarro, 2004). In addition to citation analysis, network analysis may be used to examine the social relationships between the selected major topics in more detail (Suzuki & Shimodaira, 2006). The study of relationships and interactions between a collection of branches in the subject it is necessary to understand the study field, phenomena, or data (Borgatti *et al.*., 2015). A series of links that indicate the impact connect one topic to another in a social network study (Malta *et al.*., 2008). A social network diagram can visually represent these relationships and the degree of affinity for simple and clear comprehension. Our Study focuses in the systematic review of the development of the survey design in the field of Demographic and Health Surveys and its new branches that have evolved over the years. (Szwarcwald, 2023).

This study aims to provide a comprehensive evaluation of the evolution of sampling design within survey research, examining how methodological frameworks, global contributions, and thematic priorities have progressed over time. By systematically analyzing trends from 1979 to 2024, the study offers a clear scenario of how survey research has adapted to emerging statistical techniques and complex data environments, while identifying persistent challenges and areas for further methodological refinement.

2. Materials and Methods

This review-based paper focused on studies that addressed several key methodological aspects: survey sampling, sampling error, and survey weight, as well as their implementation. To ensure a high standard of quality and relevance, only studies published in international, peer-reviewed journals and articles written in English were included. Additionally, the scope of the review was limited to research employing large-scale, multistage data.

2.1 Data sources and search strategy

Searching bibliographical databases generated potentially relevant publications for systematic review (PubMed, BMC, Scopus and Science Direct, etc). Google Scholar was also used to search for relevant literature. All international peer-reviewed articles and literature published in English in several time periods were included in the searches. Search terms used for “Survey sampling”, “Sampling error”, “survey weight”, “multi-stage”, “large scale” were matched to database-specific indexing terms.

2.2 Data extraction

Data extraction was carried out to identify and select the most relevant studies for this review. The process involved several steps. First, the titles of all retrieved papers were screened to check for relevance to the study topic. In the second step, the abstracts of the selected papers were reviewed for more detailed assessment. Finally, in the third step, the full texts of the shortlisted articles were examined to ensure they met the predefined selection criteria.

At each stage, papers were evaluated to confirm their focus on sampling design and related methodological aspects. Special attention was given to whether the studies addressed indicators such as design effect, sampling error, sampling weight, and sample size calculation methods. These factors were key to determining the papers' suitability for inclusion in the systematic analysis. Only studies meeting these criteria at all levels of screening were included in the final dataset.

2.3 Data Extraction using Scopus

The data extraction procedure for the study on the Evolution of Sampling Design entailed a systematic approach that included bibliographic analysis with a major focus on Scopus as the primary database. Scopus was chosen to provide a thorough collection of relevant papers because of its vast coverage of scholarly literature. The process included the development of particular search queries adapted to the intricacies of the Evolution of Sampling Design within the limits of the database. The search was done over a certain time period, and the results were refined using strict inclusion and exclusion criteria. Following the first search, duplicates were removed, and a detailed screening procedure was put in place to determine the relevancy of each article based on title, abstract, and keywords. The final output revealed a noteworthy set of 267 papers, thereby establishing a robust foundation for the subsequent stages of the research on the Evolution of Sampling Design.

2.4 Methodological Approach

This study used a systematic review and bibliometric analysis to investigate the evolution of sampling design research. Relevant studies were found using structured searches in databases such as Scopus, PubMed, and Google Scholar. Citation analysis, co-occurrence network analysis, factorial analysis, heat maps, and three-field plots were used to investigate research trends, influential themes, and the relationships between significant methodological concepts throughout time.

3. Results and Discussion

3.1 Completeness of data

Table 1 describes the information about the comprehensive nature of the data structure for the “Evolution of Sampling Design” The comprehensive nature of the data structure is evident in the detailed description of the results. The time span covered, from 1979 to 2023, provides a robust historical context for the study. The inclusion of 143 sources, comprising journals, books, and other scholarly materials, demonstrates the breadth of the literature considered (Figure 2). Figure 1 describes the analysis, which encompasses a total of 262 documents, showcasing a considerable body of work on the topic. The annual growth rate of 5.12% indicates a sustained and evolving interest in the evolution of Sampling Design over the years. The document contents are richly detailed, with 1328 Keywords Plus (ID) and 742 Author's Keywords (DE), offering a nuanced understanding of the terminology and concepts prevalent in the field. The extensive involvement of 568 authors, including 44 single-authored documents, underscores the diversity and depth of scholarly contributions. Collaborative efforts are highlighted by an average of 2.89 co-authors per document and an international co-authorship percentage of 25.19%, emphasizing the global perspective embedded in the research. Document types are varied, comprising 224 articles, 6 book chapters, 23 conference papers, 8 reviews, and 1 short survey, ensuring a well-rounded exploration of the evolution of sampling design across different scholarly formats.

Table 1. Information about the confirmation of data in the time span 1979 to 2024

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1979:2024
Documents	262
Annual Growth Rate %	5.12
Document Average Age	12
Average citations per document	30.5
References	5852
DOCUMENT CONTENTS	
Keywords Plus (ID)	1328
Author's Keywords (DE)	742
AUTHORS COLLABORATION	
Single-authored docs	50
Co-Authors per Doc	2.89
International co-authorships %	25.19
DOCUMENT TYPES	
Article	224
Book chapter	6
Conference paper	23
Review	8
Short survey	1

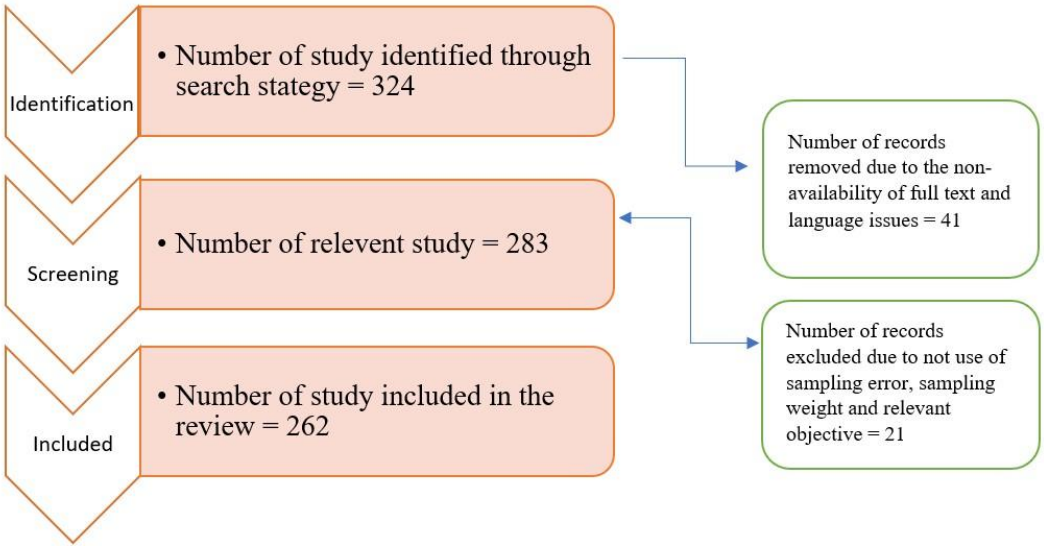

Figure 1. Flow chart of study selection process for an exploration of sample design and sampling error of large-scale surveys.

Completeness of bibliographic metadata

Metadata	Description	Missing Counts	Missing %	Status
AB	Abstract	0	0.00	Excellent
AU	Author	0	0.00	Excellent
DT	Document Type	0	0.00	Excellent
LA	Language	0	0.00	Excellent
PY	Publication Year	0	0.00	Excellent
TI	Title	0	0.00	Excellent
TC	Total Citation	0	0.00	Excellent
C1	Affiliation	1	0.38	Good
SO	Journal	1	0.38	Good
CR	Cited References	7	2.67	Good
DE	Keywords	19	7.25	Good
DI	DOI	30	11.45	Acceptable

Figure 2. Completeness of bibliographical metadata.

3.2 Annual Scientific Publication

Figure 3 describes the evolution of sampling design has witnessed a fluctuating but generally increasing trend in scholarly output over the years.

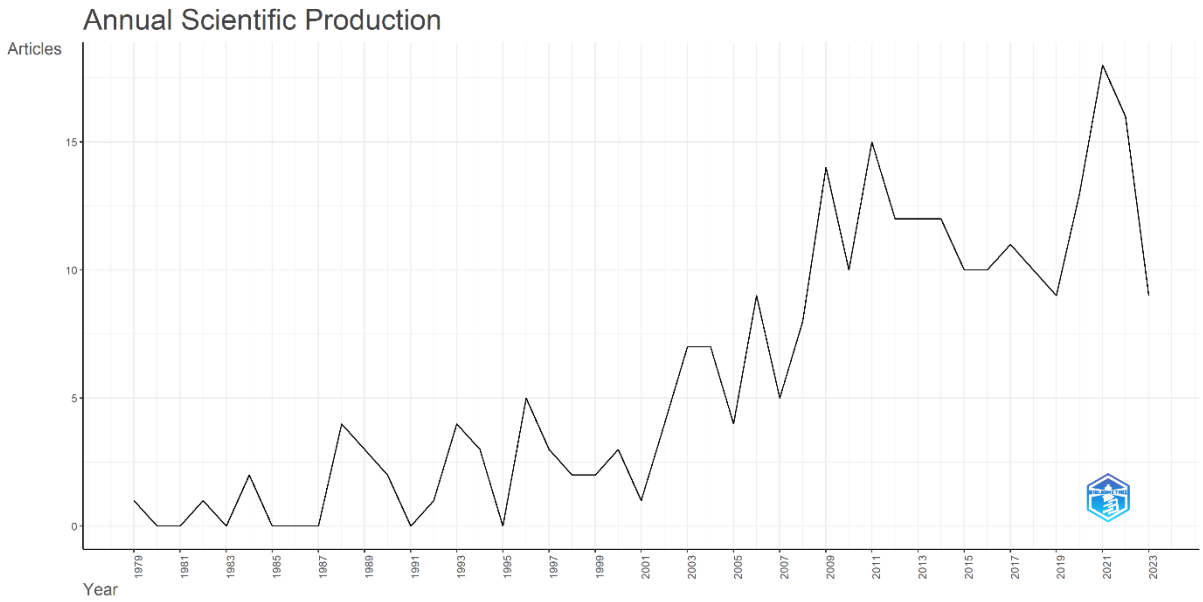

Figure 3. Annual scientific publication over the year.

In the early stages, particularly from 1979 to the late 1980s, the number of articles published annually remained sporadic, with occasional peaks in 1984 and 1988. However, scholarly participation gradually increased in the following years, reaching a tipping point in the early 2000s. The average number of papers published per year increased noticeably beginning in 2003, with peaks in 2008, 2011, and 2021. This increased trend represents an increase in interest

and research effort in the topic of the evolution of sampling design, with a particularly noticeable increase in the previous two decades. The statistics for 2022 and 2023 indicate a persistent and substantial academic contribution to this evolving topic.

3.3 Performance of various countries over time

Figures 4 and 5 shows the analysis of countries' performance in publishing papers on the evolution of sampling design. It reveals notable variations in their average article citations, reflecting the impact and reach of their contributions.

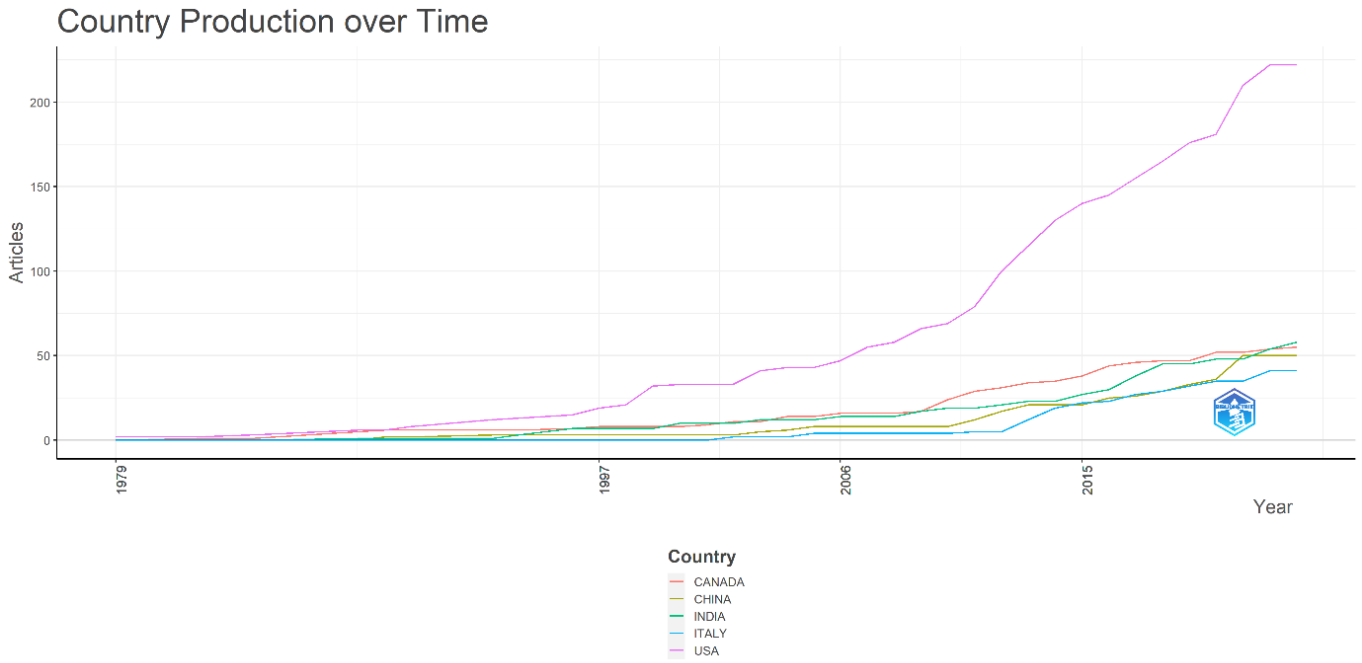

Figure 4. Countries performance over the year in the field of survey design.

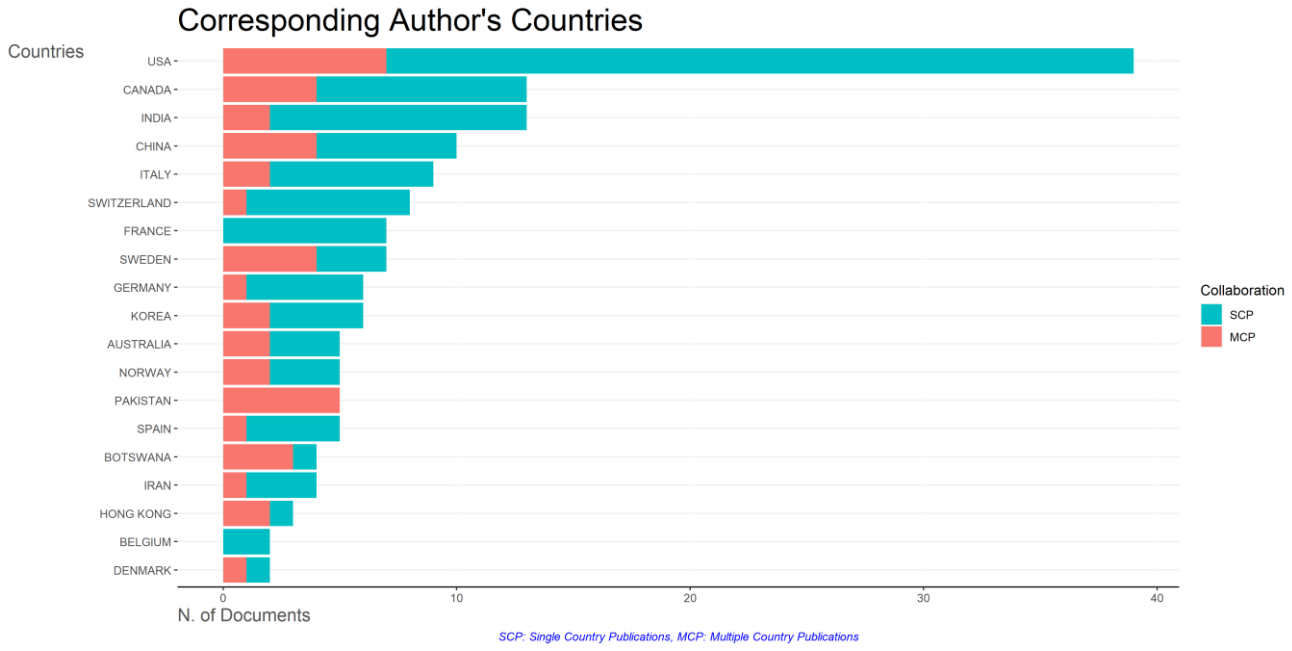

Figure 5. Corresponding Author's country information over the year in the field of Survey Design.

Figures 4 and 5 shows that the United States emerges as a leading contributor with an impressive average of 75.1 citations per article, indicating a high level of scholarly influence. Sweden and New Zealand also demonstrate strong performance, with averages of 42.6 and 63.5 citations, respectively. Switzerland, Norway, and Georgia exhibit moderate citation averages, suggesting a substantial impact of their research on the field (Figure 5). Notably, India, while having a lower average article citation of 3.1, underscores its active participation in contributing to the literature on the Evolution of Sampling Design. Despite a lower citation average, India's consistent involvement signals a growing presence in this scholarly discourse. The variations among countries highlight the diverse global engagement in this field, with each nation making unique and valuable contributions, ultimately enriching the understanding of sampling design evolution.

3.4 The three-field plot

Figure 6 presents a systematic analysis plot that offers a clear and broad overview of how research on the evolution of sampling design has developed over time. It combines information on country-wise contributions, average citations per article, and the main research themes in this area.

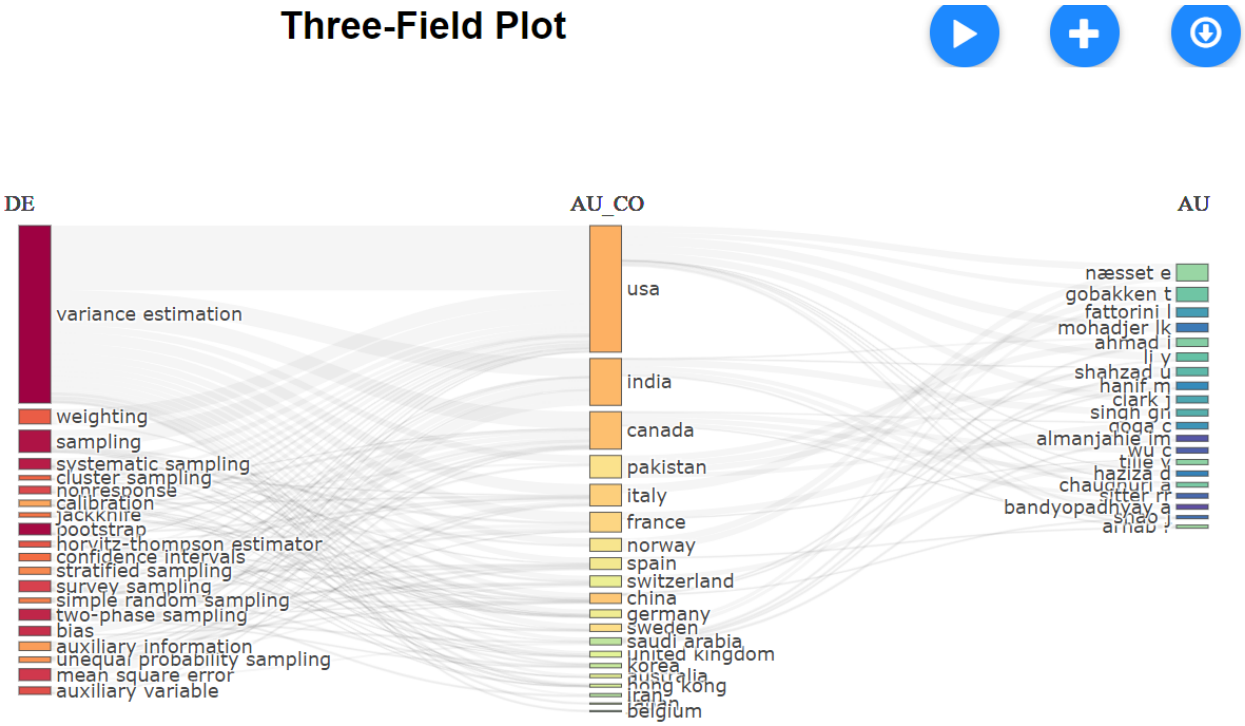

Figure 6. Three field plot.

Figure 6 shows that the United States leads the field with an impressive average per article, showing its strong influence on the subject. Other countries like India, Canada, France, and Switzerland are also actively contributing and showing steady growth in their research output. When looking at the main topics covered in the field, the analysis highlights that most studies have focused on important areas like "variance estimation," "sampling weight," and

"probabilistic design." These topics remain central because they address critical issues in making survey data accurate and reliable. However, the analysis also shows that less attention has been given to topics like "sampling error," suggesting a gap that future studies could explore. Overall, the three-field plot clearly illustrates how research on sampling design has become more diverse and interconnected. It highlights the important role of established and emerging countries in shaping the field and shows how different topics within survey methodology have developed and linked together over time.

3.5 Factorial analysis

Figure 7 displays the factorial analysis plot generated through systematic analysis, offering valuable insights into how different topics in survey design research are related to each other.

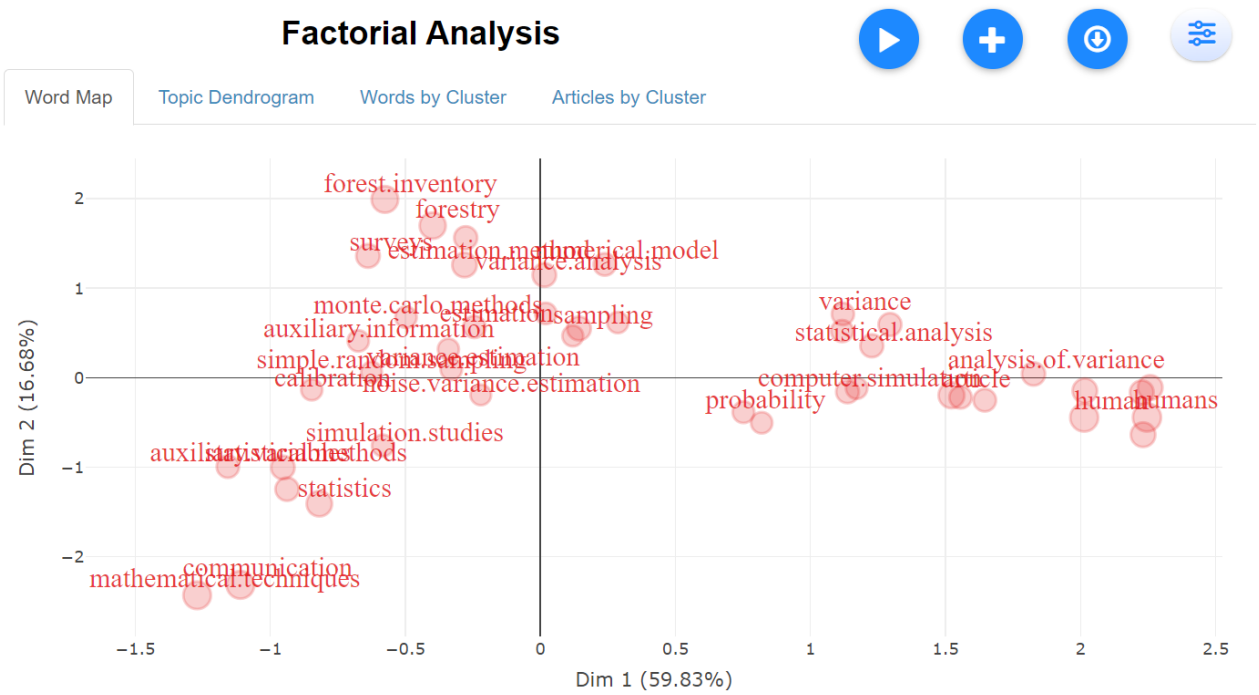

Figure 7. Factorial analysis plot in the field of survey design.

This visual tool presented by Figure 7 helps identify clusters of closely connected concepts and shows how various methodological themes have evolved together over time.

The analysis highlights strong connections between key topics like "variance estimation," "sampling weight," "sampling error," and "probabilistic design," confirming their central role in survey methodology. Additionally, it points to the growing importance of advanced techniques such as "multi-stage concept," "bootstrap," "jackknife," and "ratio method," which are increasingly being used to improve the accuracy and reliability of survey results.

The factorial plot clearly shows how these ideas are not isolated but rather interlinked, forming thematic groups that reflect the field's dynamic nature. This analysis helps explain how traditional sampling methods are gradually merging with modern, data-driven approaches to address new research challenges in complex and diverse survey settings. The factorial analysis adds depth to the understanding of the sampling design field by mapping the relationships

between established methods and emerging techniques, highlighting both the stability of core concepts and the introduction of innovative practices.

3.6 Tree map

The figure 8 is the "Tree" plot of Systematic Analysis offers a visual representation of the occurrence and impact of keywords within papers on the evolution of sampling design. The analysis highlights key terms that play a crucial role in shaping the discourse in this field. "Variance estimation" emerges as the most prominent keyword, featured in 11% of the papers, underscoring its fundamental importance in the research landscape. "Sampling" closely follows with 10%, reflecting the core focus on sampling techniques within the surveyed literature.

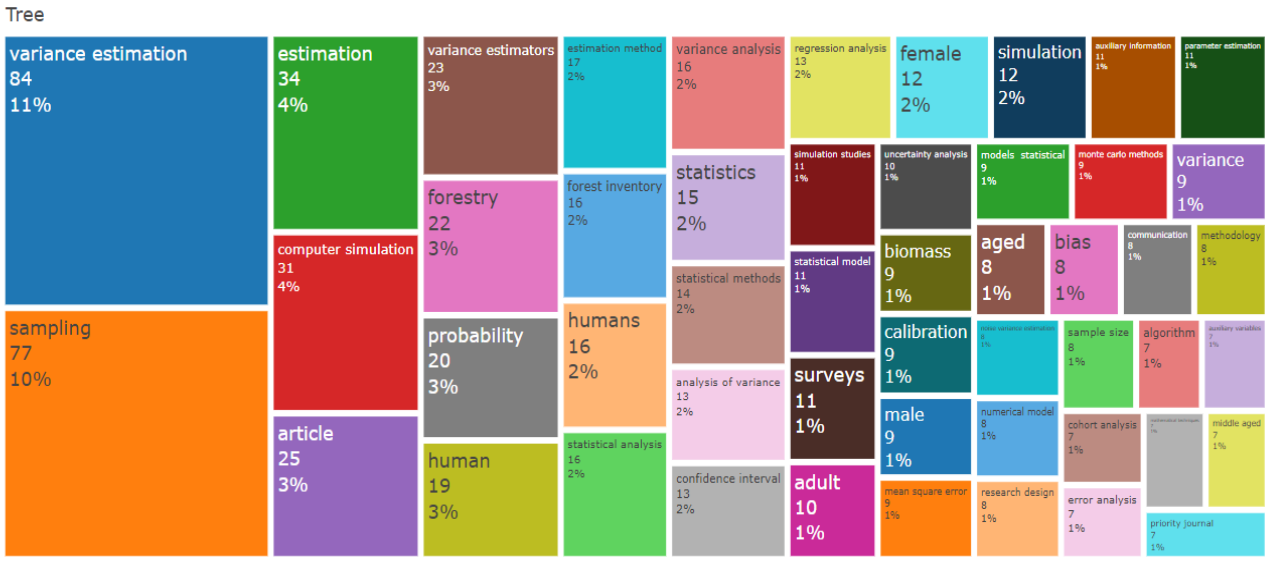

Figure 8. Tree plot in the field of survey design.

Figure 8 also shows that the incorporation of "Bayesian" (9%) and "Bootstrap" (5%) suggests a growing interest in advanced statistical methods and computer simulation, aligning with the evolving nature of research methodologies. Additionally, "Sampling weight," "Survey set," and "Probability" contribute to the richness of the discourse, each with varying percentages. This "Tree" plot not only provides a quantitative overview of keyword prevalence but also hints at the thematic diversity and interconnectedness within the evolution of sampling design literature. The visualization underscores the multidimensional nature of the research, capturing the intricate relationships among different aspects of survey methodology.

3.7 Network analysis

Figures 9 and 10 describe a Network Analysis and a Time series network in Systematic Analysis unveils the intricate connectivity of the Survey Design field with emerging branches such as "variance estimation," "sampling weight," "sampling error," "probabilistic design,"

"multi-stage concept," "ratio method," "bootstrap," "jackknife," and "Survey Set" over the time span 1979 to 2023. This visualization captures the relationships between these crucial components and indicates the strength and directionality of their connections. Keywords like "variance estimation," "sampling," "Bayesian," and "Bootstrap" emerge as central nodes, suggesting their high impact within the surveyed literature on the evolution of sampling design. The thickness of edges reflects the intensity of relationships, underscoring the interplay between different methodological aspects.

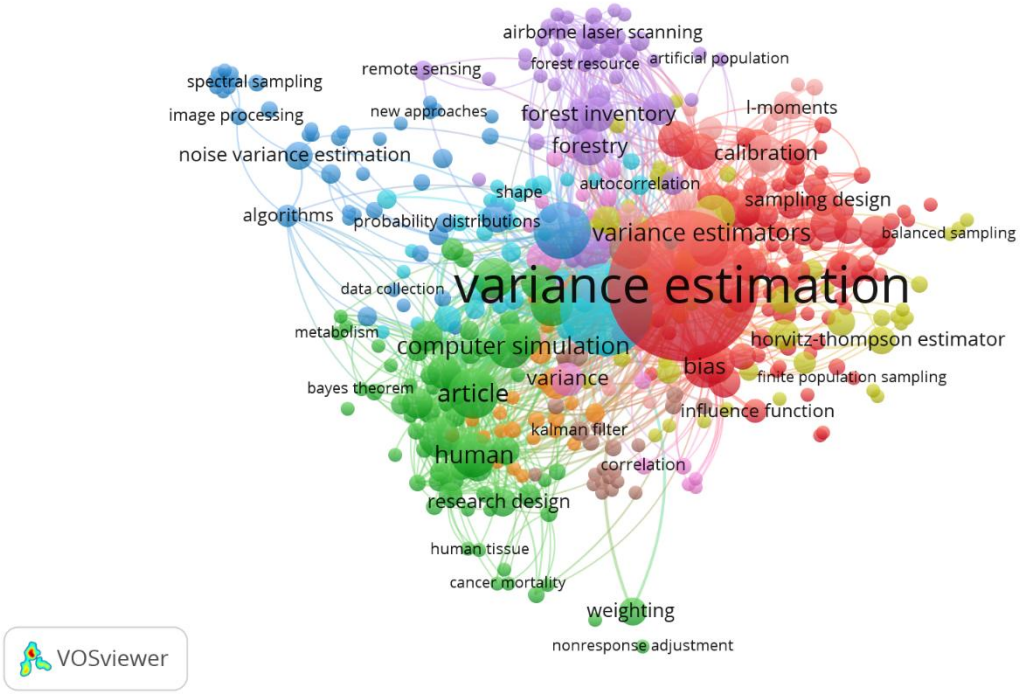

Figure 9. Network analysis plot in the field of survey design and evolving branches.

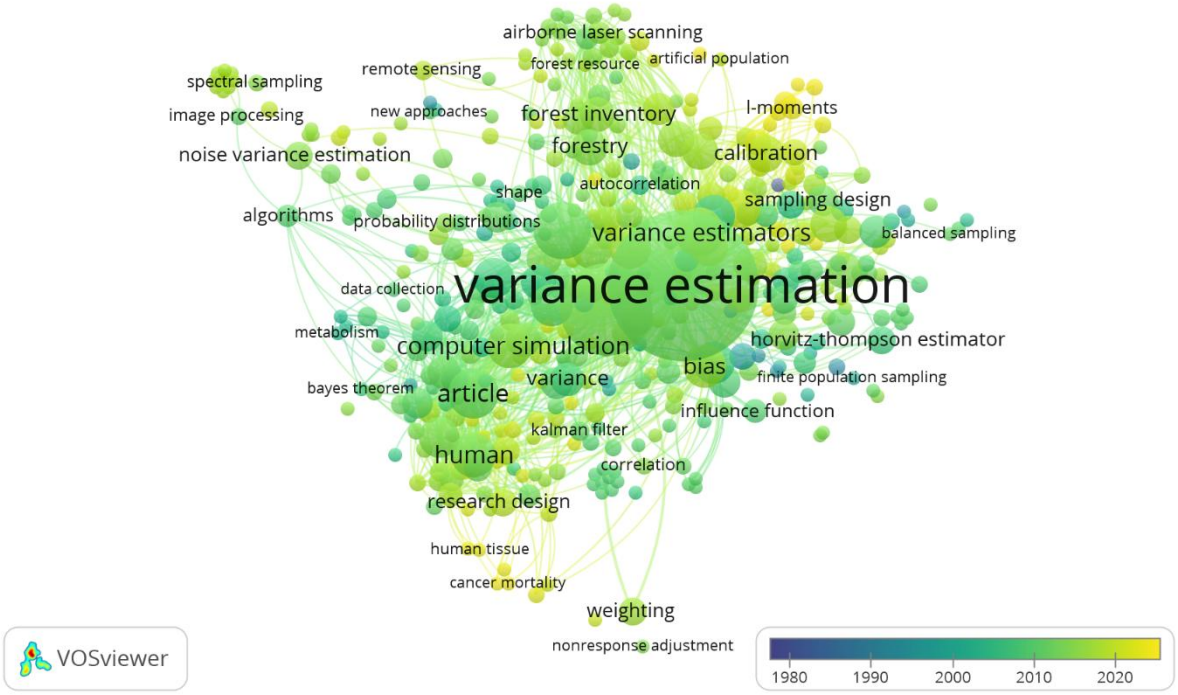

Figure 10. Time Series Span of Network Analysis.

Furthermore, Figures 9 and 10 shows that the network analysis reveals that "variance estimation" and "sampling" have particularly high impact, serving as pivotal points of connectivity and influence within the broader network. This methodological map enhances our understanding of the interdependencies and emphasizes the significance of specific concepts in shaping the discourse around sampling design evolution.

3.8 Heat map

Figure 11 presents a Heat Map generated through systematic analysis, offering a visual summary of how different topics and keywords have influenced the field of Sampling Design over time. The Heat Map uses color gradients, where brighter colors indicate areas with a stronger presence and higher impact in the literature. The analysis highlights that "variance estimation" and "sampling" are the most influential topics, consistently showing the highest intensity in the heat map. This confirms their central role in shaping the evolution of survey methodology, as also seen in the network analysis results. Other important factors like "sampling weight," "sampling error," and "probabilistic design" also appear prominently, though with slightly less intensity.

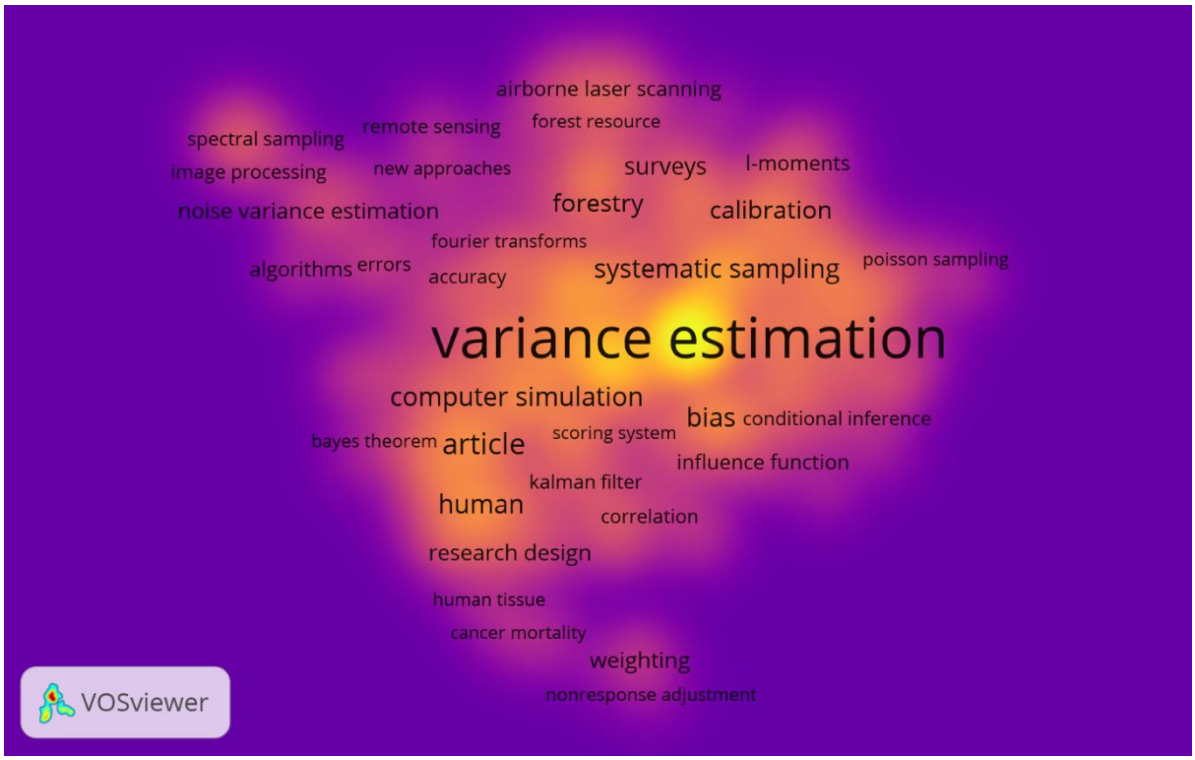

Figure 11. Heat map in the field of survey design.

The heat map presented in Figure 11 further reveals growing interest in newer themes such as "Bayesian methods," "Bootstrap," and "multi-stage concepts," reflecting the gradual shift towards advanced and adaptive sampling techniques in recent years. By visually identifying these hotspots, the heat map complements other analyses by pinpointing the core areas driving research activity and indicating emerging topics that deserve more attention in future studies. Overall, this analysis not only highlights the enduring importance of traditional sampling topics but also showcases how new methodological trends are increasingly influencing the direction of survey design research.

4. Conclusion

Our comprehensive systematic analysis of the evolution of Sampling Design provides a robust exploration of the dynamic trends and methodological nuances within data science and survey research. The assessment of national performance emphasizes not just the significant contributions of established nations such as the United States, Sweden, and New Zealand, but also India's increasing influence in the debate. The three-field, factorial, and network analyses give a vivid picture of the field's complicated linkages and developing thematic focuses, emphasizing the rising trend in academic production since the early 2000s. This complete approach is in sync with current data science processes, emphasizing the connection of survey design with evolving branches such as "variance estimation," "sampling weight," and "probabilistic design."

The results from the thematic analyses clearly show that research on sampling design has grown steadily, especially from the early 2000s onward. This highlights how the topic has become more important and relevant in recent years. The factorial and network analyses also help us understand how different ideas in survey design, like "variance estimation" and "sampling," are closely linked with new research areas. These analyses show how some topics have remained central while others have emerged over time. Additionally, the heat map offers an easy-to-understand visual summary of which topics have had the biggest impact in the field. It highlights how areas like "variance estimation" and "sampling" continue to play a key role while new themes like "Bayesian" and "Bootstrap" methods are gaining importance. Together, these findings reflect how the field of sampling design has become broader and more connected, with both old and new ideas influencing each other and shaping the way researchers approach large-scale survey data today.

The findings of this systematic analysis offer important insights for guiding methodological improvements in future large-scale demographic and health surveys, particularly in selecting appropriate sampling designs and addressing persistent challenges in complex survey environments. In essence, this systematic analysis not only provides a conclusive summary of our collective efforts but also contributes substantively to the ongoing discourse in data science and survey research. As these fields continue to evolve, our findings offer valuable insights, guiding future research endeavours and further justifying the significance of embracing emerging processes and methodologies in the pursuit of a deeper understanding of the evolution of sampling design. Importantly, the network and heat map analyses highlight how central concepts like "variance estimation," "sampling," and "sampling weight" have consistently occupied pivotal positions in shaping methodological progress. The steady growth in annual scientific publications, as evidenced in Figure 3, along with the emergence of new clusters of research such as "Bayesian" and "Bootstrap" methods, underscores the expanding scope of sampling design literature. These findings collectively demonstrate a field that has both deepened in methodological sophistication and broadened in thematic diversity over time. In essence, this systematic analysis not only provides a conclusive summary of our collective efforts but also contributes substantively to the ongoing discourse in data science and survey research. As these fields continue to evolve, our findings offer valuable insights, guiding future research endeavors and further justifying the significance of embracing emerging processes and methodologies in the pursuit of a deeper understanding of the evolution of sampling design. These findings provide useful guidance for survey practitioners and policymakers, particularly in low- and middle-income countries, for selecting context-appropriate sampling designs and addressing operational challenges in future large-scale surveys.

5. Limitations

Despite offering a comprehensive brief overview of the evolution of sampling design, this study is limited by its reliance on bibliometric data primarily from Scopus, potentially excluding relevant contributions indexed elsewhere. The restriction to English-language, peer-reviewed articles may have introduced a language and publication bias, overlooking valuable regional or grey literature. Additionally, the study focuses predominantly on methodological keywords, which may underrepresent broader conceptual or applied dimensions of sampling design. The time-bound nature of the analysis means recent publications might not have accrued sufficient citations to reflect their actual impact. Finally, while network and factorial analyses capture interrelations well, they are sensitive to the selection of keywords and thresholds, which may influence clustering outcomes. Additionally, the selection and thresholding of keywords for network analysis may have influenced the clustering structure and thematic associations observed in the study.

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Conflict of interest

The authors declared that they have no competing interests.

Author´s contribution

Conceptualization: JANA, S., DWIVEDI, L.K.; **Data curation:** JANA, S.; **Formal analysis:** JANA, S.; **Funding acquisition: -; Investigation:** JANA, S., DWIVEDI, L.K.; **Methodology:** JANA, S., DWIVEDI, L.K.; **Project administration:** JANA, S., DWIVEDI, L.K.**; Software: -; Resources: -; Supervision:** JANA, S., DWIVEDI, L.K.; **Validation:** JANA, S., DWIVEDI, L.K.; **Visualization:** JANA, S., DWIVEDI, L.K.; **Writing - original draft:** JANA, S.; **Writing - review and editing:** JANA, S., DWIVEDI, L.K.;

References

1. Archer, B. Design as a discipline. *Design Studies*, **1**(1), 17–20 (1979). https://doi.org/10.1016/0142-694X(79)90023-1
2. Aromaa, A., Koponen, P., Tafforeau, J., & Vermeire, C. Evaluation of health interview surveys and health examination surveys in the European union. *Eur J Publ Health*, **13**(3 SUPPL.), 67–72 (2003). https://doi.org/10.1093/eurpub/13.suppl_3.67
3. Berchtold, A. Key elements in the statistical analysis of surveys. *Int J Public Health*, **52**(2), 117–119 (2007). https://doi.org/10.1007/s00038-007-6081-2
4. Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (n.d.). *Network Analysis in the Social Sciences*. Retrieved November 20, 2023, from http://www.sciencemag.org/
5. Bruin, A. De, Picavet, H., & Nossikov, A. *Health Interview Surveys: towards international harmonization of methods and instruments*. World Health Organisation. (1996).
6. Demarest, S., Van der Heyden, J., Charafeddine, R., Drieskens, S., Gisle, L., & Tafforeau, J. Methodological basics and evolution of the Belgian health interview survey 1997–2008. *Archives of Public Health 2013*, **71**(1), 1–10 (2013). https://doi.org/10.1186/0778-7367-71-24
7. Einax, J., Zwanziger, H. W., & Geiss, Sabine. *Chemometrics in environmental analysis*. VCH Verlagsgesellschaft (1997).

8. Kalton, G. Developments in Survey Research over the Past 60 Years: A Personal Perspective. *International Statistical Review*, **87**(S1), S10–S30 (2019). https://doi.org/10.1111/insr.12287
9. Liu, S., & Boyle, I. M. Engineering design: perspectives, challenges, and recent advances. *Journal of Engineering Design*, **20**(1), 7–19 (2009). https://doi.org/10.1080/09544820802670914
10. Malta, D. C., Leal, M. D. C., Costa, M. F. L., & Neto, O. L. D. M. The National Health Survey: Accumulated experience and a proposal for the Brazilian Health Survey. *Revista Brasileira de Epidemiologia*, **11**(SUPPL. 1), 159–167 (2008). https://doi.org/10.1590/S1415-790X2008000500017
11. Pilkington, A., & Meredith, J. The evolution of the intellectual structure of operations management-1980-2006: A citation/co-citation analysis. *Journal of Operations Management*, **27**(3), 185–202 (2009). https://doi.org/10.1016/J.JOM.2008.08.001
12. Quataert, P., Oyen, H. Van, Tafforeau, J., Schiettecatte, E., Lebrun, L., & Bellamammer, L. *Health Interview Survey, 1997. Protocol for the selection of the households and the respondents*. S.P.H (1998).
13. Ramos-Rodrígue, A. R., & Ruíz-Navarro, J. Changes in the intellectual structure of strategic management research: a bibliometric study of the Strategic Management Journal, 1980–2000. *Strategic Management Journal*, **25**(10), 981–1004 (2004). https://doi.org/10.1002/SMJ.397
14. Rao, J. N. K., & Fuller, W. A. Sample Survey Theory and Methods: Past, Present, and Future Directions. In *Statistics and Applications,* **16**(1) (2018). http://www.statcan.gc.ca/pub/12-001-x/2017002/article/54888-eng.htm
15. Srivastava, A. K. Historical Perspective and Some Recent Trends in Sample Survey Applications. In *Statistics and Applications,* **14** (2016).
16. Surveys, H., Verma, V., Lê, T., Vermal, V., & Le2, T. An Analysis of Sampling Errors for the Demographic Analysis of Sampling Errors f or the Demographic and Health Surveys. In *International Statistical Review,* **64**(3) (1996).
17. Suzuki, R., & Shimodaira, H. Pvclust: an R package for assessing the uncertainty in hierarchical clustering. *Bioinformatics (Oxford, England)*, **22**(12), 1540–1542 (2006). https://doi.org/10.1093/bioinformatics/btl117
18. Szwarcwald, C. L. National health surveys: overview of sampling techniques and data collected using complex designs. *Epidemiologia e Serviços de Saúde : Revista Do Sistema Unico de Saúde Do Brasil*, **32**(3) (2023). https://doi.org/10.1590/S2237-96222023000300014.EN
19. Tanur, J. M. Methods for Large-Scale Surveys and Experiments. *Methodology*, **14**, 1–71 (1983). https://about.jstor.org/terms
20. Tarun Kumar Roy, R. A. A. K. R. *Statistical Survey Design and Evaluating Impact*. (2016).
21. Van Der Heyden, J., Demarest, S., Van Herck, K., De Bacquer, D., Tafforeau, J., & Van Oyen, H. Association between variables used in the field substitution and post-stratification adjustment in the Belgian health interview survey and non-response. *International Journal of Public Health*, **59**(1), 197–206 (2014). https://doi.org/10.1007/S00038-013-0460-7