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Designing, Conducting, and Reporting Survey Studies: A Primer for Researchers

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ABSTRACT

Survey studies have become instrumental in contributing to the evidence accumulation in rapidly developing medical disciplines such as medical education, public health, and nursing. The global medical community has seen an upsurge of surveys covering the experience and perceptions of health specialists, patients, and public representatives in the peri-pandemic coronavirus disease 2019 period. Currently, surveys can play a central role in increasing research activities in non-mainstream science countries where limited research funding and other barriers hinder science growth. Planning surveys starts with overviewing related reviews and other publications which may help to design questionnaires with comprehensive coverage of all related points. The validity and reliability of questionnaires rely on input from experts and potential responders who may suggest pertinent revisions to prepare forms with attractive designs, easily understandable questions, and correctly ordered points that appeal to target respondents. Currently available numerous online platforms such as Google Forms and Survey Monkey enable moderating online surveys and collecting responses from a large number of responders. Online surveys benefit from disseminating questionnaires via social media and other online platforms which facilitate the survey internationalization and participation of large groups of responders. Survey reporting can be arranged in line with related recommendations and reporting standards all of which have their strengths and limitations. The current article overviews available recommendations and presents pointers on designing, conducting, and reporting surveys.

Keywords: Research Ethics; Research Design; Social Media; Surveys and Questionnaires; Writing

INTRODUCTION

Surveys are increasingly popular research studies that are aimed at collecting and analyzing opinions of diverse subject groups at certain periods. Initially and predominantly employed for applied social science research,¹ surveys have maintained their social dimension and transformed into indispensable tools for analyzing knowledge, perceptions, prevalence of clinical conditions, and practices in the medical sciences.² In rapidly developing disciplines with social dimensions such as medical education, public health, and nursing, online surveys

have become essential for monitoring and auditing healthcare and education services^{3,4} and generating new hypotheses and research questions.⁵ In non-mainstream science countries with uninterrupted Internet access, online surveys have also been praised as useful studies for increasing research activities.⁶

In 2016, the Medical Subject Headings (MeSH) vocabulary of the US National Library of Medicine introduced "surveys and questionnaires" as a structured keyword, defining survey studies as "collections of data obtained from voluntary subjects" (<https://www.ncbi.nlm.nih.gov/mesh/?term=surveys+and+questionnaires>). Such studies are instrumental in the absence of evidence from randomized controlled trials, systematic reviews, and cohort studies. Tagging survey reports with this MeSH term is advisable for increasing the retrieval of relevant documents while searching through Medline, Scopus, and other global databases.

Surveys are relatively easy to conduct by distributing web-based and non-web-based questionnaires to large groups of potential responders. The ease of conduct primarily depends on the way of approaching potential respondents. Face-to-face interviews, regular postmails, e-mails, phone calls, and social media posts can be employed to reach numerous potential respondents. Digitization and social media popularization have improved the distribution of questionnaires, expanded respondents' engagement, facilitated swift data processing, and globalization of survey studies.⁷

SURVEY REPORTING GUIDANCE

Despite the ease of survey studies and their importance for maintaining research activities across academic disciplines, their methodological quality, reproducibility, and implications vary widely. The deficiencies in designing and reporting are the main reason for the inefficiency of some surveys. For instance, systematic analyses of survey methodologies in nephrology, transfusion medicine, and radiology have indicated that less than one-third of related reports provide valid and reliable data.⁸⁻¹⁰ Additionally, no discussions of respondents' representativeness, reasons for nonresponse, and generalizability of the results have been pinpointed as drawbacks of some survey reports. The revealed deficiencies have justified the need for survey designing and data processing in line with reporting recommendations, including those listed on the EQUATOR Network website (<https://www.equator-network.org/>).

Arguably, survey studies lack discipline-specific and globally-acceptable reporting guidance. The diversity of surveyed subjects and populations is perhaps the main confounder. Although most questionnaires contain socio-demographic questions, there are no reporting guidelines specifically tailored to comprehensively inquire specialists across different academic disciplines, patients, and public representatives.

The EQUATOR Network platform currently lists some widely promoted documents with statements on conducting and reporting web-based and non-web-based surveys (**Table 1**).¹¹⁻¹⁴ The oldest published recommendation guides on postal, face-to-face, and telephone interviews.¹ One of its critical points highlights the need to formulate a clear and explicit question/objective to run a focused survey and to design questionnaires with respondent-friendly layout and content.¹ The Checklist for Reporting Results of Internet E-Surveys (CHERRIES) is the most-used document for reporting online surveys.¹¹ The CHERRIES checklist included points on

Table 1. Recommendations for conducting and reporting survey-based studies and their implications

References	Guideline titles and acronyms	Descriptions	Limitations	EQUATOR Network listing
Kelley et al., 2003 ¹	Good practice in the conduct and reporting of survey research	The checklist and recommendations focus on designing questionnaires and ensuring the reliability of non-web-based surveys only.	The checklist and recommendations are not based on the Delphi method.	+
Eysenbach, 2004 ¹¹	Checklist for Reporting Results of Internet E-Surveys (CHERRIES)	The CHERRIES checklist focuses on web-based surveys. It ensures the reliability and representativeness of online responses and prevents duplicate/multiple entries by the same users. It is the top-cited e-survey checklist.	This checklist is not based on an expert panel consensus (Delphi method). It does not cover all parts of e-survey reports.	+
Burns et al., 2008 ¹²	A guide for the design and conduct of self-administered surveys of clinicians	This guide includes statements on designing, conducting, and reporting web- and non-web-based surveys of clinicians' knowledge, attitude, and practice.	The statements are based on a literature review, but not the Delphi method.	+
Sharma et al., 2021 ¹³	Consensus-based Checklist for Reporting of Survey Studies (CROSS)	This is a checklist with 19 sections covering all parts of web- and non-web-based survey reports. It is based on the Delphi method with 3 survey rounds in January 2018 -December 2019 and 24 experts responding to the 1 st round.	Although 24 experts with numerous related publications were initially enrolled, 6 of them were lost to follow-up.	+
Gaur et al., 2020 ¹⁴	Reporting survey based studies - a primer for authors	These recommendations cover points on planning and reporting surveys in the COVID-19 pandemic. Various online platforms, including social media, for distributing questionnaires and conducting surveys are presented.	Although these recommendations are based on a comprehensive literature review, statements are not discussed with a panel of experts and lack Delphi consensus agreements.	-

COVID-19 = coronavirus disease 2019.

ensuring the reliability of online surveys and avoiding manipulations with multiple entries by the same users.¹¹ A specific set of recommendations, listed by the EQUATOR Network, is available for specialists who plan web-based and non-web-based surveys of knowledge, attitude, and practice in clinical medicine.¹² These recommendations help design valid questionnaires, survey representative subjects with clinical knowledge, and complete transparent reporting of the obtained results.¹²

From January 2018 to December 2019, three rounds of surveying experts with interest in surveys and questionnaires allowed reaching consensus on a set of points for reporting web-based and non-web-based surveys.¹³ The Consensus-Based Checklist for Reporting of Survey Studies included a rating of 19 items of survey reports, from titles to acknowledgments.¹³ Finally, rapid recommendations on online surveys amid the coronavirus disease 2019 (COVID-19) pandemic were published to guide the authors on how to choose social media and other online platforms for disseminating questionnaires and targeting representative groups of respondents.¹⁴

Adhering to a combination of these recommendations is advisable to minimize the limitations of each document and increase the transparency of survey reports. For cross-sectional analyses of large sample sizes, additionally consulting the STROBE standard of the EQUATOR Network may further improve the accuracy of reporting respondents' inclusion and exclusion criteria. In fact, there are examples of online survey reports adhering to both CHERRIES and STROBE recommendations.^{15,16}

ETHICS CONSIDERATIONS

Although health research authorities in some countries lack mandates for full ethics review of survey studies, obtaining formal review protocols or ethics waivers is advisable for most

surveys involving respondents from more than one country. And following country-based regulations and ethical norms of research are therefore mandatory.^{14,17}

Full ethics review or exemption procedures are important steps for planning and conducting ethically sound surveys. Given the non-interventional origin and absence of immediate health risks for participants, ethics committees may approve survey protocols without a full ethics review.¹⁸ A full ethics review is however required when the informational and psychological harms of surveys increase the risk.¹⁸ Informational harms may result from unauthorized access to respondents' personal data and stigmatization of respondents with leaked information about social diseases. Psychological harms may include anxiety, depression, and exacerbation of underlying psychiatric diseases.

Survey questionnaires submitted for evaluation should indicate how informed consent is obtained from respondents.¹³ Additionally, information about confidentiality, anonymity, questionnaire delivery modes, compensations, and mechanisms preventing unauthorized access to questionnaires should be provided.^{13,14} Ethical considerations and validation are especially important in studies involving vulnerable and marginalized subjects with diminished autonomy and poor social status due to dementia, substance abuse, inappropriate sexual behavior, and certain infections.¹⁸⁻²⁰ Precautions should be taken to avoid confidentiality breaches and bot activities when surveying via insecure online platforms.²¹

Monetary compensation helps attract respondents to fill out lengthy questionnaires. However, such incentives may create mechanisms deceiving the system by surveyees with a primary interest in compensation.²² Ethics review protocols may include points on recording online responders' IP addresses and blocking duplicate submissions from the same Internet locations.²² IP addresses are viewed as personal information in the EU, but not in the US. Notably, IP identification may deter some potential responders in the EU.²¹

PATIENT KNOWLEDGE AND PERCEPTION SURVEYS

The design of patient knowledge and perception surveys is insufficiently defined and poorly explored. Although such surveys are aimed at consistently covering research questions on clinical presentation, prevention, and treatment, more emphasis is now placed on psychometric aspects of designing related questionnaires.²³⁻²⁵ Targeting responsive patient groups to collect reliable answers is yet another challenge that can be addressed by distributing questionnaires to patients with good knowledge of their diseases, particularly those registering with university-affiliated clinics and representing patient associations.²⁶⁻²⁸

The structure of questionnaires may differ for surveys of patient groups with various age-dependent health issues. Care should be taken when children are targeted since they often report a variety of modifiable conditions such as anxiety and depression, musculoskeletal problems, and pain, affecting their quality of life.²⁹ Likewise, gender and age differences should be considered in questionnaires addressing the quality of life in association with mental health and social status.³⁰ Questionnaires for older adults may benefit from including questions about social support and assistance in the context of caring for aging diseases.³¹ Finally, addressing the needs of digital technologies and home-care applications may help to ensure the completeness of questionnaires for older adults with sedentary lifestyles and mobility disabilities.^{32,33}

SOCIAL MEDIA FOR QUESTIONNAIRE DISTRIBUTION

The widespread use of social media has made it easier to distribute questionnaires to a large number of potential responders. Employing popular platforms such as Twitter and Facebook has become particularly useful for conducting nationwide surveys on awareness and concerns about global health and pandemic issues.^{34,35} When various social media platforms are simultaneously employed, participants' sociodemographic factors such as gender, age, and level of education may confound the study results.³⁶ Knowing targeted groups' preferred online networking and communication sites may better direct the questionnaire distribution.³⁷⁻³⁹

Preliminary evidence suggests that distributing survey links via social-media accounts of individual users and organized e-groups with interest in specific health issues may increase their engagement and correctness of responses.^{40,41}

Since surveys employing social media are publicly accessible, related questionnaires should be professionally edited to easily inquire target populations, avoid sensitive and disturbing points, and ensure privacy and confidentiality.^{42,43} Although counting e-post views is feasible, response rates of social-media distributed questionnaires are practically impossible to record. The latter is an inherent limitation of such surveys.

SURVEY SAMPLING

Establishing connections with target populations and diversifying questionnaire dissemination may increase the rigor of current surveys which are abundantly administered.⁴⁴ Sample sizes depend on various factors, including the chosen topic, aim, and sampling strategy (random or non-random).¹² Some topics such as COVID-19 and global health may easily attract the attention of large respondent groups motivated to answer a variety of questionnaire questions. In the beginning of the pandemic, most surveys employed non-random (non-probability) sampling strategies which resulted in analyses of numerous responses without response rate calculations. These qualitative research studies were mainly aimed to analyze opinions of specialists and patients exposed to COVID-19 to develop rapid guidelines and initiate clinical trials.

Outside the pandemic, and beyond hot topics, there is a growing trend of low response rates and inadequate representation of target populations.⁴⁵ Such a trend makes it difficult to design and conduct random (probability) surveys. Subsequently, hypotheses of current online surveys often omit points on randomization and sample size calculation, ending up with qualitative analyses and pilot studies. In fact, convenience (non-random or non-probability) sampling can be particularly suitable for previously unexplored and emerging topics when overviewing literature cannot help estimate optimal samples and entirely new questionnaires should be designed and tested. The limitations of convenience sampling minimize the generalizability of the conclusions since the sample representativeness is uncertain.⁴⁵

Researchers often employ 'snowball' sampling techniques with initial surveyees forwarding the questionnaires to other interested respondents, thereby maximizing the sample size. Another common technique for obtaining more responses relies on generating regular social media reminders and resending e-mails to interested individuals and groups. Such tactics can increase the study duration but cannot exclude the participation bias and non-response.

Purposive or targeted sampling is perhaps the most precise technique when knowing the target population size and respondents' readiness to correctly fill the questionnaires and ensure an exact estimate of response rate, close to 100%.⁴⁶

DESIGNING QUESTIONNAIRES

Correctness, confidentiality, privacy, and anonymity are critical points of inquiry in questionnaires.⁴⁷ Correctly worded and convincingly presented survey invitations with consenting options and reassurances of secure data processing may increase response rates and ensure the validity of responses.⁴⁷ Online surveys are believed to be more advantageous than offline inquiries for ensuring anonymity and privacy, particularly for targeting socially marginalized and stigmatized subjects. Online study design is indeed optimal for collecting more responses in surveys of sex- and gender-related and otherwise sensitive topics.

Performing comprehensive literature reviews, consultations with subject experts, and Delphi exercises may all help to specify survey objectives, identify questionnaire domains, and formulate pertinent questions. Literature searches are required for in-depth topic coverage and identification of previously published relevant surveys. By analyzing previous questionnaire characteristics, modifications can be made to designing new self-administered surveys. The justification of new studies should correctly acknowledge similar published reports to avoid redundancies.

The initial part of a questionnaire usually includes a short introduction/preamble/cover letter that specifies the objectives, target respondents, potential benefits and risks, and moderators' contact details for further inquiries. This part may motivate potential respondents to consent and answer questions. The specifics, volume, and format of other parts are dependent on revisions in response to pretesting and pilot testing.⁴⁸ The pretesting usually involves co-authors and other contributors, colleagues with the subject interest while the pilot testing usually involves 5-10 target respondents who are well familiar with the subject and can swiftly complete the questionnaires. The guidance obtained at the pretesting and pilot testing allows editing, shortening, or expanding questionnaire sections. Although guidance on questionnaire length and question numbers is scarce, some experts empirically consider 5 domains with 5 questions in each as optimal.¹² Lengthy questionnaires may be biased due to respondents' fatigue and inability to answer numerous and complicated questions.⁴⁶

Questionnaire revisions are aimed at ensuring the validity and consistency of questions, implying the appeal to relevant responders and accurate covering of all essential points.⁴⁵ Valid questionnaires enable reliable and reproducible survey studies that end up with the same responses to variably worded and located questions.⁴⁵

Various combinations of open-ended and close-ended questions are advisable to comprehensively cover all pertinent points and enable easy and quick completion of questionnaires. Open-ended questions are usually included in small numbers since these require more time to respond.⁴⁶ Also, the interpretation and analysis of responses to open-ended questions hardly contribute to generating robust qualitative data.⁴⁹ Close-ended questions with single and multiple-choice answers constitute the main part of a questionnaire, with single answers easier to analyze and report. Questions with single answers can be presented as 3 or more Likert scales (e.g., yes/no/do not know).

Avoiding too simplistic (yes/no) questions and replacing them with Likert-scale items may increase the robustness of questionnaire analyses.⁵⁰ Additionally, constructing easily understandable questions, excluding merged items with two or more points, and moving sophisticated questions to the beginning of a questionnaire may add to the quality and feasibility of the study.⁵⁰

CONCLUSION

Survey studies are increasingly conducted by health professionals to swiftly explore opinions on a wide range of topics by diverse groups of specialists, patients, and public representatives. Arguably, quality surveys with generalizable results can be instrumental for guiding health practitioners in times of crises such as the COVID-19 pandemic when clinical trials, systematic reviews, and other evidence-based reports are scarcely available or absent. Online surveys can be particularly valuable for collecting and analyzing specialist, patient, and other subjects' responses in non-mainstream science countries where top evidence-based studies are scarce commodities and research funding is limited. Accumulated expertise in drafting quality questionnaires and conducting robust surveys is valuable for producing new data and generating new hypotheses and research questions.

The main advantages of surveys are related to the ease of conducting such studies with limited or no research funding. The digitization and social media advances have further contributed to the ease of surveying and growing global interest toward surveys among health professionals. Some of the disadvantages of current surveys are perhaps those related to imperfections of digital platforms for disseminating questionnaires and analysing responses.

Although some survey reporting standards and recommendations are available, none of these comprehensively cover all items of questionnaires and steps in surveying. None of the survey reporting standards is based on summarizing guidance of a large number of contributors involved in related research projects. As such, presenting the current guidance with a list of items for survey reports (**Table 2**) may help better design and publish related articles.

Table 2. Items for reporting survey studies

No.	Items	Notes
1	Title	<ul style="list-style-type: none"> Reflect on the survey subject, target respondents (e.g., patients, specialists, public representatives), obtained results, and study design (online, non-web-based, cross-sectional, longitudinal).
2	Abstract	<ul style="list-style-type: none"> Provide a structured abstract with an introduction, aims, results, and conclusion.
3	Keywords	<ul style="list-style-type: none"> Add the term "surveys and questionnaires" along with subject keywords to increase retrieval of the survey report.
4	Introduction	<ul style="list-style-type: none"> Analyze available evidence, relevant reviews, and surveys to justify the need for current study and questionnaire sections.
5	Aim	<ul style="list-style-type: none"> Present specific and innovative aims.
6	Methods	<ul style="list-style-type: none"> Highlight study design (e.g., web-based, non-web-based, cross-sectional, longitudinal). Specify the survey datelines and characterize time periods (data collection during a crisis [pandemic, wartime] or certain global movements, campaigns, or interventions). Describe the surveyed respondents' characteristics. Characterize the questionnaire domains and the number of questions in each domain. Provide details of preserving confidentiality and anonymity Describe pretesting and pilot testing (experts and respondents involved), the number of revision rounds, and the average time for filling out the questionnaire. Report content and face validity (quality, completeness, and feasibility of the questionnaire and its appeal to relevant respondents). Add details of an employed survey platform for web-based surveys (e.g., SurveyMonkey, Google Forms, etc.). Report modes of questionnaire distribution (e.g., via certain social media channels, emails, face-to-face interviews, and postal mail). Clarify when and how many times survey reminders were circulated.
7	Adherence to research reporting standards	<ul style="list-style-type: none"> Refer to recommendations or their combinations consulted for reporting.
8	Ethics section	<ul style="list-style-type: none"> Provide ethics committee approval/waiver date, protocol number, and name of the ethics committee. Refer to documents of national health research authorities that regulate the ethics review waiver/exemption. Justify the ethics review exemption in view of the survey's non-interventional origin and absence of informational and psychological risks/harms. Provide details of monetary or other incentives, written informed consents, confidentiality and anonymity, and mechanisms to avoid multiple entries by the same respondents.
9	Statistical analyses	<ul style="list-style-type: none"> Report descriptive statistics, how categorical data were compared (chi-square or Fisher's exact tests), whether parametric and non-parametric tests and regression analyses were employed, level of significance, and statistical package used.
10	Results	<ul style="list-style-type: none"> Report response rates in absolute numbers and percentages if the target population was established by methods other than convenience sampling. Reflect on missing data. Provide respondents' details to characterize their representativeness and exclude/minimize nonresponse influence. Insert eye-catching and color graphs and informative tables pointing to the most remarkable results, without recapitulating the same data in the text.
11	Discussion	<ul style="list-style-type: none"> Clarify what is new. Analyze limitations by reflecting on low response rate, small sample size, non-response, missing data, a long timeline of collecting responses, language of the questionnaire other than English, and generalizability of the survey results.
12	Author contributions and acknowledgements	<ul style="list-style-type: none"> Identify the authors who drafted the questionnaire and survey report. List non-author/technical contributions for questionnaire dissemination, promotion, and data collection.
13	Disclosure of interests	<ul style="list-style-type: none"> Disclose potential conflicts which may affect the validity and reliability of the survey.
14	Funding	<ul style="list-style-type: none"> Report funding sources, provision of software, and open-access funding, if available.
15	Open data sharing	<ul style="list-style-type: none"> Add a note about the availability of data for post-publication analyses.
16	Appendix	<ul style="list-style-type: none"> Submit an English version of the questionnaire.

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