The use of reporting guidelines as an educational intervention for teaching research methods and writing

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Double Doctorate

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Translational Research in Biomedicine

Doctoral Thesis

The use of reporting guidelines as an educational intervention for teaching research methods and writing

Melissa Kathleen Sharp

May 26, 2020

In front of a jury composed of :

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Joerg Meerpohl	[Professor]	*University Medical Center Freiburg*

Examiners :

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Marjan Bakker	[Assistant Professor]	*Tilburg University*
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Supervisor

Darko Hren PhD, Assoc. Prof.

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Abbreviations

BMJ	British Medical Journal
CONSORT	Consolidated Standards of Reporting Trials
EQUATOR	Enhancing the QUAlity and Transparency Of health Research
E & E	Elaboration and Explanation
ECR	Early Career Researcher
HTA	Health Technology Assessment
ICMJE	International Committee of Medical Journal Editors
MARE-S	Medical Abortion Reporting of Efficacy – STROBE
PARIHS	Promoting Action on Research Implementation in Health Services
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RECORD	REporting of studies Conducted using Observational Routinely-collected health Data
RG	Reporting guideline
ROSES-I	CONSISE statement on the REporting of SEroepidemiologic Studies for influenza
STREGA	STrengthening the REporting of Genetic Association Studies
STROBE	STrengthening the Reporting of OBservational studies in Epidemiology
STROBE-AMS	Strengthening the Reporting of Observational Studies in Epidemiology for AntiMicrobial Stewardship
STROBE-EULAR	A EULAR extension of STROBE guidelines
STROBE-ME	STrengthening the Reporting of OBservational studies in Epidemiology - Molecular Epidemiology
STROBE-NI	Strengthening the Reporting of Observational Studies in Epidemiology for Newborn Infection
STROBE-NUT	Strengthening the Reporting of Observational Studies in Epidemiology-NUTritional epidemiology
STROBE-RDS	Strengthening the Reporting of Observational Studies in Epidemiology for Respondent-Driven Sampling studies
STROBE-SBR	Strengthening the Reporting of Observational Studies in Epidemiology for Simulation-Based Research
STROBE-Vet	Strengthening the Reporting of Observational Studies in Epidemiology – Veterinary
STROME-ID	Strengthening the Reporting of Molecular Epidemiology for Infectious Diseases
TREND	Transparent Reporting of Evaluations with Nonrandomized Designs

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Scientific Portfolio

Articles

Sharp MK, Utrobičić A, Gómez G, Cobo E, Wager E, Hren D. The STROBE extensions: protocol for a qualitative assessment of content and a survey of endorsement. *BMJ Open.* 2017;7:e019043. [1]

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Oral Presentations

Sharp MK, Tokalić R, Wager E, Hren D. Journal endorsement of STROBE and its extensions: a cross-sectional bibliometric survey. Oral presentation presented at: European Public Health Association 2019 Conference; 2018 Nov 27; Ljubljana, Slovenia [6]

Sharp MK. Attitudes towards and experiences with the STROBE reporting guideline: an online survey. Oral presentation presented at: Mediterranean Editors and Translators 2019 Meeting; 2019 Sep 28; Split, Croatia. [7]

Sharp MK. Implementing a reporting guideline for observational studies: obstacles and opportunities. Oral presentation presented at: Departmental Seminar, University College Cork School of Public Health; 2019 Dec 5; Cork, Ireland. [8]

Posters

Sharp MK. A Qualitative Assessment of the STROBE Extensions: Laying the Groundwork for Future Educational Interventions. Poster presented at the Ninth International Congress on Peer Review and Scientific Publication; 2017 Sep 10; Chicago, USA. [9]

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Other Scientific Publications

***Marked items are related to reporting guidelines and the doctoral thesis*

Sharp MK. Ocrelizumab in Primary Progressive and Relapsing Multiple Sclerosis. *New England Journal of Medicine.* 2017;376(17):1692–4. [10]

Sharp MK, Haneef R, Ravaud P, Boutron I. Dissemination of 2014 dual antiplatelet therapy (DAPT) trial results: a systematic review of scholarly and media attention over 7 months. *BMJ Open.* 2017;7(11):e014503. [11]

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Olsen M, **Sharp MK**, Bossuyt PM. From the theoretical to the practical: how to evaluate the ethical and scientific justifications of randomized clinical trials. *Journal of Clinical Epidemiology.* 2018;Jul 1;99:170–1. [13]

Sandberg DE, Gardner M, Callens N, Mazur T, **the DSD-TRN Psychosocial Workgroup**, and Accord Alliance. Interdisciplinary care in disorders/differences of sex development (DSD): The psychosocial component of the DSD—Translational research network. *American Journal of Medical Genetics Part C: Seminars in Medical Genetics* 2017;175(2):279–92. [14]

Ernst MM, Gardner M, Mara CA, Délot EC, Fechner PY, Fox M, **et al.** Psychosocial Screening in Disorders/Differences of Sex Development: Psychometric Evaluation of the Psychosocial Assessment Tool. *Hormone Research in Paediatrics.* 2019. [15]

Sharp MK. Public mental health in 2018: EUPHA Report on the mental health track at Ljubljana 2018 [Internet]. 2019 May [cited 2019 Sep 14]. Available from: https://eupha.org/repository/advocacy/Public_mental_health_in_2018_-_EUPHA_report_on_the_mental_health_track_at_Ljubljana_2018.pdf [16]

** Hawwash, D, **Sharp MK,** Argaw A, Kolsteren P, Lachat C. Usefulness of applying research reporting guidelines as Writing Aid software: a crossover randomised controlled trial. *BMJ Open.* 2019;9:e030943. [17]

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Résumé

Les publications dans le domaine de la recherche biomédicale qui rapportent les méthodes et les résultats de façon incomplète sont un problème connu qui persiste tout au long de l'histoire moderne. Dans de nombreux domaines scientifiques les résultats des études n'ont pas pu être reproduits et répliqués, souvent en raison de rapports incomplets. Lorsqu'il n'y a pas suffisamment d'information sur la façon dont une étude a été conçue, réalisée et analysée, les chercheurs et les cliniciens sont incapables d'utiliser les résultats pour informer les politiques de santé et les soins cliniques. Pour faire face à ce problème, des lignes directrices pour la rédaction des rapports ont été élaborées afin d'établir les éléments essentiels que les auteurs doivent rapporter lors de la discussion des résultats d'une étude. La ligne directrice pour la rédaction des rapports d'études observationnelles a été crée en 2007 : STROBE (STrengthening the Reporting of OBservational studies in Epidemiology), qui contient 22 éléments et des lignes directrices à l'intention des auteurs d'études cas-témoin, de cohortes et d'études transversales, est soutenue par de nombreuses revues et de nombreux groupes éditoriaux, mais à des taux assez faibles. Le manque de sensibilisation est répandu et on ne sait pas très bien ce que les auteurs pensent de STROBE. En outre, bien que STROBE ait été développé pour des domaines et des méthodologies spécifiques par la création de "extensions", on ne connait pas bien les perceptions de ces documents, leur contenu ou leur utilité. Afin de mieux mettre en œuvre STROBE ses lignes directrices, il est nécessaire de mener des recherches sur la façon de faire des auteurs et sur la façon dont leur environnement affecte leur travail.

Le travail de cette thèse a été guidé par la stratégie d'application des connaissances de Promoting Action on Research Implementation in Health Services (PARIHS). Cette approche tient compte 1) des données probantes, 2) du contexte et 3) des facilitateurs afin de mener à bien la recherche. La transformation de STROBE, qui n'était qu'une simple ligne directrice, en un outil éducatif a nécessité de recherches sur ces trois axes.

J'ai commencé par examiner le contenu des extensions STROBE pour identifier les forces et les faiblesses des éléments de la liste de contrôle. Les résultats ont révélé que le contenu des extensions STROBE est problématique, car il est parfois redondant, ce qui pourrait indiquer une mauvaise compréhension des concepts au sein de STROBE ou des problèmes liés à son contenu. Parallèlement, j'ai déterminé les taux d'approbation de ces extensions afin d'établir le contexte de publication dans lequel les auteurs travaillent. J'ai constaté que les revues ne promeuvent généralement pas STROBE et que le langage qu'elles utilisent est ambigu et vague. Les extensions STROBE sont approuvées à des taux extrêmement bas, ou ne sont pas approuvé du tout.

Ensuite, j'ai évalué la connaissance, les expériences et les attitudes des chercheurs à l'égard de la liste de vérification STROBE. Cela a permis d'établir les facilitateurs, le timing et les facteurs de motivation (contexte) et les perceptions (preuves) de son utilisation. Le deuxième projet a révélé qu'il existe un grand désaccord quant au niveau de spécificité souhaité du STROBE et à son utilité. En général, les auteurs ne s'opposent pas à son utilisation, mais souvent il n'y a pas une forte motivation. Leurs coauteurs ne l'utilisent pas et les journaux n'en ont pas besoin. Les auteurs peuvent également avoir des perceptions qui nuisent à la promotion du STROBE, comme la confiance excessive dans leurs capacités.

Les travaux des deux premiers projets ont fourni le contenu et le soutien à la creéation d'une intervention éducative intégrée dans le processus d'écriture, accessible à un public mondial, open-source et éditable.

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Mots-clés : Études d'observation, lignes directrices pour l'établissement de rapports, lignes directrices comme sujet, conception de la recherche épidémiologique, diffusion de l'information/méthodes, STROBE

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Abstract

Poor reporting of biomedical research has been a persistent and prominent problem throughout modern history. In many different scientific fields, study results have failed to be reproduced and replicated, oftentimes due to incomplete reporting. When information is missing about how a study was designed, conducted, and analyzed, researchers and clinicians are unable to use results to inform health policies and clinical care. To address this issue, reporting guidelines (RG) were created to establish the minimum criteria that authors need to disclose when discussing study results. A reporting guideline for observational studies was published in 2007 which contains 22-items and guidance for authors of case-control, cohort, and cross-sectional studies. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement is supported by many journals and editorial groups, however, at quite low rates. Lack of awareness is widespread and it is unclear what authors think about STROBE. Furthermore, while STROBE been expanded upon for specific fields and methodologies through the creation of "extensions" – little is known about perceptions towards these documents, their content, or usefulness. In order to better implement STROBE and reporting guidelines like it, research is needed into current processes by authors and how their environment affects their work.

The work in this dissertation was guided by the Promoting Action on Research Implementation in Health Services (PARIHS) knowledge translation strategy. This approach looks at the 1) evidence, 2) context, and 3) facilitators in order to implement research successfully. Transforming STROBE from simply a reporting guideline into an educational tool required investigation into these three facets.

I began by investigating the content in the STROBE extensions to identify strengths and weaknesses in the checklist items. Results found that the content in the STROBE extensions is problematic as it is sometimes redundant – potentially indicating a poor understanding of the concepts within STROBE or issues with its content. Concurrently, I determined the endorsement rates of the extensions to establish the publishing context in which authors are working. I found that journals are largely not endorsing STROBE and the language that they use is ambiguous and vague. The STROBE extensions are endorsed at extremely low rates or not at all.

Next, I assessed researcher's awareness of, experiences with, and attitudes towards the STROBE checklist. This established the facilitators, timing and motivators (context), and perceptions (evidence) of use. The second project found that there is a large disagreement regarding the level of specificity desired in STROBE and its usefulness. Generally, authors are not opposed to using it but there is often no strong motivating force. Their coauthors do not use it and journals are not requiring it. Authors also hold some internal views that are detrimental to the promotion of STROBE, such as the over-confidence in one's abilities.

The work from the first two projects provided the content and support for an educational intervention that is integrated within the writing process, accessible by a worldwide audience, and open-source and editable. It is built using R and is open-source and editable via GitHub and the repository is publicly launched alongside this dissertation.

Keywords: Observational studies, reporting guidelines, guidelines as topic, Epidemiologic research design, information dissemination/methods, STROBE

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Synthèse des travaux de thèse

Introduction au gâchis de la recherche

On estime qu'environ 85% de la recherche biomédicale est perdue [18]. La perte peut être créée tout au long du processus de recherche. Dès les premières étapes de la conception de l'étude, les choses peuvent mal tourner. Un chercheur peut poser les mauvaises questions, utiliser la mauvaise conception ou analyser les données avec les mauvaises méthodes. Même si ces étapes sont effectuées correctement, le rapport d'étude peut manquer, volontairement ou par inadvertance, des informations clés.

Les rapports incomplets sont contraires à l'éthique et ils entravent les progrès de la recherche créant une "crise de reproductibilité" car les résultats ne peuvent être répliqués, reproduits ou interprétés avec précision [19,20]. Les cliniciens sont incapables de prendre des décisions au sujet des soins, les lecteurs se retrouvent avec des questions sans fin et la généralisabilité et la crédibilité de la recherche sont incertaines. De plus, les recherches insuffisamment rapportées sont ensuite exclues des examens systématiques et des méta-analyses qui sont conçus pour regrouper et synthétiser les résultats de nombreuses études différentes.

Introduction aux lignes directrices pour la rédaction de rapports

Maintenant, il y a la plus grande reconnaissance des problèmes de biais de publication et de recherche mal rapportée puisque le nombre d'examens systématiques publiés a augmenté au cours des dernières années [21]. Les tentatives visant à résoudre les problèmes de rapport ont été axées sur les efforts visant à mieux structurer et orienter la rédaction scientifique au

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moyen des lignes directrices pour la rédaction des rapports (DR) [18,22,23]. Les lignes directrices en matière de rapports sont généralement organisées sous la forme d'une liste de contrôle qui contient les éléments contextuels et méthodologiques essentiels qui doivent être rapportés lors de la description des résultats d'une étude. Cette liste de contrôle peut également être accompagnée d'un diagramme de flux et un document d'Explication et d'Élaboration (E&E) supplémentaire qui fournit les descriptions plus détaillées des éléments demandés et les exemples de bons rapports tirées.

Le mouvement initial des lignes directrices pour les rapports a commencé à se concentrer sur les essais contrôlés randomisés (ECR) - les études généralement considérées comme "la norme d'excellence" en recherche clinique [24–26]. En 1996, le groupe SORT en collaboration avec le groupe de travail Asilomar a publié la déclaration CONSORT (Consolidated Standards of Reporting Trials Statement) [27,28]. CONSORT contenait un diagramme de flux et une liste de vérification de 21 points [27].

Plusieurs mises à jour de la déclaration CONSORT ont été publiées depuis. De plus, la déclaration CONSORT a inspiré de nombreuses ramifications, connues comme les extensions, qui fournissent des lignes directrices plus nuancées et spécialisées pour différents types d'études, d'interventions ou de données [29]. Son succès a suscité un intérêt croissant pour la rédaction de lignes directrices pour d'autres types d'études, domaines et méthodes.

Introduction au STROBE

Plus de dix ans après la publication de CONSORT, l'attention s'est finalement tournée vers la recherche observationnelle. Il est essentiel de concevoir et d'analyser soigneusement les études observationnelles parce qu'elles ne sont pas structurées de manière à tenir compte de

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facteurs externes. Donc, elles sont particulièrement sujettes aux biais et à la confusion [30–32]. En raison de la complexité de la conception et de l'exécution des études observationnelles, elles ont été considérées comme les études "les plus nécessaires et les plus difficiles" à mener [33]. Les études observationnelles sont menées dans les situations réelles et elles permettent d'étudier l'impact des politiques de santé sur les populations et d'explorer la répartition des résultats en matière de santé entre les groupes [30]. Certaines la recherche observationnelle permet également aux participants d'être suivis pendant de plus longues périodes ce qui signifie que l'on peut évaluer les changements relatifs aux résultats de la santé tout au long de la vie. De plus, les études observationnelles permettent d'obtenir un plus grand nombre de participants à un prix abordable que les ECR [30]. Cela permet d'étudier les différences entre les sous-groupes de la population (p. ex. différents groupes d'âge, sous-types de maladies) [34]. Étant donné l'étendue des sujets que les études observationnelles peuvent couvrir, il n'est pas surprenant qu'il s'agisse du modèle d'étude le plus commun utilisé en recherche biomédicale [35].

En raison de la forte prévalence des études observationnelles dans la littérature et des rapports pauvres signifie qu'une grande partie de la littérature médicale présente des problèmes. La recherche a montré que les éléments concernant la méthodologie et les résultats des études observationnelles étaient particulièrement mal rapportés [36–41]. Les détails sur les participants, la collecte de données et les analyses sont des problèmes courants. Le manque de données sur le nombre de personnes admissibles à participer, qui ont consenti à participer et qui n'ont pu répondre remet en question la généralisabilité des résultats. Attendu que les données manquantes, la fiabilité des instruments de collecte de données utilisés, la façon dont les données ont été analysées et les divulgations manquantes des sources de financement peuvent être inquiétantes car les motifs de certains récits ou résultats peuvent être cachés. Par conséquent, il est essentiel d'établir les lignes directrices en matière de rapports pour la

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recherche observationnelle afin de renforcer la réplicabilité et la reproductibilité et d'inspirer une plus grande confiance dans la fiabilité des résultats.

Afin de s'assurer que les éléments essentiels sont rapportés lors de la discussion des résultats d'une étude observationnelle, la ligne directrice en matière de rapports a été créée en 2007. La déclaration STROBE (STrengthening the Reporting of OBservational studies in Epidemiology) est une liste de vérification avec 22 points qui détaille les renseignements clés nécessaires pour communiquer les résultats d'une étude observationnelle [42]. Il est également accompagné d'un document d'explication et d'élaboration (E&E) [43]. Comme la déclaration CONSORT, au cours de la dernière décennie, STROBE a donné naissance aux nombreuses extensions différentes pour diverses méthodes et divers domaines (p. ex., l'épidémiologie nutritionnelle). [44–57].

Promotion du STROBE

Par les groupes éditoriaux

Depuis sa publication, STROBE a été approuvé par le Comité international des rédacteurs de revues médicales (ICMJE) [58]. L'ICMJE promeut l'utilisation du STROBE en l'incluant dans ses Recommandations pour la conduite, l'édition et la publication des travaux scientifiques dans les revues médicales - un document standard qui est utilisé et encouragé par des milliers de revues biomédicales [59]. Parmi les lignes directrices générales sur la rédaction et la publication d'articles universitaires, les Recommandations contiennent les informations explicites sur quelques autres lignes directrices en matière de rapports, telles que CONSORT, et elles invitent les auteurs à rechercher d'autres lignes directrices qui pourraient être pertinentes pour leurs travaux. Par exemple, le réseau EQUATOR (Enhancing the QUAlity and

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Transparency Of health Research), une initiative internationale créée en 2008 qui fournit des ressources et de la formation sur la façon de développer, de diffuser et de mettre en œuvre les lignes directrices en matière de rapports [60,61].

Par les revues biomédicales

En plus de la promotion de l'ICMJE et du travail d'EQUATOR, les revues individuelles peuvent soutenir ou "approuver" les lignes directrices en les mentionnant aux chercheurs dans leurs "instructions aux auteurs". Ces instructions expliquent en détail comment soumettre un manuscrit détaillant les résultats d'une étude. Lorsque les revues approuvent les lignes directrices pour la rédaction des rapports, les détails et la force de l'approbation varient énormément [62].

L'exigence consiste généralement à demander aux auteurs de soumettre une liste de vérification dûment remplie et/ou un diagramme de flux qui indique les numéros de texte ou de page du manuscrit où le lecteur peut trouver l'information relative à chaque élément de la liste de vérification. Par ailleurs, la revue pourrait demander aux auteurs de simplement vérifier que chaque élément a été référé, mais de ne pas fournir d'autres détails. Lorsque les revues se contentent de suggérer aux auteurs d'utiliser des lignes directrices, il n'y a pas de mécanisme d'application ou de vérification. Malgré les problèmes répandus de rapports mentionnés plus haut et la nécessité urgente de se référer à une base de données factuelle biaisée et fragmentée, de nombreuses revues négligent la non-adhésion à lesdites lignes directrices ou elles ne sont pas au courant de l'existence de ces dernières.

En fait, le manque de la prise de conscience des lignes directrices pour la rédaction des rapports semble être commun pour les éditeurs de revues. Dans une étude portant sur l'approbation de CONSORT dans les revues médicales chinoises, de nombreux éditeurs (43/54)

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ont indiqué qu'ils n'étaient pas au courant de l'existence de CONSORT bien qu'une fois introduit, ils étaient disposés à l'adopter dans l'avenir [63]. La majorité des éditeurs de revues dentaires (19/34) ne connaissaient pas non plus le réseau EQUATOR [64] et près de la moitié des éditeurs en chef de revues vétérinaires (32/68) ne savaient pas ce qu'était une ligne directrice pour la rédaction des rapports avant de recevoir un questionnaire à ce sujet [65].

En général, les lignes directrices pour la rédaction des rapports ne sont pas suffisamment approuvées par les revues [66]. Toutefois, comparativement à CONSORT [67,68], STROBE a des taux d'approbation beaucoup plus bas [69]. Par exemple, en oncologie et en hématologie, le CONSORT a été approuvé plus de deux fois plus souvent (33,3 % vs 13,4 %, n = 231) [70], tandis qu'en pédiatrie une différence de cinq fois (20 % vs 4 %, n = 69) [71] a été observée. D'autres domaines comme la dentisterie (12,8 %, n = 109) [72] et l'urologie et la néphrologie (5,4 %, n = 55) [73] ont des taux d'approbation aussi faibles pour le STROBE.

Malgré ces faibles taux d'approbation et une méconnaissance des lignes directrices, certains sont encore optimistes quant à leur impact potentiel. Dans le cadre d'une étude menée auprès d'auteurs et de éditeurs participant à la publication de recherches en santé liées à la déclaration TREND (Transparent Reporting of Evaluations with Nonrandomized Designs), les participants étaient d'avis que l'omission de renseignements dans les articles de revues était un problème courant (éditeurs n = 43; auteurs n = 56). La plupart croient également que les auteurs, les éditeurs de revues et les pairs examinateurs devraient utiliser les lignes directrices [74].

Cependant, la question des faibles taux d'utilisation n'est pas aussi simple et tout le monde n'accepte pas lesdites lignes directrices. En plus de signaler un manque de connaissances, les éditeurs de revues vétérinaires ont également signalé d'autres obstacles à l'utilisation, notamment: 1) la croyance que leurs politiques actuelles étaient suffisantes (c.-à-

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d. qu'elles constituaient une résistance au changement), 2) la croyance que les lignes directrices n'étaient pas suffisamment précises pour répondre à leurs besoins (p. ex., domaine ou type d'étude) et 3) la crainte que les auteurs préfèrent que les revues soient moins strictes et moins chargées (p. ex. aucune exigence des lignes directrices) [65]. Ce manque répandu de sensibilisation et de croyances négatives signifie que les revues peuvent être moins susceptibles d'approuver les lignes directrices. Il s'agit là d'un problème car les revues sont un canal de communication clé pour les auteurs, ce qui signifie qu'à leur tour, moins d'auteurs peuvent aussi être conscients de l'existence et de l'importance de lesdites lignes directrices.

Utilisation du STROBE par les auteurs

Lorsque les revues n'exigent pas de lignes directrices complètes pour la rédaction des rapports avec la soumission d'un manuscrit, les auteurs ne sont pas vraiment incités à modifier leur comportement [75]. À ma connaissance, seulement deux études ont interrogé directement les auteurs au sujet de leur expérience avec une ligne directrice [74,76]. Les auteurs (n = 56) qui ont répondu aux questions sur la ligne directrice TREND ont signalé des problèmes à plusieurs niveaux qui ont influé sur la probabilité d'utiliser les lignes directrices pour la rédaction des rapports [74]. Bien que les auteurs croient que l'utilisation d'une ligne directrice améliorerait la qualité de leur manuscrit, de nombreuses inquiétudes ont également été exprimées. Les préoccupations d'ordre pratique (p. ex. le temps supplémentaire nécessaire pour remplir la liste de vérification), les croyances individuelles au sujet de l'expérience et des connaissances antérieures d'une personne, le soutien de son milieu de travail et la promotion par les revues sont quelques-uns des thèmes clés qui sont ressortis. Dans l'enquête sur l'extension PRISMA, Burford et ses collaborateurs ont interrogé les auteurs de l'avis

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systématique (n = 151) sur les éléments proposés dans leur liste de vérification [76]. Les auteurs pensent que les plus importants facilitateurs de l'utilisation sont l'approbation de la revue et l'incorporation des lignes directrices dans les logiciels existants. D'autre part, certains obstacles communs étaient les limites de temps et de mots imposées par les revues [76]. Bien que ces études donnent un aperçu précieux du point de vue des auteurs sur certaines lignes directrices pour la rédaction des rapports, ces échantillons étaient petits et les résultats ne peuvent pas nécessairement être généralisés aux auteurs qui utilisent la déclaration STROBE ou d'autres lignes directrices pour la rédaction des rapports.

Passer d'un outil de reporting a un outil pédagogique

Plutôt que de s'attendre à ce que les chercheurs qui utilisent STROBE soient tout à fait suffisants sur le plan épidémiologique et statistique, nous devrions nous attendre à ce que de nombreux auteurs qui utilisent la liste de vérification ne comprennent pas tous les concepts qu'elle contient. STROBE est spécialisé et il nécessite des connaissances de base pour l'utiliser. Bien que STROBE ne soit qu'un outil de reporting, pour certains auteurs qui n'ont jamais suivi de cours sur les méthodes épidémiologiques, STROBE prend une nouvelle vie comme outil éducatif [77]. Le document d'explication et d'élaboration (E&E) du STROBE reconnaît les lacunes des connaissances de l'auteur et il fournit des exemples de bons rapports "afin d'améliorer l'utilisation, la compréhension et la diffusion de la déclaration du STROBE " [43].

Le concept nouvel du STROBE comme une liste de vérification interactive ou un outil éducatif qui offre une voie plus directe vers des informations nuancées et des exemples de bons rapports permet à l'utilisateur de gagner ou de renforcer son éducation sur des sujets critiques.

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Une bonne façon d'y parvenir est de créer des outils qui intègrent les ressources pédagogiques dans les flux de travail actuels des auteurs. Il est justifié d'intervenir tôt dans le processus de rédaction car certains soutiennent qu'intervenir à l'étape de la révision d'un manuscrit est trop tard dans le processus de recherche [78]. Les résultats d'un examen de la portée des interventions de 2019 visant à améliorer le respect des lignes directrices pour la rédaction des rapports ont montré que la majorité des interventions ont été menées dans les revues [79]. Il y a très peu d'interventions axées sur les premières étapes de la recherche et peu de travail est fait pour étudier la compréhension de lesdites lignes directrices [79]. Une grande partie de la recherche médicale est fondée sur l'observation et la valeur pratique du STROBE peut être étendue afin de fournir un cadre pour l'enseignement des principes de la recherche scientifique et de l'établissement de rapports en médecine.

Objectifs

Le doctorat s'articule autour de quatre objectifs de soutien pour atteindre l'objectif final: Développer une intervention éducative structurée basée sur la déclaration STROBE pour l'enseignement des méthodes de recherche observationnelle et du reportage. Pour donner un aperçu des données probantes entourant l'utilisation de STROBE, de l'environnement dans lequel il est utilisé (par exemple, la publication biomédicale) et des facilitateurs et des obstacles à l'utilisation, je visais à: 1) classer les changements apportés aux extensions afin d'identifier les forces et les faiblesses de la liste de vérification STROBE originale; 2) déterminer la prévalence et la typologie de l'approbation par les revues dans les domaines liés aux extensions; 3) évaluer la connaissance, les expériences et les attitudes des chercheurs actuels à l'égard de

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la liste de vérification STROBE; et 4) élaborer et évaluer un instrument d'évaluation de l'acceptation et de l'utilisation d'une ligne directrice en matière de rapports.

Cadre

Cette thèse s'inscrivait dans une approche à plusieurs étapes visant à améliorer l'utilisation des lignes directrices en matière de rapports, car elle visait à explorer les questions au niveau des lignes directrices, des auteurs et des revues [20]. Pour décomposer les interactions complexes qui influent sur l'utilisation des lignes directrices par les auteurs, on a eu recours à la stratégie d'application des connaissances PARIHS (Promoting Action on Research Implementation in Health Services, soit *promouvoir* l'*action* en application de la recherche aux services de santé) [80–82]. Le cadre PARIHS comprend trois éléments de base (chacun comprenant des composantes multiples et distinctes) qui déterminent le succès de la mise en œuvre de la recherche (Figure 1):

1. Preuve : la force et la nature de la preuve telle qu'elle est perçue par de multiples intervenants (c'est-à-dire évaluer le contenu, les adaptations et l'acceptation) ;
2. Contexte : la qualité du contexte ou de l'environnement dans lequel la recherche est réalisée (c'est-à-dire l'environnement dans lequel les auteurs évoluent), et
3. Facilitation : processus par lesquels la mise en œuvre est facilitée (c'est-à-dire les facteurs personnels et environnementaux qui influencent l'utilisation) (Helfrich et al., 2009)

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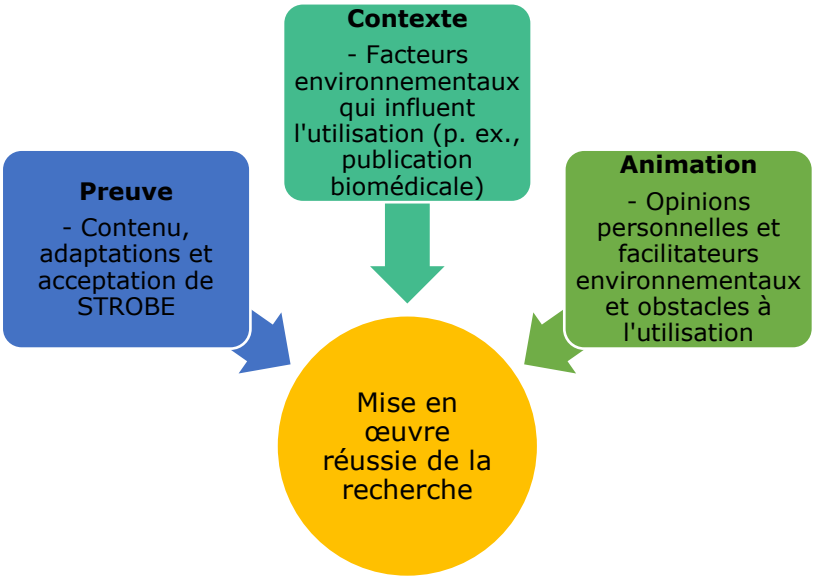

Figure 1. Cadre PARIHS appliqué à la mise en œuvre du STROBE

Chapitre un: la perspective du journal et les extensions STROBE

La première étude du travail de doctorat s'est concentrée sur la nature des preuves et du contexte du STROBE en se concentrant sur les extensions du STROBE, leur contenu et leur mise en œuvre. Une évaluation qualitative des extensions STROBE a été réalisée afin de mieux comprendre les domaines de contenu qui sont pleinement suffisants, souvent mal compris ou afin de les développer. Cela a permis d'établir une partie du contenu et une orientation nécessaire à une intervention éducative.

Ensuite, afin de mieux comprendre l'environnement actuel dans lequel travaillent les auteurs, j'ai évalué la prévalence et la typologie actuelles de l'approbation du STROBE et des extensions. Cette évaluation de l'approbation a démontré la variabilité de la formulation de l'approbation et elle a établi une importante question de classification pour la documentation et les données probantes relatives à l'approbation du STROBE. Il a révélé de fréquentes

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formulations ambiguës et dénuées de sens et il a attiré l'attention sur des méthodes d'approbation plus optimales. Ce travail a également permis de déterminer si les extensions étaient approuvées par les revues pertinentes.

Chapitre deux: le point de vue de l'auteur sur STROBE

Après avoir utilisé une approche plus objective et bibliométrique axée sur les données pour découvrir les problèmes liés au contenu du STROBE et à sa mise en œuvre actuelle par les revues, j'ai cherché à explorer ces questions telles que perçues par les auteurs. Par conséquent, le deuxième projet s'est concentré sur l'exploration des perceptions de l'auteur au sujet du contenu, de la structure et de l'utilisation du STROBE. J'ai développé et j'ai distribué un sondage en ligne ciblant les auteurs d'études observationnelles. Ce sondage a été conçu pour évaluer la connaissance, l'expérience et les attitudes des chercheurs actuels à l'égard de la liste de vérification du STROBE. Les auteurs ont été interrogés sur leur connaissance du STROBE et des extensions ainsi que sur leurs attitudes et leurs croyances quant à son utilité, sa facilité d'utilisation et les avantages perçus. On leur a également posé des questions sur leur utilisation actuelle du STROBE et sur le moment de son utilisation.

Dans le cadre du ce projet, j'ai également élaboré et évalué un instrument d'évaluation de l'acceptation et de l'utilisation d'une ligne directrice en matière de rapports. Cet instrument s'inspire de travaux antérieurs dans le domaine de l'évaluation des technologies de la santé (ETS) qui visent à évaluer systématiquement la façon dont les utilisateurs interagissent directement et indirectement avec les technologies, à découvrir les conséquences de leur utilisation et à éclairer la prise de décisions futures [83–86]. Jusqu'à présent, cette méthodologie

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n'avait pas été étendue à l'utilisation des lignes directrices en matière de rapports et il n'existait pas non plus d'outils permettant d'évaluer systématiquement les interactions de l'auteur avec lesdites lignes directrices. Mais surtout, ce projet a permis d'établir les facteurs personnels et environnementaux qui influencent l'utilisation du STROBE et de mieux comprendre les problèmes actuels auxquels sont confrontés les auteurs.

Chapitre trois: une intervention pédagogique pour l'enseignement des méthodes de recherche et de l'écriture

Selon les résultats des projets réalisés dans les chapitres un et deux, l'intervention doit 1) tenir compte des différentes écoles de pensée et d'une grande variété d'approches, de domaines et de méthodologies ; 2) inclure des informations nuancées provenant des extensions STROBE ; 3) permettre une modification facile par un public mondial lorsque de nouvelles méthodes sont disponibles ; 4) s'adapter à un public divers, reconnaissant que les processus actuels du travail peuvent avoir plus de valeur pour les chercheurs en début de carrière ; 5) ne pas s'imposer dans le déroulement du travail. Compte tenu de tout cela, il a été décidé que les interventions devraient être créées de manière transparente, qu'elles devraient être librement accessibles et éditables ainsi qu'adaptées à un public diversifié. Par conséquent, le projet final (chapitre trois) est un livre à la *source ouverte* en ligne, créé en rapport, qui peut être librement consulté et édité par la communauté épidémiologique. Un travail de collaboration a été établi avec d'autres chercheurs qui ont offert une solution technique pour intégrer l'information dans le flux de travail de rédaction sous la forme d'un ajout pour Microsoft Word. Ensemble, avec

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cet outil d'aide à l'écriture, le STROBE peut être utilisé plus efficacement à la fois comme outil d'aide à l'écriture et comme outil pédagogique.

Discussion

Le travail de cette thèse a été guidé par la stratégie d'application des connaissances de Promoting Action on Research Implementation in Health Services (PARIHS) qui contient trois éléments de base (données probantes, contexte et facilitation) qui influencent la façon dont la mise en œuvre de la recherche peut être réussie (Harvey & Kitson, 2016 ; Helfrich et coll., 2009 ; A. L. Kitson et coll., 2008 ; Stetler et coll., 2011). Pour transformer le STROBE, qui n'était qu'une simple ligne directrice pour la présentation de rapports, en un outil éducatif, il fallait étudier ces trois facettes.

Les données probantes

J'ai commencé par examiner les preuves entourant l'acceptabilité (c'est-à-dire l'endossement) du STROBE par les revues, et son acceptabilité comme une base méthodologique pour les extensions du STROBE. En évaluant qualitativement le contenu des extensions du STROBE, nous avons eu un aperçu des domaines qui pourraient devoir être ajoutés à la liste de contrôle et à l'intervention éducative (Sharp, Hren, et coll., 2018). Cette évaluation a fourni des données probantes sur les domaines susceptibles d'être mal compris par les auteurs, sur la façon dont le programme STROBE est actuellement étendu à différents domaines et méthodologies et sur la façon dont l'information peut être utilisée pour aider à former davantage les auteurs à l'avenir.

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La deuxième partie du premier projet a permis de poursuivre l'étude des données probantes entourant l'acceptabilité du STROBE et de ses extensions (Sharp, Tokalić, et coll., 2018). Les revues n'endossent pas généralement le STROBE, ni ses extensions, et le langage qu'elles utilisent est ambigu et vague. De plus, une bonne partie de l'information a été trouvée dans des endroits (p. ex., les politiques éditoriales) autres que les instructions aux auteurs, ce qui constitue un autre obstacle à la sensibilisation et à la mise en œuvre des lignes directrices sur les rapports, car ce n'est peut-être pas un endroit intuitif où les auteurs peuvent chercher. Des formulations et des suggestions vagues plutôt que des exigences peuvent également miner l'importance des lignes directrices pour la rédaction de rapports.

Le contexte

Ensuite, j'ai enquêté sur la façon dont les auteurs considéraient le contexte dans lequel ils menaient leurs travaux. Un environnement favorable est important pour le succès des lignes directrices en matière de déclaration. Si la culture dominante, les rôles de leadership et les structures organisationnelles n'appuient pas le STROBE, cela pourrait constituer des obstacles considérables à l'utilisation. L'enquête visait à recueillir les commentaires de ceux qui avaient déjà utilisé le STROBE, de ceux qui en connaissaient l'existence mais ne l'avaient jamais utilisé et de ceux qui ne connaissaient pas son existence avant l'invitation à l'enquête. Les journaux ont été la principale source de motivation, d'application et de communication au sujet du STROBE et des directives de déclaration. Leur soutien est essentiel. Le deuxième projet a également confirmé qu'une approche d'évaluation des technologies de la santé (ETS) peut s'appliquer au STROBE (et aux lignes directrices de déclaration), mais qu'elle doit tenir davantage compte du milieu de l'édition universitaire.

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Les facilitateurs

En plus d'avoir un environnement favorable, les auteurs doivent aussi posséder les caractéristiques personnelles qui facilitent l'utilisation du STROBE. Quinze pour cent (n = 150) des participants au sondage (n = 1015) ont partagé leurs perceptions et leurs idées par le biais d'une rétroaction qualitative. Les résultats ont montré qu'il y avait beaucoup de désaccord sur le niveau de spécificité souhaité dans le STROBE et sur son utilité. En général, les auteurs n'étaient pas opposés à l'utilisation du STROBE mais, en l'absence d'exigence de journal, ils ont exprimé qu'il n'y avait souvent pas de forte force de motivation externe. Leurs co-auteurs ne l'utilisaient pas et les revues ne l'exigeaient pas. En outre, lorsque certains utilisaient le STROBE, comme l'exige une revue, ils étaient découragés car il n'était pas utilisé par la rédaction ou les pairs examinateurs, ce qui faisait de l'exécution du STROBE un simple fardeau administratif. Enfin, et c'est peut-être le problème le plus difficile à résoudre: le rejet de l'utilité du STROBE par des expressions d'assurance ou de confiance excessive en ses capacités.

Les auteurs qui ont participé à un sondage en ligne ont partagé leurs points de vue sur leur environnement et les facteurs qui facilitent l'utilisation. Les réponses ont révélé de multiples malentendus sur l'objet et le contenu de STROBE et de grands désaccords sur le niveau de spécificité souhaité. Les auteurs ont également exprimé certaines opinions internes qui sont préjudiciables à la promotion du STROBE, comme la confiance en soi exagérée. En outre, les résultats ont souligné la nécessité de mettre en place de meilleurs mécanismes d'incitation et d'application car il n'existe souvent pas de force de motivation forte pour utiliser le STROBE. Les entraîneurs l'utilisent rarement et la plupart des revues ne l'exigent pas.

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Conclusion

Les interventions précoces axées sur les chercheurs en début de carrière sont peut-être les plus prometteuses, mais l'auditoire d'une intervention éducative sera diversifié et le contenu doit être souple. Les résultats ont aidé à fournir le contenu et le soutien d'une intervention éducative qui est à code source ouvert, modifiable et accessible par un public mondial.

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Introduction

Introduction to research waste

It is estimated that about 85% of biomedical research is wasted [18]. Waste can be created throughout the process of conducting research. From the initial stages of study conception, things can go wrong. A researcher can ask the wrong questions, use the wrong design, or analyze the data with the wrong methods. Even if these steps are done properly, the study report can be, either purposefully or inadvertently, missing key information. Selective and incomplete information in a research article makes replication, critical appraisal, and interpretations difficult or impossible. With inadequate reporting, results cannot properly inform clinical practice and health policies, meaning that the same research questions need to be asked again and again, creating unnecessary duplicative work and creating waste in research [87].

Incomplete reporting is unethical and hinders progress in research, creating a "reproducibility crisis" as results cannot be replicated, reproduced, nor accurately interpreted [19,20]. Clinicians are unable to make decisions about care, readers are left with endless questions, and the generalizability and credibility of research is uncertain. Furthermore, inadequately reported research is then excluded from systematic reviews and meta-analyses, which are designed to pool together and synthesize the results from many different studies.

This is worsened by the fact that the results of roughly half of all funded research studies are also never published [88] with reports detailing negative or null findings being far less likely to be published [89,90]. Similar to when research is simply unavailable, when study results are poorly reported there is no way to integrate them into reviews and meta-analyses. Paired with the large amount of unpublished literature, the final results are then less

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conclusive and possibly biased, especially in a positive direction. This leaves us with a misleading evidence base where research is essentially unusable in guiding future research and clinical care. In addition to the human costs, the inaccessible nature of research is also literally fiscally expensive, resulting in a waste of as much as $240 billion in annual worldwide health research expenditures [91].

Introduction to reporting guidelines

There is now a greater recognition of the problems of publication bias and poorly reported research as the amount of systematic reviews and meta-analyses being published has increased in recent years [92]. Attempts to address the reporting problems have focused on efforts to provide more structure and guidance to scientific writing through the use of reporting guidelines (RG) [18,22,23]. RG are commonly organized in the form of a checklist which contains essential contextual and methodological items that need to be reported when describing the results of a study. For example, clear definitions and rationale must be given about how participants were deemed eligible to participate, how they were recruited and tracked throughout the course of the study, and what information was collected from them and how. The items in this checklist promote reproducibility and replicability and aim to give readers sufficient information to help them judge a study's quality and generalizability. This checklist may also be accompanied by a flow diagram, detailing information about things such as how many people were initially contacted, how many people declined to participate, and how many people dropped out of the study. Furthermore, the checklist may also be paired with an additional Elaboration and Explanation (E&E) document which provides more detailed descriptions of why the requested items are important and gives examples of "good

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reporting" from real research articles. This additional information attempts to provide some education alongside the strict writing guidance.

The initial reporting guideline movement began focused on randomized control trials (RCT) -- studies generally considered to be the "gold standard" in clinical research [24–26]. RCTs are studies in which patients are assigned to either an experimental (i.e., they receive an intervention) or a control group (i.e., they receive the standard of care or a placebo) and then are followed to see if there are any differences between the groups in certain pre-determined outcomes. The random allocation of participants to groups reduces confounders, making the groups comparable at baseline and allowing researchers to more easily draw causal inferences on whether a treatment or procedure has any impact. [93] Confounders are especially important to consider in all of health research as they are variables that can result in spurious associations, masking real relationships between independent (exposures) and dependent (outcomes) variables. [94]

Efforts to improve the quality of RCTs harken back to 1993 when the Standardized Reporting of Trials (SORT) Statement was created in an effort to address the inadequate reporting in randomized clinical trials (RCT) [24]. At the same time and independently, another group was also working on providing guidance for reporting. So, in 1996, the SORT group, in collaboration with the Asilomar Working Group published the Consolidated Standards of Reporting Trials (CONSORT) Statement [28,27]. CONSORT contained a flow-diagram which showed how many participants were approached, engaged in, and completed the study. It also contained a 21-item checklist which listed the key pieces of information which were necessary to judge the quality of a study [27].

Several updates to the CONSORT Statement have since been published. These updates have modified and added items to the checklist and provided even more detailed

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guidance. Furthermore, CONSORT has inspired many offshoots, known as extensions, which provide more nuanced and specialized guidance for different study designs, interventions, or data types [29]. Studies have shown that when biomedical research journals support or endorse the use of CONSORT, there are improvements in the reporting of the study methods and results [95–99]. A systematic review of 50 different interventions (involving 16,604 RCTs) demonstrated that journals which endorsed CONSORT had significant improvement on five of 22 items (of the 2001 CONSORT checklist) and similar positive effects for another 15 items [96]. Whereas, another study found that when journals took an active implementation stance for the CONSORT for Abstracts guideline (i.e., regulated monitoring and enforcement), there were improvements in the reporting [95]. CONSORT was a pioneer in demonstrating the potential benefits of reporting guidelines. Its success has generated a growing interest in the production of guidelines for other study designs, fields, and methods.

Introduction to STROBE

More than ten years after the publication of CONSORT, the attention finally turned to observational research. Creating CONSORT and deciding upon the essential items for reports of randomized control trials was a complex task – one which involved some of the best experts in the world working on the issue over many years. Deciding what items are essential for an observational study is arguably an even more difficult task.

Clinical trials are often more structured and "clean-cut" to perform as, by design, they have experimental and control groups. These groups allow researchers to control for external factors, (i.e., confounders and biases) which can easily influence results. For example, groups are generally balanced such that one is not older, wealthier, or healthier than the other. Additionally, participants and even researchers can be blinded to an intervention, such that

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one or both groups do not know if the participant is getting the intervention or not, thus they cannot influence the results in the way that they want. Careful design and analysis of observational studies is essential because they are not structured to control for these external factors, thus they are especially prone to bias and confounding [30–32].

In an ideal world, people would be able to use randomized control trials more often, however, sometimes it is simply unethical or unreasonable to conduct an RCT [32]. For example, it would be immoral and impractical to design an RCT to investigate socioeconomic impacts on health (e.g., you cannot assign someone's geographic location, race, income, gender, etc.) or surgical procedures.

Observational studies are also particularly useful for those working on health policies and in comparative effectiveness research as they allow evaluations of several interventions already in use and can then determine which may be most effective. Furthermore, observational research is greatly beneficial for those using "big data" such as those taken from social media, electronic medical records, billing data, or health registry – all fields which have seen large growth in the past several decades [100]. Given the breadth of topics that observational studies can cover, it is no surprise that it is the most common study design used in biomedical research [35].

Due to the complex design and conduct of observational studies, they have been deemed to be "the most necessary and difficult" studies to conduct [33]. Observational studies are conducted in real-world settings and can investigate the impact of health policies on populations and explore the distribution of health outcomes across groups [30]. One of the biggest benefits of observational research is that it can affordably provide a larger number of participants in comparison to RCTs [30]. This allows investigations into differences between subgroups in the population (e.g., different age groups, disease subtypes) and can promote

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broader generalizability of findings as the sample is larger and may be more representative of the population [34]. RCTs simply cannot achieve these same results.

Observational research can broadly be divided into three main study designs: cross-sectional, case-control, and cohort studies. Cross-sectional studies, can provide a "snapshot" in time and establish the prevalence of certain conditions whereas case-control and cohort studies give a temporal dimension to the data. These latter two study designs are particularly useful as they can offer a prospective or retrospective dimension to disease occurrence and associations with exposures. [32] Additionally, with a larger study timeframe, researchers can then take a life course perspective on health -- investigating critical periods of exposure, accumulative risk, and how varying biopsychosocial factors influence health throughout life [101–103]. Observational research which allows participants to be followed for longer periods of time also fosters evaluations of changes in health outcomes throughout the lifespan.

Due to a high prevalence of observational studies in the literature, widespread poor reporting means that an enormous amount of the medical literature has issues. Research has shown that some authors have trouble even correctly identifying the type of study that they have conducted. For example, in a 2018 study evaluating articles published in the field of neurosurgery, 40.62% of their sample (91/244) misclassified their study design. Cohort studies were the most common design mislabeled as case-control studies. [104] This misclassification has implications for indexing, synthesis methods, and statistical analyses as incorrect measurements may have been reported, thus distorting results. Incorrectly reported metrics (e.g., giving odds ratio instead of relative risk) may then influence results of systematic reviews and meta-analyses if these errors are not caught.

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Research has also shown that items concerning the methodology and results of observational studies are particularly poorly reported [36–41,105]. Details about participants, data collection, and analyses are common problems. While missing details on how many people were eligible to participate, consented, and lost to follow-up questions the generalizability of results. On the other hand, missing data on the reliability of the data collection instruments used, how the data was analyzed, and missing disclosures of funding sources can be worrying for different reasons. This missing information can mask motives for certain narratives or may result in certain null or unfavorable outcomes not being reported. Therefore, a reporting guideline for observational research is critically needed to promote appropriate interpretations of study findings and to foster transparency and the reproducibility of results.

To ensure that essential items are reported when discussing the results of an observational study, a reporting guideline was created in 2007. The STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) Statement is a 22-item checklist that details the key information needed when reporting the results of an observational study [42] (Figure 1). It is also accompanied by an Explanation and Elaboration (E&E) document that provides further details for each checklist item and gives examples of good reporting [43]. Similar to CONSORT, over the past decade, STROBE has spawned many different extensions for various methods and fields (Table 1). [45–57,106,107]

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Table. **The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Checklist of Items That Should Be Addressed in Reports of Observational Studies**

Item	Item Number	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract. (b) Provide in the abstract an informative and balanced summary of what was done and what was found.
Introduction		
Background/ rationale	2	Explain the scientific background and rationale for the investigation being reported.
Objectives	3	State specific objectives, including any prespecified hypotheses.
Methods		
Study design	4	Present key elements of study design early in the paper.
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection.
Participants	6	(a) Cohort study: Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up. Case–control study: Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls. Cross-sectional study: Give the eligibility criteria, and the sources and methods of selection of participants. (b) Cohort study: For matched studies, give matching criteria and number of exposed and unexposed. Case–control study: For matched studies, give matching criteria and the number of controls per case.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group.
Bias	9	Describe any efforts to address potential sources of bias.
Study size	10	Explain how the study size was arrived at.
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why.
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding. (b) Describe any methods used to examine subgroups and interactions. (c) Explain how missing data were addressed. (d) Cohort study: If applicable, explain how loss to follow-up was addressed. Case–control study: If applicable, explain how matching of cases and controls was addressed. Cross-sectional study: If applicable, describe analytical methods taking account of sampling strategy. (e) Describe any sensitivity analyses.
Results		
Participants	13*	(a) Report the numbers of individuals at each stage of the study—e.g., numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed. (b) Give reasons for nonparticipation at each stage. (c) Consider use of a flow diagram.
Descriptive data	14*	(a) Give characteristics of study participants (e.g., demographic, clinical, social) and information on exposures and potential confounders. (b) Indicate the number of participants with missing data for each variable of interest. (c) Cohort study: Summarize follow-up time—e.g., average and total amount.
Outcome data	15*	Cohort study: Report numbers of outcome events or summary measures over time. Case–control study: Report numbers in each exposure category or summary measures of exposure. Cross-sectional study: Report numbers of outcome events or summary measures.
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence intervals). Make clear which confounders were adjusted for and why they were included. (b) Report category boundaries when continuous variables were categorized. (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period.
Other analyses	17	Report other analyses done—e.g., analyses of subgroups and interactions and sensitivity analyses.
Discussion		
Key results	18	Summarize key results with reference to study objectives.
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.
Generalizability	21	Discuss the generalizability (external validity) of the study results.
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based.

*Give such information separately for cases and controls in case–control studies, and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

An Explanation and Elaboration article (18–20) discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available at www.annals.org and on the Web sites of *PLoS Medicine* [www.plosmedicine.org] and *Epidemiology* [www.epidem.com]). Separate versions of the checklist for cohort, case–control, and cross-sectional studies are available on the STROBE Web site (www.strobe-statement.org).

Figure 1. The STROBE Checklist (Replicated from Published Report) [42]

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Table 1. List of STROBE Extensions

Abbreviation	Title/Description	Publication Date
STREGA [53]	STrengthening the REporting of Genetic Association Studies	February 3, 2009
STROBE-EULAR [46]*	A EULAR extension of STROBE guidelines	June 4, 2010
STROBE-ME [49]	STrengthening the Reporting of OBservational studies in Epidemiology - Molecular Epidemiology	October 24, 2011
STROME-ID [47]	Strengthening the Reporting of Molecular Epidemiology for Infectious Diseases	March 13, 2014
STROBE-RDS [56]	Strengthening the Reporting of Observational Studies in Epidemiology for Respondent-Driven Sampling studies	May 1, 2015
RECORD [106]	REporting of studies Conducted using Observational Routinely-collected health Data (RECORD) Statement	October 6, 2015
STROBE-AMS [55]	Strengthening the Reporting of Observational Studies in Epidemiology for AntiMicrobial Stewardship	February 19, 2016
MARE-S [108]	Medical Abortion Reporting of Efficacy - STROBE	April 23, 2016
STROBE-NUT [52]	Strengthening the Reporting of Observational Studies in Epidemiology-NUTritional epidemiology	June 7, 2016
ROSES-I [50]	CONSISE statement on the REporting of SEroepidemiologic Studies for influenza	July 17, 2016
STROBE-SBR [109]	Strengthening the Reporting of Observational Studies in Epidemiology for Simulation-Based Research	July 26, 2016
STROBE-NI [48]	Strengthening the Reporting of Observational Studies in Epidemiology for Newborn Infection	September 13, 2016
STROBE-Vet [110]	Strengthening the Reporting of Observational Studies in Epidemiology - Veterinary	November 1, 2016
STROBE-SIIS [107]	STROBE Extension for Sport Injury and Illness Surveillance (STROBE-SIIS))	January 7, 2020

** This extension does not have an official acronym. For simplicity's sake, one has been created.*

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Promotion of STROBE

By editorial groups

Since its publication, STROBE has been endorsed by the International Committee of Medical Journal Editors (ICMJE) [58], a group that encompasses many of the top-ranked journals in medicine, and world-renowned bodies such as the World Association of Medical Editors [111] and the United States National Library of Medicine [112]. The ICMJE promotes the use of STROBE by including it in the ICMJE Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals -- a standard document which is used and promoted by thousands of biomedical journals [59].

The ICMJE is invested in the promotion and implementation of reporting guidelines, and directs authors to initiatives dedicated to this aim. Amongst the general guidance on writing and publishing of academic articles, the Recommendations contains explicit information about a few other reporting guidelines, such as CONSORT, and instructs authors to look for other guidance that may be relevant to their work. For example, the ICMJE Recommendations reference the Enhancing the QUAlity and Transparency Of health Research (EQUATOR) Network, an international initiative created in 2008 which provides resources and training on how to develop, disseminate, and implement reporting guidelines [60,61]. The EQUATOR Network is an important and dedicated advocate for reporting guidelines and does so by indexing guidelines on their site, providing training workshops for researchers, and broadly promoting reporting guideline use.

By biomedical journals

In addition to the ICMJE promotion and EQUATOR's work, individual journals can support or "endorse" reporting guidelines by mentioning them to researchers in their

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"instructions for authors." These instructions detail how to submit a manuscript detailing the results of a study. When journals endorse reporting guidelines, the detail and strength of endorsement is extremely varied [62]. Journals can:

1. imply reference resources which encourage the use of reporting guidelines (i.e., the ICMJE document, or the EQUATOR Network),
2. mention the existence of "relevant" RG (meaning that it is up to the author to find one on their own),
3. suggest using specific ones, such as CONSORT or STROBE, or
4. require authors to submit a completed RG checklist with their manuscript [67,113,114].

Requirement generally entails having authors submit a completed checklist and/or flow diagram which notes the text or page numbers of the manuscript where the reader can find the information related to each checklist item. Alternatively, the journal could ask authors to simply check that each item was addressed but not provide any further details. When journals only suggest to authors that they should use a reporting guideline, there is no enforcement mechanism or check. The lack of an enforcement mechanism and use of ambiguous endorsement language by journals implies that some journals do not want to take responsibility for guideline enforcement. Despite the widespread issues of reporting mentioned earlier and the urgent need to address a biased and broken evidence-base, many journals overlook non-adherence to RG or are not aware of the existence of RG.

In fact, a lack of awareness of reporting guidelines seems to be common for journal editors. In one study investigating the endorsement of CONSORT in Chinese medical journals, many editors (43/54) reported that they were not aware of the existence of CONSORT although once introduced, they were willing to adopt it in the future [63]. A

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majority of dental journal editors (19/34) also were not familiar with the EQUATOR Network [64] and nearly half of veterinary journal Editors-in-Chief (32/68) did not know what a reporting guideline was before they received a questionnaire about the topic [65].

In general, reporting guidelines are inadequately endorsed by journals [66]. However, when compared to CONSORT [67,68], STROBE has much worse endorsement rates [69]. For example, in oncology and hematology, CONSORT was endorsed more than twice as often (33.3% vs. 13.4%, n = 231 [115], while in pediatrics, a five-fold difference was found (20% vs. 4%, n = 69) [71]. Other fields such as dentistry (12.8%, n=109) [72] and urology and nephrology (5.4%, n=55) [73], have similarly low endorsement rates for STROBE.

Despite these low endorsement rates and a lack of awareness of RG, some are still optimistic about their potential impact. In one study with authors and editors involved in publishing health research related to the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) Statement, participants believed that omitted information from journal articles was a common problem (editors n = 43; authors n = 56). Most also believed that authors, journal editors, and peer reviewers should use RG [74].

However, the issue of low rates of use is not so straightforward and everyone is not as accepting of RG. In addition to reporting a lack of knowledge, veterinary journal editors also reported other barriers to use including: 1) beliefs that their current policies were sufficient (i.e., they were resistance to change), 2) beliefs that reporting guidelines were not specific enough for their needs (e.g., subject area or study type), and 3) fears that authors would prefer journals will less strict submissions and decreased workloads (i.e., no RG requirement) [65]. This widespread lack of awareness and negative beliefs, means that journals may be less likely to endorse guidelines. This is a problem as journals are a key communication channel

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to authors, meaning that, in turn, fewer authors may also be aware of the existence and importance of RG.

Unfortunately, low endorsement rates may also be affected by the lack of evidence regarding their impact on the completeness of reporting [116,117,114,118]. In general, there is insufficient evidence to determine the relationship between the endorsement of reporting guidelines and the completeness of reporting [117]. Specific to STROBE, endorsement appeared to have no effect on the reporting of confounding [114] and there was no improvement in methodology reporting in nephrology studies after STROBE was published [118]. A perceived lack of impact of reporting guideline use can affect journal editors' willingness to endorse them.

Use of STROBE by authors

When journals do not require a completed reporting guideline with manuscript submission, there is no real incentive for authors to change their behavior [75]. It is currently unclear what may motivate authors to use reporting guidelines on their own or why they may not want to use one. To my knowledge, only two studies have directly asked authors about their experiences with a reporting guideline [74,76]. Authors (n = 56) responding to questions about the TREND guideline reported issues across many levels that affected the likelihood to use the RG [74]. While authors believed that using an RG would improve the quality of their manuscript, there were also many worries expressed. Practicality concerns (e.g., the additional time needed to complete the checklist), individual beliefs about one's prior experience and knowledge, support from one's working environment, and promotion by journals were some key themes that emerged. In work investigating the PRISMA-Equality extension, Burford et al. asked systematic review authors (n = 151) about proposed items in

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their checklist [76]. Authors thought that the most important facilitators of use were journal endorsement and incorporation of RG into existing software. On the other hand, some common barriers were time and word limits enforced by journals [76]. Although these studies offer valuable insights into author's perspectives on certain reporting guidelines, these samples were small and results cannot necessarily be generalized to authors using the STROBE Statement or other reporting guidelines.

When compounded by the aforementioned weak evidence of STROBE's impact on the completeness of reporting and author's overall lack of awareness of its existence, it is not surprising that authors do not use STROBE. Research has also shown that authors are generally unaware of reporting guidelines or their value [65,77]. This is unfortunate because many biomedical researchers are poorly trained in research design and analysis. It is fairly inarguable that reporting standards for observational studies are needed, especially since epidemiologists are often not involved in the design or conduct of a study, nor are analyses guided or performed by full-time statisticians [119].

Expanding from a reporting tool to an educational tool

Rather than expecting researchers using STROBE to be fully sufficient in epidemiological and statistical concepts, we should expect that many authors using the checklist may not understand all the concepts contained within it. STROBE is specialized and requires background knowledge to use it. While STROBE is intended to only be a tool for reporting, to some authors who never took courses covering epidemiological methods, STROBE takes on a new life as an educational tool [77]. STROBE's Explanation and

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Elaboration (E&E) document recognizes author's gaps in knowledge and provides examples of good reporting in order to "enhance the use, understanding, and dissemination of the STROBE Statement" [43]. However, the information provided in the E&E is quite superficial and the document is not sufficient enough to be a fully-realized educational tool.

Author's lack of expertise and knowledge can be partially addressed by adding interactive layers to STROBE, i.e. providing a deeper level of information than the current E&E provides. Each original STROBE item can be expanded to take the author to more detailed explanation and examples of principles represented by the item. By better integrating reporting standards and educational resources, the value of STROBE can be expanded from a fixed checklist to an interactive educational tool that can be used throughout the writing process to bolster author's current skills and reinforce the need for certain checklist items.

Re-envisioning STROBE as an interactive checklist or educational tool that offers a more direct route to nuanced information and examples of good reporting allows the user to gain or reinforce education on critical topics. This is aligned with a psychoeducational approach to changing behavior and learning. Learning can be viewed as an active interaction with one's social environment that results in changing behavior [120,121]. In our case, the behavior we want changed is the reporting of their research. One good way to achieve that is to create tools that integrate educational resources into authors' current workflows.

Early-stage intervention within the writing workflow is warranted as some argue that intervening at the revision stage of a manuscript is too late in the research process [78]. Results from a 2019 scoping review on interventions to improve reporting guideline adherence showed that the majority of interventions have been conducted in journals [79]. and that there are large research gaps on interventions focused on training on the practical use of RGs and enhancing accessibility and understanding There are very few interventions

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focused at the early stages of research (i.e., general education, grant writing, and protocol writing) and little work done on encouraging and checking adherence at these stages [79]. The team involved in this scoping review also conducted a survey with journal editors, asking them about the feasibility and practicality of many different kinds of interventions for increasing reporting guideline use and adherence. [122] Interventions targeted at authors were seen as potentially effective but plagued by logistical issues when they were proposed at the manuscript submission stage. (e.g., no enforcement/checking mechanism, differences in formatting accepted by different journals, manuscript tracking system abilities, etc.). However, some of the interventions were seen as more effective if they were implemented prior to or during the manuscript writing process.

Aim of compiled research papers

The PhD was structured with four supporting aims to achieve the final objective: to develop a structured educational intervention based on the STROBE statement for teaching observational research methods and reporting. To provide insight into the evidence surrounding the use of STROBE, the environment in which it is used (e.g., biomedical publishing), and facilitators and barriers of use, I aimed to:

1) Classify changes made in the extensions to identify strengths and weaknesses of the original STROBE checklist;
2) Determine the prevalence and typology of endorsement by journals in fields related to extensions;
3) Assess current researcher's awareness of, experiences with, and attitudes towards the STROBE checklist; and

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4) Develop and evaluate an instrument for assessing the acceptance and use of a reporting guideline.

Methods and Framework

This thesis was aligned with a multistage approach to improve reporting guideline use as it aimed to explore issues at the guideline, author, and journal level [20]. In order to effectively implement reporting guidelines, one must consider that interventions aimed at one level of the system are not in isolation and they can affect everyone within the research environment [123]. Biomedical publishing contains complex and interdependent actions from a variety of different stakeholders, each with their own set of capabilities, opportunities, and motivators [123]. Although this work is chiefly focused on intervening at the individual author level, this complex systems approach was embraced throughout the course of this work in order to better translate research into practice [124].

As the overall aim was to develop an intervention, an implementation science approach was embraced in order to systematically study the methods needed to promote uptake of research findings into practice [125]. To breakdown the complex interactions affecting the use of reporting guidelines by authors, the Promoting Action on Research Implementation in Health Services (PARIHS) knowledge translation framework was used to inform how to better implement reporting guidelines into practice [80–82]. The PARIHS Framework was developed in 1998 and has been continually refined and evaluated throughout the years. It "posits that successful implementation is represented as a function (f) of the nature of the type of evidence (E), the qualities of the context (C), in which the evidence is being introduced, and the way the process is facilitated (F); sI = f (E, C, F)." [81]

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In order to have a successful research implementation, the evidence must be robust, the recipients or users must agree with it, and implementation processes must be facilitated by both internal and external factors. [126] These three core elements (each comprising multiple, distinct components) determine the success of a research implementation (Figure 2). In this project they can translate loosely to the following:

1. Evidence: the strength and nature of the evidence as perceived by multiple stakeholders (i.e., evaluating STROBE's content, adaptations, and acceptance);
2. Context: the quality of the context or environment in which the research is implemented (i.e., the environment that authors are operating in); and
3. Facilitation: processes by which implementation is facilitated. (i.e., personal and environmental factors influencing use) [127]

This framework guided the evaluations on the strength and nature of the evidence (i.e., evaluating STROBE's content, adaptations, and acceptance), the context (i.e., the environment that authors are operating in), and facilitation aspects of STROBE (i.e., personal and environmental factors influencing use).

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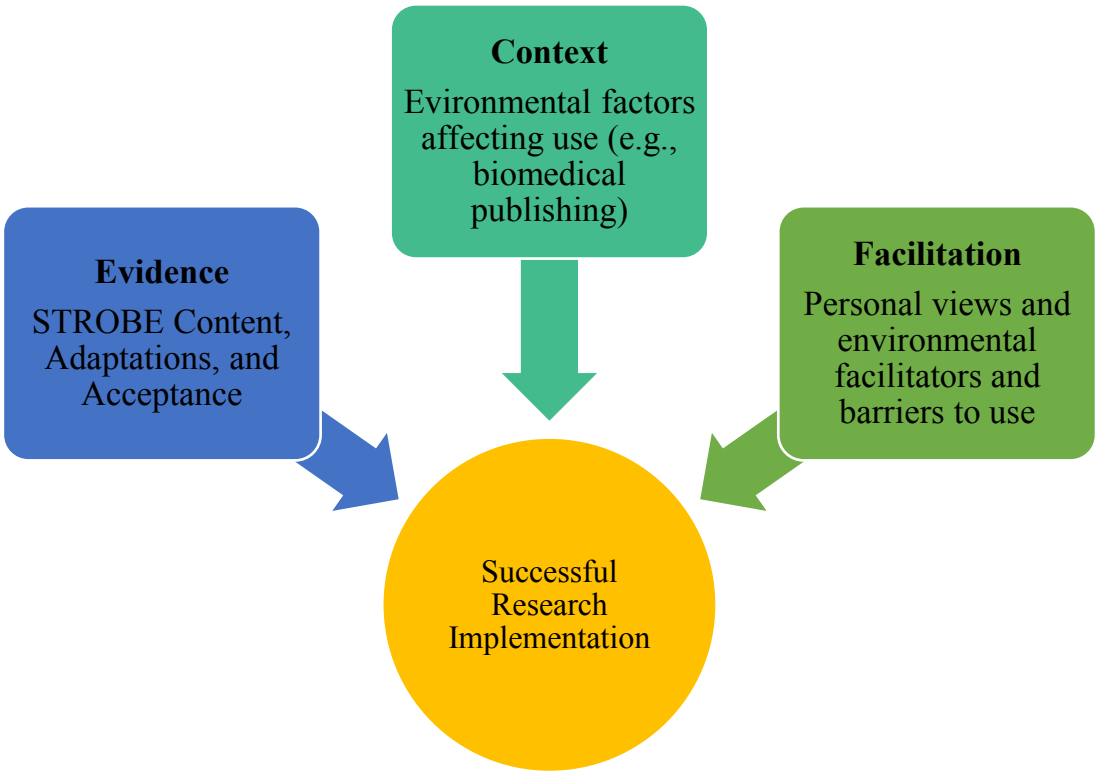

Figure 2. PARIHS Framework Applied to STROBE Implementation

Scientific contribution of compiled research papers

The work in this thesis attempts to provide empirical evidence on how STROBE (and its extensions) are currently being used by journals and authors. Furthermore, it aims to explore potential strengths and weaknesses of the checklist itself, both in terms of content and implementation. This work can also be thought of as a preliminary step in developing more theoretical models of reporting guidelines.

Chapter One details work which was the first to investigate the endorsement of several STROBE extensions and the first to investigate the content of the STROBE extensions. These projects focused on the nature of the evidence and the context of STROBE by concentrating on the STROBE extensions and their content and implementation. It had

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two main aims: 1) To classify changes made in the extensions to identify strengths and weaknesses of the original STROBE checklist; and 2) To determine the prevalence and typology of endorsement by journals in fields related to extensions.

First, the investigation began by delving into the STROBE checklist itself. A qualitative evaluation of the STROBE extensions was performed in order to provide a deeper understanding of content areas that are fully sufficient, commonly misunderstood, or in need of elaboration. This established some of the content and focus needed for an educational intervention.

Next, in order to gain insight into the current environment in which authors are operating, I assessed the current endorsement prevalence and typology for STROBE and the extensions. This endorsement evaluation demonstrated the variability in the phrasing of endorsement and established a major classification issue for the literature and evidence-base for STROBE endorsement. It revealed frequent ambiguous and meaningless endorsement phrasings and drew attention to more optimal methods of endorsement. This work also detected whether extensions were being endorsed by relevant journals and identified editors that extension authors could target for discussions about endorsement. Furthermore, this study created a corpus of observational studies and a methodology which can be used for future research evaluating the relationship between completeness of reporting and endorsement of STROBE and the extensions. These projects established that the STROBE extensions are largely not being endorsed and that there are some issues with the content which could be relevant for an update of STROBE and an educational intervention.

The survey detailed in Chapter Two was the first and only survey aimed at asking authors about their interactions with and perceptions towards STROBE. I adapted and evaluated an which was informed by previous work in the field of Health Technology

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Assessment (HTA). HTA aims to systematically evaluate how users directly and indirectly interact with technologies, discovers consequences of use, and informs future decision making [83–85]. Until now, this methodology had not been extended to the use of reporting guidelines nor were there any tools to systematically evaluate author's interactions with reporting guidelines. This work turned anecdotes into evidence and provided insights into the facilitators and barriers of reporting guideline use. Furthermore, it established that a Health Technology Assessment (HTA) approach can be applicable to STROBE (and reporting guidelines) [83–85]. As meta-research and reporting guidelines are a relatively new field, it is important to recognize and harness the power of other theoretical approaches to this arena. Also, most importantly, this project established the personal and environmental factors influencing use of STROBE and created a deeper understanding of the current issues facing authors.

The results from the two projects detailed in Chapters One and Two were important to inform the creation of an educational intervention for teaching authors of observational studies how to report their research and be clear about the methods they used. These projects investigated the evidence, context, and facilitators needed to make a successful intervention.

The modus operandi throughout this work was to embrace implementation science (e.g., using the PARIHS framework) and not simply do research for the sake of research. While standalone educational interventions (i.e., trials) could show benefit to a small group of individuals, the long-term impact would most likely to be minimal and would actually create more waste in research. Furthermore, epidemiology is complex and rapidly changing field. STROBE was created more than a decade ago and survey respondents (Chapter Two) expressed concerns about its breadth, content, and implementation. To address issues surrounding the current timing of use (i.e., during the manuscript submission process), an

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early-intervention approach was taken to test the integration of STROBE, reporting guidelines, and education into the writing workflow itself.

Based on the results of the projects performed in Chapters One and Two, the intervention has to 1) accommodate different schools of thought and a wide variety of approaches, fields, and methodologies; 2) encompass nuanced information from the STROBE extensions; 3) allow for easy modification by a global audience when new methods are available; 4) adapt to a diverse audience, recognizing that there may be more value for early-career researchers; 5) not intrude upon the current workflow processes. Taking all of this into account, it was decided that the interventions should be transparently created, freely available and editable, and geared towards a diverse audience. Therefore, the final project (Chapter Three) is an online open source book, created in R, which can be freely accessed and edited by the epidemiological community. Collaborative work was established with other researchers who offered a technical solution to integrating information into the writing workflow in the form of an Add-in for Microsoft Word. Together, with this writing aid, STROBE can be more effectively delivered as both a writing aid and as an educational tool.

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Chapter One: The Journal's Perspective and the STROBE Extensions

As a general guideline for observational studies, STROBE should cover all of the necessary information needed in order to evaluate and reproduce a study. However, for some topics, STROBE may not be sufficient due to specific requirements within that domain. This gap is then covered by an extension for that field. Extensions focus on a specific topic area (e.g., molecular epidemiology [49]) or methodology (e.g., response-driven sampling [56]) and offer new avenues for promoting more complete reporting. In addition to providing more nuanced guidance to authors, extensions may also address editor's concerns that STROBE is not focused enough for their journal [45–50,52–56,106,128]. While extensions have the potential to be beneficial for both authors and editors, their use has been largely unassessed and, similar to STROBE, they may face implementation and usage problems [65,116].

Extensions for other reporting guidelines are common, however the creation of extensions for STROBE has outpaced those for other reporting guidelines such as the CONSORT [26]. Since the publication of STROBE in 2007, at least 14 extensions have been published [45–50,52–56,61,106,107,128], whereas CONSORT was first published in 1996, yet 17 extensions were published in nearly double that time [61]. That equates to an average of 1.08 extensions per year for STROBE versus .74 for CONSORT. The reason behind the difference in extension publication rates is unclear. Perhaps the concept of field-specific extensions to reporting guidelines were pioneered by CONSORT, thus making the idea more commonplace for subsequent reporting guidelines. However, this is not the case for the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guideline [129] which was published in 2009, has 9 extensions, and is often endorsed at higher rates than STROBE [64,130].

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Alternatively, the complexity of observational research may require more guidance due to the wide variety of methods employed in observational studies. Inadequate reporting is prevalent across most items of the STROBE checklist but previous work has largely focused on reporting deficiencies in the methods section – particularly on statistical analyses, confounding, bias, and the handling of missing data [31,41,114,118,131–136]. As mentioned previously in the introduction, confounding and bias are special concerns for observational research. Thus, it is logical that they would be a primary focus for investigations into the completeness of reporting and the area with the most reported deficits. Perhaps this complexity is the reason for the faster creation of extensions for STROBE. Regardless of the reasoning, it is evident that authors are still perceiving a need for more details on how to report information about their studies.

In addition to the uncertainty behind the proliferation of guidelines (i.e., *why* they were created), it is often unclear *how* they were created. There is no clear advice for creating an extension of a reporting guideline and methods are varied. Most extensions do not include authors of the original STROBE guideline and some also do not provide a methodology or rationale behind the inclusion of new items or the rewording of old ones. New or reworded items that are non-specific in nature (i.e., items that can be extrapolated to most observational studies such as details about participants, confounders, biases or any other general epidemiological constructs) suggest potential deficiencies in the STROBE checklist. If the content is already in STROBE, extension authors may have thought that it was not clearly communicated, or that it is necessary to include it in the checklist instead of being only in the Explanation and Elaboration document. Whereas, if the content is not already in STROBE, extension authors may have identified a gap or insufficiency which should be considered as an addendum to STROBE.

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Even though the extension guidelines may be more useful than STROBE due to their specificity and nuance, their uptake may be even lower than the endorsement of STROBE. The extensions were created more recently, many within the past few years, and they do not benefit from the explicit backing of large organizations like ICMJE. Along these lines, as they are narrower in scope, they may also have less people engaged in their promotion and awareness campaigns. To date, only one study has investigated the promotion and uptake of a STROBE extension. Nevodic et. al's study investigated endorsement for the STrengthening the REporting of Genetic Association Studies (STREGA) extension in genetics journals which showed endorsement rates around 16% (29/180, [137]).

In light of these two main research gaps: 1) insufficient knowledge behind what is actually contained within the STROBE extensions and how they relate back to the original core STROBE checklist and 2) how these extensions are currently being promoted by relevant journals in their field, an investigation into these issues was necessary. This chapter begins with a protocol detailing the methodology used to approach both of these issues; it describes the approach to qualitatively coding content in the extensions and to assessing the endorsement of the STROBE extensions.

Assessing the content of the extensions

After the presentation of the protocol for both studies, I present the results of a qualitative assessment of the extensions to identify gaps and redundancies in content. Nearly 300 additions were double-coded and classified as either field-specific or non-field-specific (i.e., items that can be extrapolated to most observational studies) and attributed to each related STROBE checklist item. The research letter that is contained within this chapter [2] complemented existing research and signaled a need for more guidance on methodological

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items -- those which are the most important for research reproducibility. In particular, the items regarding statistical methods, participants, variables, and data sources had many additions with a significant portion of these suggestions not being field-specific. These study results also useful for isolating areas to focus on for the educational intervention and for identifying problems areas to guide a potential update of STROBE.

Assessing the endorsement of the extensions

The other section of this chapter focuses on the endorsement of the extensions by journals. Thus, I conducted an inquiry into extension endorsement for extensions which were published at least one year prior to the start of the study: March 2017. This allowed for a time buffer for uptake so results were not biased. This project was conducted in such a manner that relevant journals were identified in a systematic way and a corpus of observational studies was created that can be used to assess changes in completeness of reporting over time. While the research is mixed on STROBE's impact, there is even less evidence on the impact of extensions. Only one piece, focused on STREGA, investigated this and found that journals that endorsed the were found to have better completeness of reporting than those that did not endorse STREGA [137]. This project did not include an assessment of STROBE's impact on completeness of reporting but all of endorsement data and the observational study corpus is open source for other researchers to use [138]. Furthermore, the search strategies are readily available and replicable such that the study time period can be continually extended if desired (see Additional File 1: Ovid MEDLINE Search Strategies).

The work detailed in this chapter provided some evidence for how the STROBE's content was perceived by extension authors and how the extensions introduced new concepts, reinforced, or reiterated existing ones. This provided evidence that there are perceived gaps in

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STROBE, that certain information may need to be communicated more clearly, and that more detailed information is needed in certain areas. Information from the qualitative assessment of the extensions was valuable for informing the content that should be included in an educational intervention. For example, if an item on the STROBE checklist has many suggested additions across all of the extensions (especially overlapping suggestions), it may indicate a need to elaborate upon that item in greater detail or perhaps even to update the item in the original STROBE checklist. Qualitative coding highlighted important field-specific information that should not be forgotten and also identified topics that need further elaboration and guidance.

In addition, the acceptance of STROBE and the extensions is also an important contextual factor as it is a key communication channel for conveying the importance of complete reporting to authors. Weak phrasing (i.e., suggestions to use RG rather than enforcements), paired with overall low endorsement rates, raise red flags concerning implementation and dissemination strategies for reporting guidelines.

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The STROBE extensions: Protocol for a qualitative assessment of content and a survey of endorsement

Citation

Sharp MK, Utrobičić A, Gómez G, Cobo E, Wager E, Hren D. The STROBE extensions: protocol for a qualitative assessment of content and a survey of endorsement. *BMJ Open* 2017;7(10). [1]

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The STROBE extensions: Considerations for development

Citation

Sharp MK, Hren D, Altman DG. The STROBE Extensions: Considerations for Development. *Epidemiology* 2018;29(6):e53-56. [2]

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A cross-sectional bibliometric study showed suboptimal journal endorsement rates of STROBE and its extensions

Citation

Sharp MK, Tokalić R, Gómez G, Wager E, Altman DG, Hren D. A cross-sectional bibliometric study showed suboptimal journal endorsement rates of STROBE and its extensions. *J Clin Epidemiol* 2018;107:42–50. [3]

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Chapter Two: The Author's Perspective on STROBE

One of the most neglected issues in the reporting guideline literature is the end user's perception and use of them. Current work is largely being guided by anecdotes and speculations rather than solid evidence. Dr. Thomas Chalmers, a key member involved in the SORT group and pioneer in advocating for RCTs, once said that:

> "*People tend more to think that, when wine comes out of an expensive looking bottle, it is better than wine coming from a cheap bottle. I think, all through our lives, we make judgements that do not stand up to evidence*." [139]

The field of reporting guidelines is not immune to making judgments that do not stand up to evidence. Problems with the implementation and use of STROBE have not been properly explored. Unfortunately, to date, little work has been done exploring author's actual use of reporting guidelines and their attitudes towards them. Most research focuses on endorsement rates by journals (as discussed in Chapter One) although there are a few studies that focus on editor's [63–65,74] and author's [74,76] perspectives on reporting guidelines such at the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND), CONSORT, and PRISMA Statements. However, to my knowledge, no work has been done that specifically investigated author's perceptions towards or use of STROBE.

While it is true that those who created, conducted, and reported the results of a study are those that can have the most impact on the final quality of reporting, it is too simplistic to assume that reporting issues are due to the inadequate education of biomedical researchers. Unjust blame is often placed solely upon authors, ignoring external environmental factors that may influence how authors may be creating and continuing the problem of incompletely reporting research. For example, due to power structures in academia, early career

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researchers and junior authors may not be able to fully control a paper's narrative or how data is presented. Additionally, regulatory and administrative overburdens threatening job security may be viewed as more important documents to complete than reporting guidelines [140,141]. Placing all of the blame upon authors ignores the situational constraints they are under [142]. For example, the complex academic and institutional factors that may increase the likelihood that authors spin, selectively, or inadequately report items about their study. In order to design an effective educational intervention for authors, there must be a good understanding of the context or environment in which authors are working and the processes by which reporting guidelines are currently being facilitated [80–82,143].

As previously discussed, one of the most important environmental factors affecting author's use of RG is whether journals support or require RG use. To investigate the reasons behind endorsement (or lack thereof), several studies have asked editors about RG, finding high levels of unawareness of the existence of reporting guidelines and beliefs that current journal policies are sufficient. [63–65,74] Editors have also claimed that reporting guidelines are not specific enough and expressed fears that authors will submit to journals with less strict requirements. [65,74]

Of the limited research that has investigated author's beliefs, one study involving 35 authors found that they generally did not think that the TREND Statement took too long to complete or was too prescriptive, meaning that editor's concerns about needlessly strict requirements could be baseless [74]. However, 43 authors sharing their views on the PRISMA-Equity extension expressed concerns about word limits, a lack of journal endorsement of RG, and no integration of RG into existing software [76].

Although Fuller et. al gave some indication as to how authors may currently use an RG in manuscript writing, other work has demonstrated that there are many different ways

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that authors have used STROBE [74]. Costa et al. conducted a bibliometric study on the uses and misuses of STROBE and found that in addition to being appropriately used as an RG and as an assessment tool of reporting quality (neutral), it was also inappropriately used as an assessment tool of methodological quality [77]. While the ultimate goal of STROBE is to improve the completeness of reporting, an effective educational intervention needs to account for a variety of different types of authors who may use STROBE in some unanticipated ways throughout the research process.

Due to these large gaps in understanding about how authors use and think about STROBE, and how they perceive their environment affecting their decisions, an investigation into these issues was warranted. Therefore, I conducted an online survey aimed at observational study authors to ask them about the factors influencing their use (or not) of STROBE and how their environment affects their decisions. Over 1,000 authors completed the entire survey and 150 of them completed an open-ended qualitative question that asked for any feedback about the survey itself or STROBE. The papers included in this chapter discuss both the quantitative and qualitative results.

A health technology assessment (HTA) framework was used to guide survey development [83,144,145]. It is important to harness this approach as it allows for a systematic evaluation of the properties, effects and/or impacts of health technologies and interventions. Reporting guidelines can be viewed as interventions in biomedical research yet the HTA framework has not been previously utilized in this field.

A commonly used instrument in the HTA field is the unified theory of acceptance and use of technology (UTAUT) scale. UTAUT is a technology acceptance model (TAM) which aims to explain one's intentions to use an information system and their subsequent usage behavior. It has been used hundreds of times in evaluations of communication systems (e.g.,

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mobile technologies), office systems (e.g., desktop applications), general purpose systems (e.g., internet banking), and specialized business systems (e.g., electronic medical record systems) [86]. For the survey described within this chapter, the UTAUT scale was modified to be relevant to STROBE and reporting guideline use [84–86].

The instrument was tested and validated, allowing for future use in research on the promotion and evaluation of other reporting guidelines. The survey was structured to gain perspectives from as many different authors as possible. It allowed for three main categories of use and awareness: 1) those who had never heard of STROBE prior to the survey and accordingly had never used it; 2) those who had heard of STROBE but have not used it; and 3) those who had heard of STROBE and who have used it. This allowed nearly 200 respondents to be introduced to STROBE for the first time and to share their first impressions, making the survey an educational intervention itself. In addition to capturing the viewpoints of those who were never previously exposed to STROBE, the HTA instrument revealed that respondents who had prior experience with STROBE generally found it to be useful, easy to use, clear and understandable.

However, the qualitative responses revealed more depth and nuance to their responses, with many reporting mixed feelings about STROBE. Both quantitative and qualitative feedback highlighted concerns about the perceived benefits of using STROBE given additional time requirements of use. Furthermore, authors shared some apprehension about how supportive peers and the research environment were towards using STROBE and how journals need to better implement and enforce reporting guidelines during editorial or peer review.

Two particularly interesting themes were revealed in the qualitative responses but not in the rest of the survey. Many participants noted that they use STROBE as a teaching tool

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for early career researchers and found its structure and content useful. However, for mid- to late-career researchers, there was an overwhelming response of self-assuredness that STROBE was not as useful given their level of expertise. These juxtaposed beliefs are somewhat contradictory as authors find STROBE valuable to others for teaching and reinforcing epidemiological methods but simultaneously find it not personally valuable as they are "too experienced."

Survey results provided valuable information for the creation of an effective educational intervention. Firstly, and perhaps most importantly, the flexible nature, purpose, and potential impact of STROBE needs to be better communicated to authors who are investing extra time (sometimes as the sacrifice of one's ego) to complete reporting checklists. Secondly, in align with feedback from systematic review authors [76], RG need to be better integrated into author's workflow such as through integration with existing writing software. This can help to address concerns about extra time requirements needed to complete STROBE. Finally, it is reassuring that authors see value in STROBE and many currently use it to teach early career researchers. It would be beneficial to create an educational intervention that harnesses these valuable experiences from teachers and is accessible (and editable) by them.

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Using the STROBE statement: Survey findings emphasized the role of journals in enforcing reporting guidelines

Citation

Sharp MK, Bertizzolo L, Rius R, Wager E, Gómez G, Hren D. Using the STROBE statement: survey findings emphasized the role of journals in enforcing reporting guidelines. *J Clin Epidemiol* 2019;116:26–35. [4]

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Online survey about the STROBE statement highlighted diverging views about its content, purpose, and value

Citation

Sharp, M.K., Glonti, K. Hren, D. Online survey about the STROBE statement highlighted diverging views about its content, purpose, and value. *Journal of Clinical Epidemiology.* 2020; 123:100-106. [5]

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Chapter Three: An educational intervention for teaching research methods and writing

Citation

Sharp, M.K. sharpmel/STROBECourse. GitHub. https://GitHub.com/sharpmel/STROBECourse. Accessed 16 Jul 2019. [146]

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Summary

Participants from our online survey (Chapter 2) confirmed that time was a perceived barrier to using STROBE. They reported that completing the STROBE checklist was a separate additional task to the manuscript submission process. STROBE is not integrated into the writing workflow nor is it effectively used during the peer review process. These create barriers to effective implementation of STROBE and reporting guidelines like it. Furthermore, many survey participants highlighted issues with STROBE's content and lack of detailed guidance in many areas. These gaps and lack of guidance are further reinforced by the results of the qualitative assessment detailed in Chapter One. Despite these gaps though, many authors mentioned that they use STROBE in the training and education of early career researchers. However, to our knowledge, information on how this content is delivered or what it entails is not readily accessible nor standardized.

Epidemiology is a collaborative and rapidly-changing art. There are many excellent epidemiology textbooks and online courses and quality education is attainable [94,147–149]. But in large part, these are static and closed sources of knowledge which are created by experts in the field. These educational sources are also scattered and require additional effort by authors to seek out information, disrupting their manuscript writing flow.

In recent decades, manuscript writing has evolved to include a broad digital ecosystem of software such as reference management software that easily integrates into word processing software (e.g., EndNote [150], Mendeley [151], or Zotero [152] add-ins in Microsoft Word). Harnessing these technological capabilities allows for a seamless integration between knowledge production (i.e., manuscript writing), reinforcement and procurement (i.e., easier access to educational resources). By integrating reporting guidelines into the writing process, authors can

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be continuously exposed to education and guidance. This allows authors to more easily incorporate checklist items into the structure of their workflow and manuscripts. Furthermore, if co-authors have access to the same guidance, the effort becomes more collaborative in nature. This can address voiced concerns about the time and effort required needed to complete a reporting guideline.

An early-intervention approach is supported by results from a 2019 scoping review on interventions to improve reporting guideline adherence [79]. It found that little work has focused on training and educating authors on using RG and more research was needed at the early stages of research, such as during manuscript preparation. Manuscript writing is a complex and iterative process involving multiple stakeholders.

Interventions targeted at educating individual authors may not be sufficient. Authors in the survey discussed in Chapter Two indicated that their environment may not be aware or supportive of reporting guidelines [4]. Broader and larger interventions are more likely to see success as awareness is a major barrier to use. We cannot expect every individual author to want to be in the vanguard trying to convince their coauthors to use reporting guidelines. Creating an early-intervention approach integrated within existing manuscript writing software may see the most success as it is an early-intervention approach and it is able to reach a broader group of individuals.

Collaborating on a Writing Aid Tool

The initial approach to addressing this issue was to create an Add-in in Microsoft Word to integrate the completion of checklists into the manuscript writing process. This approach was also aligned from previous work suggesting better integration of reporting guidelines into writing

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software [76]. At the initial Methods in Research on Research (MiRoR) meeting in October 2016, it was discovered that a team of researchers had a similar idea and were already at the initial stages of developing a writing aid tool to address this issue. Thus, rather than compete or create research waste, a collaboration was initiated with a doctoral student from the team at Ghent University. The tool allows for four different checklists to be used (e.g., STROBE, STROBE-nut, CONSORT, and PRISMA) and for additional information from the explanation and elaboration documents (and links) to be provided to external sources in a text-box [17,153]. Supporting Blanco et al.'s call for more evaluations at the formative stages of research [79], a crossover randomized control trial beta-tested the tool and evaluated its acceptability to authors in comparison to current methods (i.e., the standard use of the checklist as a Microsoft Word document). I assisted with recruitment, data analyses, and manuscript preparation. Researchers from high-, middle-, and low-income countries used the tool to apply reporting guidelines to their checklist. Participants perceived the writing aid tool to be easier use to use than the Word document and feedback was useful for improving the tool's technical capabilities. The tool is available freely via GitHub [153].

Developing the curriculum and course content

The question of what content to include remained. Participants from our online survey [4] offered many differing opinions on the scope of STROBE and what it should address. The qualitative assessment of the content in the extensions demonstrated that there may be some gaps in content and stressed the importance of certain field- or method- specific items that are needed beyond the scope of the STROBE core checklist [2]. Participants from our survey also highlighted the need for a greater emphasis on casual and epidemiological thinking and

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thoughtful approaches to analyses. Furthermore, many reported that they already use STROBE in teaching and they see a lot of value for using it with early career researchers. However, there appears to be no simple answer for what content nor level of detail to include.

Many biomedical researchers are poorly trained in research design and analysis [119]. Clinical researchers often receive only introductory courses in biostatistics and do not engage in continuing formal training in data analysis or study design [119]. While clinicians must past rigorous examinations to practice medicine, they are not faced with the same assessments prior to practicing clinical research and consequently do so with deeply inadequate training [119].

Even when training may be adequate, curriculums can be slow to change and keep up with new approaches and methodologies. Surveys of North American doctoral programs in psychology, published in 1990 and 2008 respectively, showed that new developments in statistics, measurement, and methodology are not being incorporated into most graduate training programs and the research design curriculum is not evolving to encompass new approaches [154,155]. In addition to these outdated and inadequate programs, there is a widespread lack of statisticians and epidemiologists [156]. With deficient or undertrained workforce, it is unsurprising that a lot of that biomedical research is poorly designed, analyzed, and reported. Better training in hypothesis and study design formulation, critical thinking, and evaluation of the evidence is greatly needed [33].

In a recent survey of perceptions on interventions to improve adherence to reporting guidelines, interventions related to training were considered the most difficult to implement although they were also perceived to be one of the most potentially effective [122]. The task of creating this educational intervention is incredibly complex but vital as observational studies are the most common study design employed in epidemiology and they are "ambiguous, difficult,

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and necessary" for it [33,92]. Plainly stated, even the creation of STROBE itself was a colossal task. An intervention with a rigorous study design, like a randomized controlled trial, would have to restrict its scope (due to the large amount of content covered in STROBE) and audience (for feasibility purposes). Thus, it could, at best, only demonstrate a proof of concept, with no guarantee that this intervention could reach or impact a larger and more generalizable group of researchers. An online writing aid tool for CONSORT, the CONSORT-based WEB tool, was previously created and tested which focused on the methods section of a manuscript based on a RCT [157]. Participants were given a protocol then given four hours to write the methods section of a manuscript either with or without additional assistance (i.e., text from the CONSORT reporting guideline). Results showed that it could improve the completeness of reporting for manuscripts, but the generalizability of results is limited as participants were masters and doctoral students who were given four hours to write a section of a published report, which is not representative of the collaborative time-consuming nature of biomedical writing. Additionally, in light of the feedback from authors in the survey detailed in Chapter Two, there are large concerns about barriers to using STROBE and reporting guidelines. COBWEB's online nature means that it is not integrated into the workflow and adds additional awareness and time burdens on authors. Furthermore, its content is restricted to that from CONSORT and is therefore a "closed" innovation, with a gatekeeper, not allowing for input from the broader biomedical community. In other words, this tool could be strengthened by the provision of additional educational resources, however, its design currently does not allow for this.

Restricting an intervention to train authors on the "most important" items of the STROBE checklist could be problematic as well. Other work evaluating the impact of a web-based tool (WebCONSORT) demonstrated that many authors cannot even properly identify their study

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design. In a quarter of the manuscripts involved in the study, authors incorrectly selected the relevant CONSORT extension [143]. Similar misclassification issues exist for observational research [104]. This work emphasized a clear need for better education earlier in the publication process. Furthermore, it suggests that a lack of understanding can range from the "simplest" items of the STROBE checklist to the more complex. Education should be as comprehensive as possible as students have various needs.

As previously discussed, major barriers exist to effectively implementing education surrounding reporting guidelines. Firstly, despite information being generally widely available, a lack of awareness is extremely prevalent. More work needs to be done at the grassroots level as it is evident that many journals are not supporting reporting guidelines. Secondly, epidemiology and observational studies are extremely diverse, rapidly changing, and nuanced. Information must be tailored and in accordance with expert knowledge and opinion in multiple areas. "Reinventing the wheel" and creating another epidemiological course could create research waste. Thirdly, authors may be resistant to attempts to "forceful education" (e.g., placing a barrier between them and their manuscript submission), believing that suggestions for additional education may be undermining and undervaluing their training. A participant from the online survey summarized this common sentiment saying that, "*As a trained epidemiologist, using STROBE is a waste of my time*." [4]

Creation of an educational expansion of STROBE

Accounting for the level of detail and nuance needed for an educational intervention, as well as the necessity for a cautious (i.e., not offensive or demeaning) approach for a global audience, it was decided to create an open access, editable course aligned with the tenants of

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open science and transparency. In this manner, the course can harness expert and specialized knowledge to fill much-needed gaps in conveying statistical and methodological concepts. Furthermore, there is some evidence to suggest that interactive, theoretically based, and flexible interventions may show more promise [126,158].

A previous review of graduate medical training in clinical epidemiology, critical appraisal, and evidence-based medicine, found that incomplete descriptions of course curricular is common [159]. By using crowd-sourcing on an open-platform, this problem will be addressed as curriculum changes can be proposed, monitored, and approved. This platform would also allow survey participants who indicated that they already use STROBE as a teaching tool to share their experiences, curriculums, and resources. With a centralized platform, more formal evaluations can then occur. These evaluations will be facilitated by the use of R as the language has immense functionality, flexibility, and strength (e.g., allows interactive elements, html forms, data visualizations, etc.). The delivery of these course modifications, monitoring, and eventual evaluation, is made possible by using GitHub and R [160,161]. GitHub is a website that allows for collaborative version control for open source projects. It is free to access and use and allows users to track bugs, request features, manage tasks, and create wikis for projects. It is the largest host of source code in the world [162]. The course content is created using R, a programming language and free software environment for statistical computing and graphics [160]. This is used by many statisticians and epidemiologists and is open-source, meaning that there are no monetary barriers to engaging in the code development.

While many people traditionally use R for statistical analyses and generating data visualizations, the capacity of R is continually expanded upon through the creation of new "packages." For example, the R Markdown package allows authors to create dynamic documents

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that contain statistical analyses and plots [163]. In other words, one can create documents (e.g., .pdf, .doc, .html files) that contains things like normal text, pictures, hyperlinks to external sources, and chunks of embedded R code. R Markdown can also work with many different packages, such as the "Bookdown" package which allows one to create online, interactive books [164], and "Shiny" [165] which allows users to create interactive web apps for things such as sample size calculations, spatial epidemiology maps, and various types of data visualization (e.g., scatterplots, bar charts, box plots, etc.) [166].

Using Bookdown, I created an Educational Expansion to STROBE which is comprised of many individual R Markdown files that "knit" together. I created the framework and draft content using information from STROBE E&E [43] document, results from the qualitative assessment of the extensions (Chapter One), and qualitative feedback about content given by survey participants (Chapter Two). All of the individual items from the STROBE extensions which were coded as non-specific (as a part of the qualitative assessment detailed in Chapter One) were distilled and added as suggested additional items (see Chapter 3: Additional File 2). As a final deliverable of this dissertation, the educational intervention has been "launched" and is open to contributions (Figure 4) [146].

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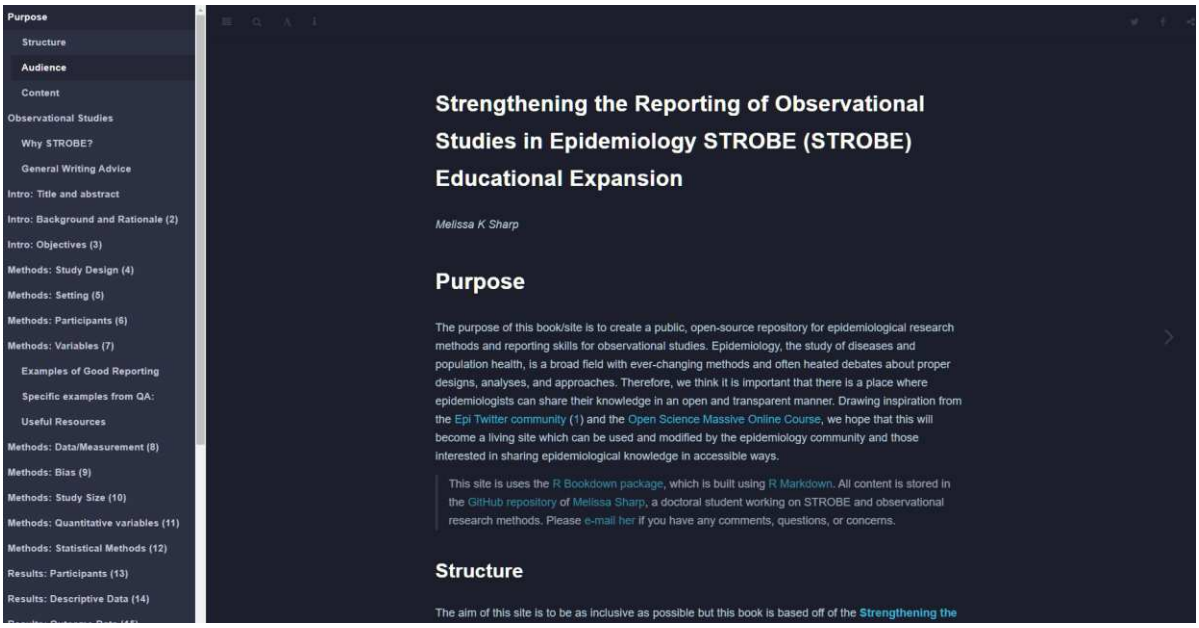

Figure 4. Screenshot of an R Bookdown Educational Expansion to STROBE draft

The educational expansion begins with a general introduction to its purpose, content, and audience then each checklist item is addressed in order. Each page relating to a checklist item contains the original text from the STROBE checklist and Explanation and Elaboration [42,43]. It is supplemented by further expansion related to the non-specific items that were mentioned in the qualitative assessment. Each page also contains a section dedicated to the field-specific items identified that relate to that checklist item [2]. At the bottom of each page, cited references are included (from the E & E) and any additional educational resources related to the checklist item can be added. These references are able to be downloaded as a typical reference manager software filetypes (e.g., bibme, bibtex, etc.) from the open repository on GitHub. At the end of the STROBE items there is also a page dedicated to sharing general epidemiological resources such as online courses, books, and journal articles.

If a reader would like to contribute to the Educational Expansion, they can suggest edits by accessing the file on GitHub (Figure 5), by commenting via a Disqus [167] forum at the

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bottom of each page, or by contacting the primary author (me) via social media or e-mail (Figure 6). This allows for different levels of engagement and technical knowledge as not all users may be familiar with R or GitHub. Each page is its own html file and the font size, style, and page colors can be changed according to the user's preferences (Figure 6).

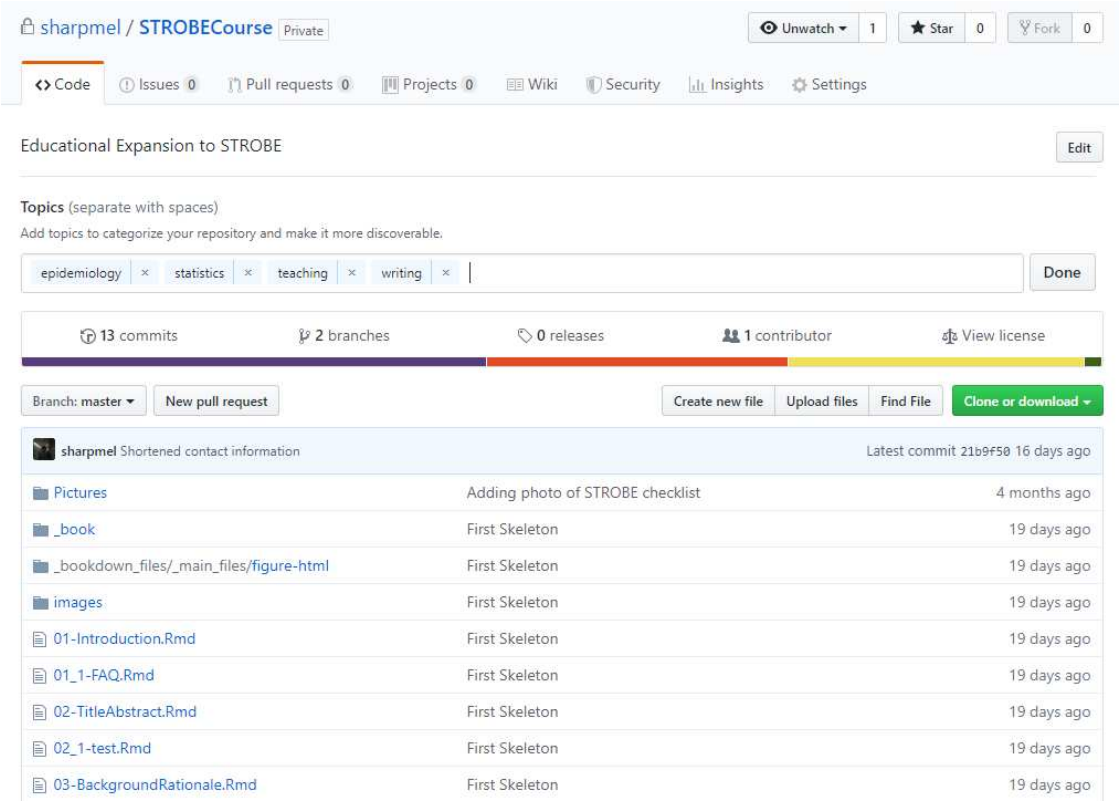

Figure 5. Screenshot of GitHub Repository

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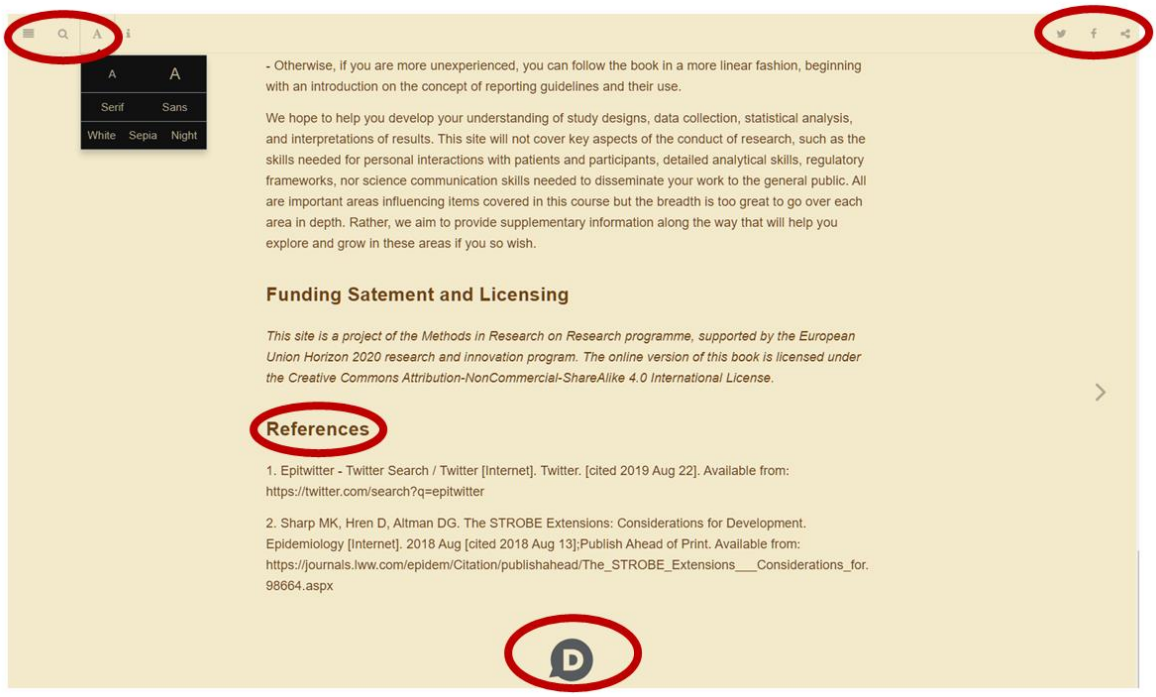

Figure 6. Screenshot of R Bookdown Functionalities

By harnessing the power of R Markdown and GitHub, this educational intervention can is open-source and editable by the epidemiology community if they wish to share their knowledge and resources. This idea was inspired by the #epitwitter community on Twitter which regularly discusses epidemiology topics in threads -- resulting in the sharing of some great resources that communicate complex epidemiological methods in easy-to-understand ways [168]. However, this information is currently extremely scattered and not indexed well. Through crowdsourcing, an open innovation approach is embraced rather than the conventional medical research approach which is a closed innovation process [169]. Traditional models of medical research are often led by experts, with little input from the outside and focuses on controlling intellectual properties (IP). Crowdsourcing allows for a diverse group of individuals, both experts and non-experts, to create and use other's IP when it advances the research.

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Crowdsourcing or collective intelligence efforts also face some challenges. We have tried to address the potential issues of sustainability, communication, and recruitment through several avenues [170]. Firstly, the platform itself (R and GitHub) allows for allows for the free-exchange of ideas in a transparent manner. R and GitHub will most likely be used by the more "expert" audience whereas each page will allow public contributions (via Disqus comment functionalities [167]) which allows a "non-technical" audience to provide feedback. GitHub also allows for additions or changes in moderation over time if contributors demonstrate interest and ability in expanding and continuing the work. Secondly, contributor guidelines, frequently asked questions (FAQ), and introductory text about the purpose of the platform have been created to help communicate to participants about expectations of use and give guidance on how to interact with the platform. Lastly, throughout the course of this doctoral work, I have been engaged with several epidemiology, statistics, and early career researcher communities on Twitter, partially in attempts to build a network which may be interested in this platform. Several survey participants also expressed their desire to be informed of results and potentially be engaged in future work. Lastly, the MiRoR network [171] and partners within it, particularly the EQUATOR Network [61], can distribute this platform further

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Discussion

The work in this dissertation was guided by the Promoting Action on Research Implementation in Health Services (PARIHS) knowledge translation strategy which contains three core elements (evidence, context, and facilitation) that influence how successful research implementation can be [80–82,127]. The **evidence** of STROBE's effectiveness and acceptability by the research community must be strong; the **context**, containing prevailing culture, leadership roles, and organizational structures must support the use of STROBE; and authors must hold the personal characteristics that **facilitate** the use of STROBE. Transforming STROBE from simply a reporting guideline into an educational tool required investigation into these three facets.

The evidence

I began by investigating the evidence surrounding STROBE's acceptability (i.e., endorsement) by journals, and its acceptability as a methodological base for the extensions to STROBE. CONSORT has had two updates in the two decades since its creation [26,172,173], and PRISMA has been updated once (and is currently undergoing another update) [129,174–176]. STROBE has not been updated at all. At a meeting in 2010, 3 years after its publication, an update was deemed unnecessary [177]. However, another 10 years has passed since. It would be ill advised to create an educational intervention on a checklist that authors may view as flawed or in need of updating.

By qualitatively assessing the content of the STROBE extensions, we were given a glimpse into areas that may need to be added to the checklist and the educational intervention [2]. Specifically, the methodological items were of particular concern. It also indicated that there may

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be items that are not clearly communicated or insufficiently described. 298 additions were proposed across 13 extensions. With an average of 22 additional items per extension, the reporting checklist for authors to complete is essentially doubled in length, potentially introducing a barrier to use. Furthermore, results found that 112/298 (37.6%) of these additions were redundant or reflected general epidemiological or methodological concepts. This raises concerns that certain concepts are being poorly understood, in need of clarification or deeper guidance, or are simply missing from STROBE. This assessment provided evidence for areas that may be misunderstood by authors, how STROBE is currently being expanded upon for different fields and methodologies, and how information can be used to help further educate authors in the future.

The second part of the first project (discussed in Chapter One) continued investigating the evidence surrounding the acceptability of STROBE and its extensions [3]. Journals are largely not endorsing STROBE, nor the extensions, and the language that they use is ambiguous and vague. Of the 257 unique journals identified in the study, more than half (54%) did not mention STROBE in any manner. 12 (5%) required STROBE on submission, 22 (9%) suggested use, 12 (5%) recommended a "relevant guideline," 72 (28%) mentioned it indirectly (via editorial policies or International Committee of Medical Journal Editors recommendations). The STROBE extensions are endorsed at extremely low rates (~1%) or not at all.

Furthermore, a decent portion of information was found in places (e.g., editorial policies) other than instructions for authors which is another barrier to raising awareness and reporting guideline implementation as it may not be an intuitive place for authors to look. Vague phrasings and suggestions rather than requirements can also undermine the importance of reporting guidelines. A key finding from this study was also the relationships found between endorsement

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of STROBE and CONSORT, PRISMA, and COPE. This suggests that good publication practices come as a package. This strength should be harnessed, as these groups can have a larger number of individuals and therefore global reach. The EQUATOR Network recognizes this aim and promotes the overall concept of reporting guidelines and reporting transparency but RG creation is largely done in isolated teams due to the specialized nature of their work. Generally speaking, trialists stick with CONSORT, epidemiologists stick with STROBE, and methodologists stick with PRISMA. In the future it may be better if these teams try to create better synergies between themselves and work to promote guidelines other than just their own.

These results of the first project also has important implications for the literature surrounding endorsement as much of it focuses only on information in instructions to authors and does not delineate different definitions of "endorsement." Consequently, it raises questions regarding the validity of the evidence base for endorsement and must be considered for future investigation into STROBE's impact on completeness of reporting. Another differentiation between our work and existing literature is that this study found no relationships between four different indices of journal impact factors (JIF) and endorsement, despite others finding a link to higher journal impact factors (JIF) [72].

This study also provided an approach and open-source corpus of journal and observational studies for assessing the impact that endorsement has on the completeness of reporting. Testing a relationship between endorsement and an increase in completeness of reporting can provide the much-needed data to address skeptic's concerns about the tangible value of supporting STROBE and its extensions. Previous studies have utilized segmented time regressions, an approach commonly used to evaluate the impact of health policies, to evaluate the impact of a reporting guideline's publication (or endorsement) on the quality of reporting

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[95,178–180]. With all endorsement data open source, a corpus of articles, and replicable search strategies, it is possible to build upon this research in the future.

The context

Next, I investigated how authors viewed the context in which they were conducting their work. A supportive environment is important for the success of reporting guidelines. If the prevailing culture, leadership roles, and organizational structures do not support STROBE, these could be considerable barriers to use. Efforts to educate authors could be futile if their environment does not allow them to apply their education in a meaningful manner. While the first project could establish the objective nature of the context (i.e., low endorsement rates of STROE and the extensions) in which authors are working in, one needs to also consider authors' views on this. If authors do not view the environment as an issue, then low endorsement rates are less of a problem than expected. The survey sought feedback from those with prior experience using STROBE, those who were aware of its existence but had never used it, and those who were unaware of its existence prior to the survey invitation.

The survey sought feedback from those with prior experience using STROBE, those who were aware of its existence but had never used it, and those who were unaware of its existence prior to the survey invitation. 1015 participants completed the entire survey with those with experience with STROBE (n = 635) were the largest portion of our sample (60%). However, of note, we engaged nearly 200 participants who previously had never heard of STROBE making our survey an awareness intervention itself. Targeted campaigns like this might be a good avenue for educating authors about certain guidelines.

Of those who had used STROBE previously, the most frequently endorsed motivator to use STROBE was the journal submission process. Those that had never used STROBE also

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reported that this would be a strong motivator to use it. For those who heard of STROBE but had never used it, the most frequently reported reason was that journals did not require it. Furthermore, for those that were already aware of STROBE prior to the survey, they reported that journals were the most frequently endorsed way they were made aware. In sum, journals are the key motivator, enforcer, and raiser of awareness. Their support is essential.

While authors may hold journals ultimately responsible, as previously discussed, endorsement rates are extremely low [66,72,73,115,130]. Furthermore, a survey of journal editors demonstrated that while journal editors generally believed that engaging trained editorial staff would be the most effective, yet resource intensive, editorial intervention, they also thought that peer reviewers should not be asked to check RGs [122]. While there is some evidence to demonstrate that a more active implementation stance (i.e., checking for compliance) improves reporting [95], this may not be feasible for all journals, especially for those which have less resources and staff to check compliance with reporting guidelines.

All groups reported that they would consider or have used STROBE during the manuscript writing process. A majority of those who have not used STROBE also said they would consider using it during the protocol/design stage while (65% and 60%) while those who have used STROBE before were much less likely to report actually using it at this stage (38%). An opposite trend was seen for using STROBE after completing a manuscript to check that all information was reported. Of those who actually used STROBE, 69% reported doing this, while only 50% and 43% of those who never used STROBE would use it at this stage. This insight presents a potential new avenue for early-intervention approaches and also questions the traditional modality of use. Intervening at the protocol/design stage could also have the most impact and could pair best with educational efforts.

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Lastly, the second project confirmed that a Health Technology Assessment (HTA) approach can be applicable to STROBE (and reporting guidelines) but it needs to take the academic publishing environment more into consideration. Previous surveys done with journal editors may [74,76,122,181] and literature on the "publish or perish" mentality in biomedical publishing may be helpful for creating new questions to flesh out the special "facilitating conditions" that the academic publishing environment may contain [181–183]. In spite of the need to improve upon this instrument, its current state was still validated. It can consequently be used as a base in future research evaluating other reporting guidelines.

The facilitators

In addition to having a supportive environment, authors must also hold the personal characteristics that facilitate the use of STROBE. Fifteen percent (n = 150) of survey participants (n = 1015) shared perceptions and insights via qualitative feedback. Results showed that there is a lot of disagreement regarding the level of specificity desired in STROBE and its usefulness. Generally, authors were not opposed to using STROBE but in the absence of journal requirement, they expressed that there was often no strong external motivating force. Their coauthors did not use it and journals were not requiring it. Furthermore, when some used STROBE, as required by a journal, they were discouraged as it was not used by the editorial staff or peer reviewers, thus turning STROBE's completion into a simple administrative burden. Lastly, and perhaps the most difficult issue to address, was author's expressions of views of their own. These views were mainly manifested in rejecting the usefulness of STROBE through expressions of self-assuredness or over-confidence in one's abilities.

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When this over-confidence is demonstrated by physicians, it has been deemed to be considered arrogance or even violence. [184–187] Academia, similar to medicine, is a hierarchical system plagued by imposter syndrome, socially-prescribed perfectionism, and burnout [188]. One's high level of academic achievement has been linked to one's identity – low levels of academic achievement can result in confusion regarding one's commitment and identity [189] With such dire consequences, arrogance persists because of sociologic and psychological pressures. [185] Regarding the sociological factors, working towards the "greater good" of science is often seen as a noble pursuit, garnering prestige and respect. [185] Whereas, psychologically speaking, health researchers indeed have special knowledge which can be used as an instrument of healing populations. My survey's weakness in detecting the facilitating conditions within the academic publishing environment and through the qualitative responses from participants rebuking the value of reporting guidelines, it is apparent that sociological and psychological issues may need to be addressed in order to see the full benefit of reporting guidelines. Accommodating for deeply engrained personal beliefs influenced by the structure of academia complicates the issues of reporting guideline use.

Limitations

Regarding the PARiHS framework for this project, Kitson et al. [190] note that, while the it is a useful tool for research implementation, it remains largely untested. They believe that the PARiHS framework may be best used as a two-stage process – where the evidence and context are evaluated first then the aggregated data is used to determine the most appropriate facilitation method. By using the framework in this manner, decision-makers can tailor any knowledge translation interventions to the local context [190]. A hybrid approach was used for this

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dissertation. The work was conducted in a two-stage process but, as STROBE is already actively implemented, we did not separate the process into evidence and context evaluations *then* determining the most appropriate facilitation method. It was important to investigate current facilitators of use to inform how best to transform STROBE into an educational tool. Only after the first two projects were conducted was the final educational expansion was decided upon.

As previously noted, the first project of the dissertation could only focus on the endorsement of 7 out of 13 extensions, thus results may not be generalizable to all extension fields. Also, due to time and resource restraints, investigating the evidence of STROBE's impact on completeness of reporting was not performed. This work could have helped strengthen the evidence-base. Lastly, the search strategies did not evaluate non-English journals and restricted to pool to those indexed in MEDLINE. Many journals were dropped during the screening process.

The second project, the online survey, has two main limitations: self-selection and non-response bias. Those who have used STROBE previously represented roughly 60% of participants and it is possible that they could have a more favorable view of STROBE, especially if they continue to use it. Additionally, this group had a lower dropout rate than the other two groups, possibly because it is easier to think concretely about STROBE because it has been used whereas the other groups had to be more theoretical or hypothetical in their thinking. The information about STROE which was given to those who never heard of STROBE may have also been too brief to allow for the reader to fully comprehend it. Furthermore, it was not practical to accurately estimate how many potential people viewed our survey and, despite three contact attempts, our nonresponse rate from journal editors was high.

Regarding the final project, the educational intervention, as it is a drafted website and is collaborative in nature, evaluation may be more difficult than a traditional research study. There

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may also be some technical barriers to use where those who are familiar with R and GitHub may be more eager or willing to participate. We attempted to address this by allowing other forms of feedback but still, people who engage will probably be a biased group who are most likely to believe in STROBE and want it to be successful. Furthermore, as reporting guidelines themselves have faced this issue, it may be difficult to raise awareness of the existence of this Educational Expansion to STROBE. Consequently, user engagement may be low. Lastly, as results from the qualitative assessment suggested, STROBE may need to be updated in its traditional format. This educational expansion could complicate things and it is different than the traditional Delphi survey consensus approaches to updating reporting guidelines [191].

Implications

One of the key originators of STROE, Erik von Elm, envisaged reporting guidelines as life jackets, not strait jackets. [192] This vision portrays STROBE as a safety mechanism of sorts. It is not, nor was ever met to be, constrictive, rigid, or reduce one's creative writing capabilities. STROBE extension creators have shared this vision as they have adapted it for their own purposes, however, adaptations have pointed out some concerns with STROBE through the creation of redundant or nonspecific content additions. In light of the results from the qualitative assessment, it is warranted that this be reconsidered. After all, STROBE is an "evolving document that requires continual assessment, refinement, and if necessary change." [43] As previously discussed, when compared to CONSORT and PRISMA, STROBE is overdue for an update.

The implications for an educational intervention are multi-faceted and challenging. Firstly, the intervention cannot be static in light of the demonstrated need of an eventual need to

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update STROBE. Secondly, although STROBE has seen some success in terms of endorsement by journals, the extensions are largely not being promoted and STROBE is still endorsed at suboptimal rates. This is in spite of authors essentially stating that journals are the most important motivators and enforcers of use. Engaging journal editors and continuing to work on the "top-down" approach is necessary but our findings also highlight that individual authors concerns and views have largely been ignored to date.

After journals, self-motivation was the next biggest driving force behind use of STROBE. With many journals not endorsing STROBE, raising awareness needs to occur through other mechanisms. We engaged nearly 200 authors who previously had never heard of STROBE, making our survey an awareness intervention itself. Targeted campaigns like this might be a good avenue for educating authors about certain guidelines. Furthermore, for our intervention, it is important to recognize that many who are exposed to education attempts may not even be aware of the overarching issues of reproducibility and replicability or the need for reporting guidelines -- let alone STROBE.

Broader awareness campaigns can also address some of the main concerns expressed by authors – the additional time needed to complete a checklist. With more people aware of the issue and engaged in the use of STROBE, the workload can be shared among coauthors. Integrating education and the checklists into the workflow process, by use of a writing aid tool supplemented by open-source detailed education, can help address both concerns of time and a greater level of detail desired.

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Perspectives

The expressions of confidence and feelings of being constrained by the rigidity of the checklist highlight key issues that need to be addressed in awareness and education efforts. Notably though, the hubris demonstrated from some biomedical researchers in our study is not a unique phenomenon. One of key players in the SORT group [24] and in the creation of the CONSORT Statement [27], Dr. Thomas Chalmers, shared this same thought over twenty years ago. He worked for decades as a clinical researcher conducting and advocating for randomized control trials and meta-analysis in medical research. When discussing the initial and persistent resistance to clinical trials, he noted:

> *"There is something very pejorative about the concept of randomization. They have to recognize how ignorant they are before they really accept it. And that is the difficult thing: getting doctors who have begun feeling they are more and more knowledgeable and omnipotent to appreciate that they do not know everything."*

Although he was speaking about randomization and RCTs, a parallel argument can be used for epidemiological and biomedical researchers in the survey discussed in Chapter Two. Our study results demonstrated that many highly trained epidemiologists believed that they are knowledgeable to the point where they do not see personal value in using STROBE. In addition to "simpler" issues of a lack of awareness, education, and time, this project is engulfed by cognitive barriers which are bolstered by the culture of academic publishing.

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It has been over ten years since STROBE has been published. Many have been raising awareness and endorsement has increased, however, it is still at "suboptimal" rates. While the main motivator and enforcer of reporting guidelines is journals, author's perspectives and self-motivators have been largely ignored to date. Authors are the end user of the tools; thus, they should be given more attention. If there is real or perceived resistance to use, this is more difficult to address than any issues of journal endorsement.

Proliferation of reporting guidelines in recent years can be partially attributed to authors taking back a sense of ownership. Through extensions, they have the opportunity to change how current things are communicated and also bring more rigor to their own specialty. While guideline development can include multidisciplinary groups of experts using feedback methods such as the Delphi survey, it is still largely a closed and exclusive process, adhering towards conventional forms of innovation in medical research. By embracing a modern open innovation approach, the narrative is flipped and some power is given back individual authors.

Increasingly, the culture of open science is being embraced, especially by early career researchers [193]. Paired with the survey results from Chapter Two which highlighted beliefs in earlier interventions in the research process and career, an open flexible platform of shared learning has potential in the reporting guideline realm. In this way, inclusion of supplemental resources can allow information to be incredibly nuanced and detailed, allowing for better development of critical thinking skills and in-depth understanding of complex issues. At the same time, the checklist can remain relatively static, until crowdsourcing reaches saturation on some issues. Additionally, this approach does not interfere with the traditional approach and could also help advance an update of STROBE (as results have thus far indicated that it may be necessary).

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Lastly, survey participants had such diverse views that accommodating them all in a closed innovation approach would be incredibly complex and potentially ineffective.

Conclusion

The Promoting Action on Research Implementation in Health Services (PARIHS) knowledge translation strategy was used to evaluate the evidence, context, and facilitators surrounding the use of STROBE. Transforming a reporting guideline into an educational tool required investigation into these three components.

The first project investigated the evidence for the acceptability of STROBE and its extensions. The qualitative assessment found that content in the STROBE extensions is sometimes redundant or reflects general epidemiological tenets that may be missing from STROBE. While the cross-sectional bibliometric study found that the context in which authors are working is largely unsupportive of reporting guidelines. The extensions are essentially not being endorsed and endorsement of STROBE is often scattered and vague.

Authors participating in an online survey shared views on their environment and facilitators of use. Responses revealed multiple misunderstandings about STROBE's purpose and content and revealed large disagreements about the level of specificity desired. Authors also held some internal views that are detrimental to the promotion of STROBE, such as the inflated self-confidence. Furthermore, results emphasized the need for better incentive and enforcement mechanisms as there is no often no strong motivating force to use STROBE. Coauthors rarely use it and most journals are not requiring it.

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Early-interventions focused on early-career researchers may hold the most promise but the audience for an educational intervention will be diverse and content must be flexible. Results helped provide content and support for an educational intervention that is open-source, editable, and accessible by a worldwide audience.

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PROTOCOL

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Chapter One: Protocol

Additional File 1. Ovid MEDLINE Search Strategies

All searches use the following database: Database: Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) <1946 to Present>

For each extension (except for EULAR), the observational strategy (14) is combined with the field-specific strategy (or/15-xx) and restricted to search only within the list of eligible journals ("journal name" or "journal name 2" ...or "journal name n"…).jn. within a certain time frame (limit xx to year="2 years prior to extension publication – 2017").

Identifying Observational Studies

1. Observational study/
2. (observational adj3 stud$).tw. 3. exp Cohort Studies/
4. cohort$.tw.
5. controlled clinical trial.pt.
6. Epidemiologic Methods/ 7. exp case-control studies/ 8. (case$ adj3 control$).tw. 9. Comparative Study/
10. prospective$.tw.
11. retrospective$.tw.
12. Cross-Sectional Studies/
13. prevalence/
14. or/1-13

Identifying Journal Publishing Studies in the Relevant Field

STREGA

15. exp Genetic Association Studies/
16. exp Polymorphism, Genetic/
17. exp Genetic Predisposition to Disease/
18. exp Genetic Research/ 19. genome-wide association.tw. 20. genomewide association.tw
21. genetic research.tw.
22. gene$ polymorphism.tw.
23. gene$ association.tw.
24. or/15-23

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STROBE-EULAR

No field-specific search strategy necessary due to specificity of broad subject term. The observational filter is still used in combination with the eligible journal pool.

STROBE-ME

15. exp molecular epidemiology/
16. exp Biomarkers/
17. Molecular epidemiolog$.tw.
18. Genetic epidemiolog$.tw.
19. Biomarker$.tw.
20. Bio-marker$.tw.
21. Or/15-20

STROME-ID

15. Molecular Epidemiology/
16. molecular epidemiolog$.tw.
17. exp Communicable Diseases/ep [Epidemiology]
18. exp Infection Control/
19. infection$.tw.
20. exp Molecular Typing/
21. molecular typing.tw.
22. molecular marker$.tw.
23. molecular clock.tw.
24. multiple-strain.tw.
25. or/15-24

RECORD

15. exp Records as Topic/
16. Registries/
17. database/ or dataset/
18. exp Information Systems/

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19. (data or dataset or database or register or registry or registries or record$).tw.
20. or/15-19

STROBE-RDS

15. respondent driven.tw.
16. respondentdriven.tw.
17. participant driven.tw.
18. or/15-17

STROBE-AMS

15. exp Anti-Infective Agents/
16. exp Infection/
17. (antibiot$ or antimicrob$).tw.
18. exp Drug Resistance, Microbial/
19. Vancomycin/
20. exp Aminoglycosides/
21. exp Fluoroquinolones/
22. exp Carbapenems/
23. exp Cephalosporins/
24. (vancomycin or aminoglycosides or fluoroquinolones or carbapenems or cephalosporins).tw.
25. or/15-24

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Chapter One: Article

Additional File 1. Ovid MEDLINE Search Output

All search strategies utilized Database: Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1946 to Present>

EULAR

Search Strategy:

---

1 Observational Study/ (38921)

2 (observational adj3 stud$).tw. (94352)

3 exp Cohort Studies/ (1708703)

4 cohort$.tw. (421788)

5 controlled clinical trial.pt. (94399)

6 Epidemiologic Methods/ (31287)

7 exp case-control studies/ (886809)

8 (case$ adj3 control$).tw. (138990)

9 Comparative Study/ (1819870)

10 prospective$.tw. (577410)

11 retrospective$.tw. (555639)

12 Cross-Sectional Studies/ (251139)

13 prevalence/ (245273)

14 or/1-13 (4258993)

15 ("Scandinavian journal of rheumatology" or "Connective tissue research" or "Annals of the rheumatic diseases" or "Scandinavian journal of rheumatology Supplement" or "Seminars in arthritis and rheumatism" or "The Journal of rheumatology" or "The Journal of rheumatology Supplement" or "Rheumatology international" or "Clinical rheumatology" or "Clinical and experimental rheumatology" or "Rheumatic diseases clinics of North America" or "Current opinion in rheumatology" or "Lupus" or "Osteoarthritis and cartilage" or "Journal of clinical rheumatology : practical reports on rheumatic & musculoskeletal diseases" or "Rheumatology" or "Current rheumatology reports" or "Joint, bone, spine : revue du rhumatisme" or "Modern rheumatology" or "Best practice & research Clinical rheumatology" or "Arthritis research & therapy" or "Pediatric rheumatology online journal" or "Current rheumatology reviews" or "Reumatologi-a clinica" or "International journal of rheumatic diseases" or "Nature reviews Rheumatology" or "Arthritis care & research" or "Bulletin of the Hospital for Joint Diseases" or "Arthritis & rheumatology" or "Revista brasileira").jn. (88036)

16 14 and 15 (27559)

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17 limit 16 to yr="2008 - 2017" (14993)

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RECORD

Search Strategy:

The search was erroneously left out the journal "Home healthcare now" originally. The search was rerun and 20 articles were added to the observational stage and 9 to the specific stage. Because of this, numbers for the search strategy items 21 -25, including this journal, are unable to be provided. This error should have no effect on the final results provided.

---

1 Observational Study/ (38921)

2 (observational adj3 stud$).tw. (94352)

3 exp Cohort Studies/ (1708703)

4 cohort$.tw. (421788)

5 controlled clinical trial.pt. (94399)

6 Epidemiologic Methods/ (31287)

7 exp case-control studies/ (886809)

8 (case$ adj3 control$).tw. (138990)

9 Comparative Study/ (1819870)

10 prospective$.tw. (577410)

11 retrospective$.tw. (555639)

12 Cross-Sectional Studies/ (251139)

13 prevalence/ (245273)

14 or/1-13 (4258993)

15 exp Records as Topic/ (231683)

16 Registries/ (71401)

17 database/ or dataset/ (323)

18 exp Information Systems/ (209749)

19 (data or dataset or database or register or registry or registries or record$).tw. (3841302)

20 or/15-19 (4033597)

21 ("Community mental health journal" or "Health services research" or "Inquiry : a journal of medical care organization, provision and financing" or "Medical care" or "The journal of extra-corporeal technology" or "Language, speech, and hearing services in schools" or "Journal of allied health" or "American journal of community psychology" or "Child welfare" or "The Journal of school health" or "The Hastings Center report" or "International journal of health services : planning, administration, evaluation" or "Bulletin of the American College of Surgeons" or "Scandinavian journal of work, environment & health" or "Journal of community health" or "Social work in health care" or "Journal of health politics, policy and law" or "Health & social work" or "Health care management review" or "Journal of medical engineering &

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technology" or "Hospital peer review" or "Evaluation and program planning" or "Modern healthcare" or "The Journal of ambulatory care management" or "Evaluation & the health professions" or "Research in nursing & health" or "Family & community health" or "Journal of epidemiology and community health" or "Home health care services quarterly" or “Home healthcare now” or "Radiology management" or "Evaluation review" or "Infant mental health journal" or "International quarterly of community health education" or "Health law in Canada" or "JEMS : a journal of emergency medical services" or "Medical decision making : an international journal of the Society for Medical Decision Making" or "Journal of psychosocial nursing and mental health services" or "Advances in health economics and health services research" or "The journal of primary prevention" or "Journal of American college health : J of ACH" or "Australian health review : a publication of the Australian Hospital Association" or "Healthcare financial management : journal of the Healthcare Financial Management Association" or "Medical reference services quarterly" or "Japan-hospitals : the journal of the Japan Hospital Association" or "Health affairs" or "Social science & medicine" or "Health marketing quarterly" or "Journal of insurance medicine" or "Health policy" or "Journal of rehabilitation research and development" or "Journal of health economics" or "Health care for women international" or "Health progress" or "Frontiers of health services management" or "Journal of healthcare protection management : publication of the International Association for Hospital Security" or "Death studies" or "International journal of technology assessment in health care" or "The Journal of medical practice management : MPM" or "The Health service journal" or "The International journal of health planning and management" or "The Milbank quarterly" or "Provider" or "Health policy and planning" or "Healthcare executive" or "Journal of pediatric health care : official publication of National Association of Pediatric Nurse Associates & Practitioners" or "Healthcare management forum" or "The Journal of continuing education in the health professions" or "Health services management research" or "Joint Commission perspectives" or "Health facilities management" or "Health communication" or "Journal of aging and health" or "Administration and policy in mental health" or "Journal of women & aging" or "International journal of health care quality assurance" or "Healthcare informatics : the business magazine for information and communication systems" or "Journal of health care for the poor and underserved" or "Benefits quarterly" or "Journal of AHIMA" or "Qualitative health research" or "Journal for healthcare quality : official publication of the National Association for Healthcare Quality" or "Journal of interprofessional care" or "The Journal of school nursing : the official publication of the National Association of School Nurses" or "Developments in health economics and public policy" or "Journal of mental health" or "Studies in health technology and informatics" or "American journal of medical quality : the official journal of the American College of Medical Quality" or "Managed care" or "Journal of healthcare risk management : the journal of the American Society for Healthcare Risk Management" or "Quality management in health care" or "Health & social care in the community" or "Health economics" or "Health matrix" or "Hospitals & health networks" or "Technology and health care : official journal of the European Society for Engineering and Medicine" or "EBRI issue brief" or "Health management technology" or "ED management : the monthly update on emergency department management" or "Health care analysis : HCA : journal of health philosophy and policy" or "International journal for quality in health care : journal of the International Society for Quality in Health Care" or "Pacific health dialog" or "Nurse researcher" or "World hospitals and health services : the official journal of the International Hospital Federation" or "Journal of health and human services administration" or "Psychiatric services : a journal of the American Psychiatric Association" or "Journal of health

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care finance" or "Journal of correctional health care : the official journal of the National Commission on Correctional Health Care" or "Journal of public health management and practice : JPHMP" or "Journal of telemedicine and telecare" or "Medical care research and review : MCRR" or "Health & place" or "Health data management" or "Psychiatric rehabilitation journal" or "Psychology, health & medicine" or "Journal of health communication" or "Annual statistical supplement, to the Social security bulletin" or "Journal of health services research & policy" or "Education for health : change in training & practice" or "Ethnicity & health" or "Journal of evaluation in clinical practice" or "Australian and New Zealand journal of public health" or "Australasian psychiatry : bulletin of Royal Australian and New Zealand College of Psychiatrists" or "The American journal of managed care" or "Journal of prevention & intervention in the community" or "Aging & mental health" or "Health technology assessment : HTA" or "Canadian journal of rural medicine : the official journal of the Society of Rural Physicians of Canada = Journal canadien de la médecine rurale : le journal officiel de la Société de médecine rurale du Canada" or "Maternal and child health journal" or "Public health reports" or "Health" or "The Permanente journal" or "The journal of behavioral health services & research" or "Journal of child health care : for professionals working with children in the hospital and community" or "Issue brief" or "The journal of mental health policy and economics" or "Health care management science" or "LDI issue brief" or "Health expectations : an international journal of public participation in health care and health policy" or "Evidence-based nursing" or "Harvard business review" or "Architectural record" or "The Rand journal of economics" or "The journal of economic perspectives : a journal of the American Economic Association" or "Fordham law review" or "Journal of medical economics" or "Review of law and social change" or "Care management journals : Journal of case management ; The journal of long term home health care" or "Health estate" or "Clinical privilege white paper" or "The health care manager" or "Primary health care research & development" or "Journal of health, population, and nutrition" or "Telemedicine journal and e-health : the official journal of the American Telemedicine Association" or "HealthcarePapers" or "BMC family practice" or "BMC medical research methodology" or "Health information and libraries journal" or "Policy brief" or "Evidence report/technology assessment" or "Nursing older people" or "Issue brief" or "BMC health services research" or "BMC international health and human rights" or "Advances in health care management" or "Australian journal of primary health" or "MMWR Recommendations and reports : Morbidity and mortality weekly report Recommendations and reports" or "MGMA connexion" or "Rural policy brief" or "Mental health today" or "Current problems in pediatric and adolescent health care" or "The European journal of health economics : HEPAC : health economics in prevention and care" or "Sentinel event alert" or "International journal for equity in health" or "African health sciences" or "Hispanic health care international : the official journal of the National Association of Hispanic Nurses" or "Applied health economics and health policy" or "Health research policy and systems" or "Human resources for health" or "Rural and remote health" or "Journal of health organization and management" or "Communication & medicine" or "Healthcare quarterly" or "Technology Evaluation Center Assessment Program Executive summary" or "Psychological services" or "National Bureau of Economic Research bulletin on aging and health" or "Perspectives in health information management" or "Journal of patient safety" or "Joint Commission journal on quality and patient safety" or "Journal of child and adolescent mental health" or "Globalization and health" or "International journal of evidence-based healthcare" or "Health economics, policy, and law" or "International journal of prisoner health" or "International journal of qualitative studies on health and well-being" or

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"Implementation science : IS" or "Simulation in healthcare : journal of the Society for Simulation in Healthcare" or "Behavioral healthcare" or "Clinical interventions in aging" or "Progress in community health partnerships : research, education, and action" or "Healthcare policy = Politiques de santé" or "American journal of men's health" or "Professional case management" or "Journal of Nepal Health Research Council" or "Evidence-based child health : a Cochrane review journal" or "Disability and health journal" or "World health & population" or "The patient" or "Leadership in health services" or "Tanzania journal of health research" or "Population health management" or "Health systems in transition" or "Journal of primary care & community health" or "Ontario health technology assessment series" or "Journal of healthcare engineering" or "NASN school nurse" or "Sexual & reproductive healthcare : official journal of the Swedish Association of Midwives" or "East Asian archives of psychiatry : official journal of the Hong Kong College of Psychiatrists = Dong Ya jing shen ke xue zhi : Xianggang jing shen ke yi xue yuan qi kan" or "HERD" or "BMJ quality & safety" or "EMS world" or "Journal of comparative effectiveness research" or "Journal of global health" or "Israel journal of health policy research" or "Healthcare philanthropy" or "International journal of health policy and management" or "Healthcare" or "Global health, science and practice" or "Physician leadership journal" or "International journal of health economics and management").jn. (250576)

22 14 and 21 (35143)

23 limit 22 to yr="2013 - 2017" (9925)

24 14 and 20 and 21 (17856)

25 limit 24 to yr="2013 - 2017" (5771)

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STREGA

Search Strategy:

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1 Observational Study/ (38921)

2 (observational adj3 stud$).tw. (94352)

3 exp Cohort Studies/ (1708703)

4 cohort$.tw. (421788)

5 controlled clinical trial.pt. (94399)

6 Epidemiologic Methods/ (31287)

7 exp case-control studies/ (886809)

8 (case$ adj3 control$).tw. (138990)

9 Comparative Study/ (1819870)

10 prospective$.tw. (577410)

11 retrospective$.tw. (555639)

12 Cross-Sectional Studies/ (251139)

13 prevalence/ (245273)

14 or/1-13 (4258993)

15 exp Genetic Association Studies/ (40956)

16 exp Polymorphism, Genetic/ (244145)

17 exp Genetic Predisposition to Disease/ (119244)

18 exp Genetic Research/ (9488)

19 genome-wide association.tw. (20251)

20 genomewide association.tw. (599)

21 genetic research.tw. (3272)

22 gene$ polymorphism.tw. (19600)

23 gene$ association.tw. (8983)

24 or/15-23 (343019)

25 ("Annual review of genetics" or "Biochemical genetics" or "Human heredity" or "Folia biologica" or "Behavior genetics" or "Clinical genetics" or "Theoretical population biology" or "Advances in genetics" or "American journal of human genetics" or "Genetica" or "Heredity" or "Cancer" or "Genetics" or "Hereditas" or "The Journal of heredity" or "Mutation research" or "Neurology" or "Radiation research" or "Annals of human genetics" or "Immunogenetics" or "Trends in biochemical sciences" or "Human genetics" or "Plasmid" or "Current genetics" or

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"Molecular and biochemical parasitology" or "Journal of neurogenetics" or "Genetic epidemiology" or "Trends in genetics : TIG" or "Animal genetics" or "Yeast" or "Proteins" or "Genome" or "Mutagenesis" or "Genes & development" or "Genomics" or "Genes, chromosomes & cancer" or "Human gene therapy" or "Animal biotechnology" or "Genetic counseling" or "Mammalian genome : official journal of the International Mammalian Genome Society" or "Psychiatric genetics" or "Molecular plant-microbe interactions : MPMI" or "Current opinion in genetics & development" or "Genetics, selection, evolution : GSE" or "Trends in cell biology" or "Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology" or "Journal of assisted reproduction and genetics" or "Journal of genetic counseling" or "The Plant cell" or "Human molecular genetics" or "Molecular ecology" or "Human mutation" or "Nature genetics" or "European journal of human genetics : EJHG" or "Insect molecular biology" or "Molekuliarnaia genetika, mikrobiologiia i virusologiia" or "Gene therapy" or "DNA research : an international journal for rapid publication of reports on genes and genomes" or "Cancer gene therapy" or "Ophthalmic genetics" or "Journal of molecular medicine : official organ of the 'Gesellschaft Deutscher Naturforscher und Ärzte'" or "Journal of applied genetics" or "Genome research" or "Molecular vision" or "Fungal genetics and biology : FG & B" or "Genes & genetic systems" or "BioDrugs : clinical immunotherapeutics, biopharmaceuticals and gene therapy" or "Neurogenetics" or "Molecular genetics and metabolism" or "Journal of human genetics" or "International journal of molecular medicine" or "Physiological genomics" or "The journal of gene medicine" or "Genetics in medicine : official journal of the American College of Medical Genetics" or "Plant cell reports" or "Pharmacogenomics" or "Familial cancer" or "Annual review of genomics and human genetics" or "Genesis : the journal of genetics and development" or "Functional & integrative genomics" or "Journal of animal breeding and genetics = Zeitschrift für Tierzüchtung und Züchtungsbiologie" or "Genome biology" or "Nature reviews. Genetics" or "BMC genomics" or "BMC genetics" or "BMC medical genetics" or "Infection, genetics and evolution : journal of molecular epidemiology and evolutionary genetics in infectious diseases" or "Proteomics" or "Current molecular medicine" or "Molecular genetics and genomics : MGG" or "Expert review of molecular diagnostics" or "Current gene therapy" or "Molecular & cellular proteomics : MCP" or "Genes, brain, and behavior" or "Microbial cell factories" or "Cytogenetic and genome research" or "Orthodontics & craniofacial research" or "Plant biology" or "Journal of experimental zoology. Part B, Molecular and developmental evolution" or "Genetics and molecular research : GMR" or "Statistical applications in genetics and molecular biology" or "Cancer genomics & proteomics" or "Genomics, proteomics & bioinformatics" or "Human genomics" or "Pharmacogenetics and genomics" or "International journal of immunogenetics" or "American journal of medical genetics. Part A" or "American journal of medical genetics. Part B, Neuropsychiatric genetics : the official publication of the International Society of Psychiatric Genetics" or "American journal of medical genetics. Part C, Seminars in medical genetics" or "PLoS genetics" or "Twin research and human genetics : the official journal of the International Society for Twin Studies" or "European journal of medical genetics" or "Epigenetics" or "Molecular neurodegeneration" or "Comparative biochemistry and physiology. Part D, Genomics & proteomics" or "The plant genome" or "Current protocols in human genetics" or "Journal of experimental zoology. Part A, Ecological genetics and physiology" or "Journal of nutrigenetics and nutrigenomics" or "WormBook : the online review of C. elegans biology" or "Journal of genetics and genomics = Yi chuan xue bao" or "Molecular oncology" or "Sexual development : genetics, molecular biology, evolution, endocrinology, embryology, and pathology of sex

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determination and differentiation" or "Forensic science international. Genetics" or "Genome dynamics" or "BMC medical genomics" or "Journal of cardiovascular translational research" or "Epigenetics & chromatin" or "Public health genomics" or "Marine genomics" or "Genome medicine" or "Circulation. Cardiovascular genetics" or "Genetic testing and molecular biomarkers" or "Clinical epigenetics" or "Epigenomics" or "Briefings in functional genomics" or "Molecular autism" or "Cancer genetics" or "Genetics research" or "Revista de derecho y genoma humano = Law and the human genome review" or "Current protocols in mouse biology" or "Nucleic acid therapeutics" or "G3 : genes - genomes - genetics" or "Human gene therapy methods" or "Open biology" or "GigaScience" or "Human gene therapy. Clinical development" or "Annual review of animal biosciences" or "Microbiome" or "The New bioethics : a multidisciplinary journal of biotechnology and the body" or "Mutation research. Genetic toxicology and environmental mutagenesis" or "Mutation research. Reviews in mutation research" or "EBioMedicine" or "Nature plants" or "HLA" or "JBRA assisted reproduction").jn. (411082)

26 14 and 25 (66729)

27 limit 26 to yr="2007 - 2017" (26857)

28 14 and 24 and 25 (14634)

29 limit 28 to yr="2007 - 2017" (9554)

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STROBE-AMS

Search Strategy:

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1 Observational Study/ (38921)

2 (observational adj3 stud$).tw. (94352)

3 exp Cohort Studies/ (1708703)

4 cohort$.tw. (421788)

5 controlled clinical trial.pt. (94399)

6 Epidemiologic Methods/ (31287)

7 exp case-control studies/ (886809)

8 (case$ adj3 control$).tw. (138990)

9 Comparative Study/ (1819870)

10 prospective$.tw. (577410)

11 retrospective$.tw. (555639)

12 Cross-Sectional Studies/ (251139)

13 prevalence/ (245273)

14 or/1-13 (4258993)

15 exp Anti-Infective Agents/ (1484444)

16 exp Infection/ (716937)

17 (antibiot$ or antimicrob$).tw. (372664)

18 exp Drug Resistance, Microbial/ (145543)

19 Vancomycin/ (12240)

20 exp Aminoglycosides/ (146448)

21 exp Fluoroquinolones/ (29635)

22 exp Carbapenems/ (9046)

23 exp Cephalosporins/ (40069)

24 (vancomycin or aminoglycosides or fluoroquinolones or carbapenems or cephalosporins).tw. (50615)

25 or/15-24 (2221817)

26 ("Drug and therapeutics bulletin" or "Chemotherapy" or "The Journal of antibiotics" or "Antimicrobial agents and chemotherapy" or "Current medical research and opinion" or "Infection" or "Clinical pharmacology and therapeutics" or "The Journal of pharmacology and experimental therapeutics" or "Thérapie" or "European journal of clinical pharmacology" or "British journal of pharmacology" or "The Journal of antimicrobial chemotherapy" or "Drugs" or

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"Clinical therapeutics" or "Cancer chemotherapy and pharmacology" or "Journal of cardiovascular pharmacology" or "Pharmacology & therapeutics" or "Therapeutic drug monitoring" or "Journal of veterinary pharmacology and therapeutics" or "Antiviral research" or "Pharmacotherapy" or "Drug development research" or "American journal of clinical oncology" or "Biomedicine & pharmacotherapy = Biomédecine & pharmacothérapie" or "Critical reviews in therapeutic drug carrier systems" or "Advances in therapy" or "Alimentary pharmacology & therapeutics" or "Fundamental & clinical pharmacology" or "Advanced drug delivery reviews" or "Cardiovascular drugs and therapy" or "Magnesium research" or "Journal of chemotherapy" or "The Journal of dermatological treatment" or "Drug safety" or "Antiviral chemistry & chemotherapy" or "Anti-cancer drugs" or "Drugs & aging" or "Journal of child and adolescent psychopharmacology" or "European neuropsychopharmacology : the journal of the European College of Neuropsychopharmacology" or "International journal of antimicrobial agents" or "Inflammopharmacology" or "The Annals of pharmacotherapy" or "The International journal of pharmacy practice" or "Pharmacoepidemiology and drug safety" or "PharmacoEconomics" or "Drug delivery" or "International journal of clinical pharmacology and therapeutics" or "CNS drugs" or "Expert opinion on investigational drugs" or "Prescrire international" or "American journal of health-system pharmacy : AJHP : official journal of the American Society of Health-System Pharmacists" or "Clinical drug investigation" or "Microbial drug resistance : MDR : mechanisms, epidemiology, and disease" or "Journal of ocular pharmacology and therapeutics : the official journal of the Association for Ocular Pharmacology and Therapeutics" or "Journal of oncology pharmacy practice : official publication of the International Society of Oncology Pharmacy Practitioners" or "Journal of cardiovascular pharmacology and therapeutics" or "Journal of experimental therapeutics & oncology" or "Journal of infection and chemotherapy : official journal of the Japan Society of Chemotherapy" or "BioDrugs : clinical immunotherapeutics, biopharmaceuticals and gene therapy" or "Pulmonary pharmacology & therapeutics" or "European review for medical and pharmacological sciences" or "Journal of pharmacy & pharmaceutical sciences : a publication of the Canadian Society for Pharmaceutical Sciences, Société canadienne des sciences pharmaceutiques." or "Drug resistance updates : reviews and commentaries in antimicrobial and anticancer chemotherapy" or "Antiviral therapy" or "The international journal of neuropsychopharmacology" or "Skin therapy letter" or "Diabetes, obesity & metabolism" or "Drugs in R&D" or "Paediatric drugs" or "Value in health : the journal of the International Society for Pharmacoeconomics and Outcomes Research" or "Research initiative, treatment action : RITA" or "Expert opinion on pharmacotherapy" or "Current pharmaceutical biotechnology" or "Current drug targets" or "Current opinion in pharmacology" or "American journal of cardiovascular drugs : drugs, devices, and other interventions" or "Current cancer drug targets" or "Clinical colorectal cancer" or "Nature reviews. Drug discovery" or "Journal of pain & palliative care pharmacotherapy" or "Daru : journal of Faculty of Pharmacy, Tehran University of Medical Sciences" or "Expert opinion on therapeutic targets" or "Expert review of neurotherapeutics" or "Expert review of pharmacoeconomics & outcomes research" or "Expert opinion on emerging drugs" or "Annals of clinical microbiology and antimicrobials" or "Harm reduction journal" or "Current vascular pharmacology" or "Journal of drugs in dermatology : JDD" or "Drugs of today" or "Expert opinion on drug safety" or "Journal of the American Pharmacists Association : JAPhA" or "Expert review of anti-infective therapy" or "Skin pharmacology and physiology" or "Current drug delivery" or "The AAPS journal" or "Expert opinion on drug delivery" or "Journal of opioid management" or "Drug discovery today. Technologies" or "Anti-cancer agents in medicinal chemistry" or "Recent patents on anti-cancer

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drug discovery" or "Recent patents on anti-infective drug discovery" or "Inflammation & allergy drug targets" or "CNS & neurological disorders drug targets" or "Endocrine, metabolic & immune disorders drug targets" or "Infectious disorders drug targets" or "Cardiovascular & hematological disorders drug targets" or "Current drug safety" or "Recent patents on endocrine, metabolic & immune drug discovery" or "Recent patents on inflammation & allergy drug discovery" or "Cardiovascular therapeutics" or "Anti-inflammatory & anti-allergy agents in medicinal chemistry" or "Journal of aerosol medicine and pulmonary drug delivery" or "Drug design, development and therapy" or "Probiotics and antimicrobial proteins" or "Drug discoveries & therapeutics" or "Journal of population therapeutics and clinical pharmacology = Journal de la therapeutique des populations et de la pharamcologie clinique" or "Therapeutic delivery" or "International journal of clinical pharmacy" or "Nucleic acid therapeutics" or "Clinical pharmacology in drug development" or "International journal for parasitology. Drugs and drug resistance" or "Value in health regional issues" or "Drug research" or "Journal of global antimicrobial resistance" or "ACS infectious diseases" or "European heart journal. Cardiovascular pharmacotherapy").jn. (222039)

27 14 and 26 (45127)

28 limit 27 to yr="2014 - 2017" (6860)

29 14 and 25 and 26 (15283)

30 limit 29 to yr="2014 - 2017" (1800)

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STROBE-ME

Search Strategy:

The search was erroneously performed on the journal pool that included the infectious disease journals. These articles and journals were deleted from the final corpus but because of this, numbers for the search strategy items 22, 23 and 25 are unable to be provided. This error should have no effect on the final results provided.

---

1 Observational Study/ (39203)

2 (observational adj3 stud$).tw. (94446)

3 exp Cohort Studies/ (1710664)

4 cohort$.tw. (422091)

5 controlled clinical trial.pt. (94418)

6 Epidemiologic Methods/ (31294)

7 exp case-control studies/ (888040)

8 (case$ adj3 control$).tw. (139034)

9 Comparative Study/ (1820429)

10 prospective$.tw. (577689)

11 retrospective$.tw. (555893)

12 Cross-Sectional Studies/ (251568)

13 prevalence/ (245612)

14 or/1-13 (4261233)

15 exp molecular epidemiology/ (32592)

16 exp Biomarkers/ (813358)

17 Molecular epidemiolog$.tw. (9339)

18 Genetic epidemiolog$.tw. (2616)

19 Biomarker$.tw. (168435)

20 Bio-marker$.tw. (486)

21 or/15-20 (935725)

22 ("Molecular pharmacology" or "Biochemical genetics" or "FEBS letters" or "The Journal of membrane biology" or "Chemico-biological interactions" or "Progress in molecular and subcellular biology" or "Folia biologica" or "Journal of molecular and cellular cardiology" or "Advances in enzymology and related areas of molecular biology" or "Journal of molecular evolution" or "Molecular and cellular biochemistry" or "Experimental and molecular pathology" or "Life sciences" or "Journal of lipid research" or "Progress in biophysics and molecular biology" or "Molecular biology reports" or "Molecular and cellular endocrinology" or "Molecular

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aspects of medicine" or "Gene" or "Molecular immunology" or "International journal of biological macromolecules" or "Molecular and biochemical parasitology" or "Bioscience reports" or "Molecular and cellular biology" or "Cellular and molecular neurobiology" or "The EMBO journal" or "Journal of biomolecular structure & dynamics" or "Molecular biology and evolution" or "Biotechnology & genetic engineering reviews" or "BioEssays : news and reviews in molecular, cellular and developmental biology" or "Histology and histopathology" or "Origins of life and evolution of the biosphere : the journal of the International Society for the Study of the Origin of Life" or "Molecular and cellular probes" or "Journal of computer-aided molecular design" or "Oncogene" or "Genes & development" or "Molecular microbiology" or "Environmental and molecular mutagenesis" or "Virus genes" or "Molecular carcinogenesis" or "Molecular neurobiology" or "Journal of molecular endocrinology" or "Molecular reproduction and development" or "Critical reviews in biochemistry and molecular biology" or "Current protocols in molecular biology" or "Zeitschrift für Naturforschung C, A journal of biosciences" or "Chirality" or "American journal of respiratory cell and molecular biology" or "Journal of molecular neuroscience : MN" or "DNA and cell biology" or "Journal of molecular recognition : JMR" or "Critical reviews in eukaryotic gene expression" or "Genes, chromosomes & cancer" or "Pathobiology : journal of immunopathology, molecular and cellular biology" or "Journal of structural biology" or "The Journal of steroid biochemistry and molecular biology" or "Molecular and cellular neurosciences" or "Mechanisms of development" or "Protein expression and purification" or "Plant molecular biology" or "Current opinion in structural biology" or "Molecular plant-microbe interactions : MPMI" or "Journal of biomolecular NMR" or "Gene expression" or "Molecular biology of the cell" or "Roumanian archives of microbiology and immunology" or "Insect biochemistry and molecular biology" or "The Plant journal : for cell and molecular biology" or "Human molecular genetics" or "Transgenic research" or "Protein science : a publication of the Protein Society" or "Molecular ecology" or "Methods in molecular biology" or "Cellular and molecular biology" or "Insect molecular biology" or "Molecular phylogenetics and evolution" or "Chromosome research : an international journal on the molecular, supramolecular and evolutionary aspects of chromosome biology" or "Molecular biotechnology" or "DNA research : an international journal for rapid publication of reports on genes and genomes" or "Virchows Archiv : an international journal of pathology" or "Molecular membrane biology" or "Matrix biology : journal of the International Society for Matrix Biology" or "Journal of computational biology : a journal of computational molecular cell biology" or "Biocell : official journal of the Sociedades Latinoamericanas de Microscopia Electronica et al" or "Molecular medicine" or "Nature medicine" or "Journal of molecular medicine : official organ of the Gesellschaft Deutscher Naturforscher und Ärzte" or "journal of molecular medicine" or "RNA" or "Molecular human reproduction" or "Comparative biochemistry and physiology Part B, Biochemistry & molecular biology" or "Molecular diversity" or "Spectrochimica acta Part A, Molecular and biomolecular spectroscopy" or "Molecular vision" or "Genes to cells : devoted to molecular & cellular mechanisms" or "Cellular & molecular biology letters" or "Genes & genetic systems" or "Molecular psychiatry" or "Experimental & molecular medicine" or "Molecules and cells" or "Cellular and molecular life sciences : CMLS" or "Microbiology and molecular biology reviews : MMBR" or "Journal of molecular graphics & modelling" or "Journal of biochemical and molecular toxicology" or "Molecular cell" or "Molecular genetics and metabolism" or "Comparative biochemistry and physiology Part A, Molecular & integrative physiology" or "Journal of molecular modeling" or "Bioinformatics" or "Combinatorial chemistry & high throughput screening" or "International journal of molecular medicine" or "Physiological

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genomics" or "The journal of gene medicine" or "Journal of plant physiology" or "Macromolecular rapid communications" or "Evolution & development" or "Journal of biomolecular techniques : JBT" or "IUBMB life" or "Applied immunohistochemistry & molecular morphology : AIMM" or "Molecular therapy : the journal of the American Society of Gene Therapy" or "Journal of molecular microbiology and biotechnology" or "Marine biotechnology" or "Biomacromolecules" or "The Journal of molecular diagnostics : JMD" or "Current protocols in cytometry" or "American journal of physiology Lung cellular and molecular physiology" or "Genesis : the journal of genetics and development" or "Current issues in molecular biology" or "Functional & integrative genomics" or "Expert reviews in molecular medicine" or "Genes and immunity" or "Molecular plant pathology" or "Comparative biochemistry and physiology Toxicology & pharmacology : CBP" or "Nature reviews Molecular cell biology" or "EMBO reports" or "Trends in molecular medicine" or "BMC genetics" or "BMC molecular biology" or "BMC gastroenterology" or "Biochemistry and molecular biology education : a bimonthly publication of the International Union of Biochemistry and Molecular Biology" or "Journal of cellular and molecular medicine" or "The pharmacogenomics journal" or "Structure" or "Nano letters" or "BMC structural biology" or "International journal of molecular sciences" or "Current molecular medicine" or "Molecular genetics and genomics : MGG" or "Expert review of molecular diagnostics" or "Molecular imaging and biology : MIB : the official publication of the Academy of Molecular Imaging" or "Molecular & cellular proteomics : MCP" or "Omics : a journal of integrative biology" or "Neuromolecular medicine" or "DNA repair" or "Annual review of plant biology" or "Archaea : an international microbiological journal" or "Molecular cancer" or "Molecular cancer research : MCR" or "Gene expression patterns : GEP" or "Journal of experimental zoology Part B, Molecular and developmental evolution" or "Genetics and molecular research : GMR" or "Statistical applications in genetics and molecular biology" or "Nature structural & molecular biology" or "Journal of molecular histology" or "Chemistry & biodiversity" or "Molecular pharmaceutics" or "The quarterly journal of nuclear medicine and molecular imaging : official publication of the Italian Association of Nuclear Medicine (AIMN) [and] the International Association of Radiopharmacology (IAR), [and] Section of the Society of Radiopharmaceutica" or "The FEBS journal" or "Molecular nutrition & food research" or "Journal of chemical theory and computation" or "RNA biology" or "Molecular systems biology" or "Medical molecular morphology" or "Future cardiology" or "Molecular pain" or "Cellular & molecular immunology" or "Molecular bioSystems" or "Molecular & cellular biomechanics : MCB" or "Molecular diagnosis & therapy" or "Molecular neurodegeneration" or "The anatomical record : advances in integrative anatomy and evolutionary biology" or "WormBook : the online review of C elegans biology" or "Molecular oncology" or "Sexual development : genetics, molecular biology, evolution, endocrinology, embryology, and pathology of sex determination and differentiation" or "BMB reports" or "New biotechnology" or "Molecular plant" or "Molecular ecology resources" or "Current molecular pharmacology" or "Molecular brain" or "Biomolecular NMR assignments" or "Molecular medicine reports" or "International review of cell and molecular biology" or "EMBO molecular medicine" or "Genetic testing and molecular biomarkers" or "Progress in molecular biology and translational science" or "Journal of molecular cell biology" or "Genome biology and evolution" or "Cold Spring Harbor perspectives in biology" or "Nucleus" or "Biomolecular concepts" or "Cold Spring Harbor protocols" or "Molecular informatics" or "Transcription" or "Virulence" or "Wiley interdisciplinary reviews RNA" or "Hormone molecular biology and clinical investigation" or "Chimerism" or "Theranostics" or "Nucleic acid therapeutics" or "G3 : genes -

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genomes - genetics" or "Advances in biological regulation" or "GM crops & food" or "Cell reports" or "Annual review of chemical and biomolecular engineering" or "ACS synthetic biology" or "Open biology" or "Biomolecules" or "MicroRNA" or "EcoSal Plus" or "The Enzymes" or "Cell systems" or "Mitochondrial DNA Part A, DNA mapping, sequencing, and analysis" or "SLAS discovery").jn. (x)

23 14 and 22 (x)

24 limit 23 to yr="2012 - 2017" (9288)

25 14 and 21 and 22 (x)

26 limit 25 to yr="2012 - 2017" (2107)

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STROME-ID

Search Strategy:

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1 Observational Study/ (38921)

2 (observational adj3 stud$).tw. (94352)

3 exp Cohort Studies/ (1708703)

4 cohort$.tw. (421788)

5 controlled clinical trial.pt. (94399)

6 Epidemiologic Methods/ (31287)

7 exp case-control studies/ (886809)

8 (case$ adj3 control$).tw. (138990)

9 Comparative Study/ (1819870)

10 prospective$.tw. (577410)

11 retrospective$.tw. (555639)

12 Cross-Sectional Studies/ (251139)

13 prevalence/ (245273)

14 or/1-13 (4258993)

15 Molecular Epidemiology/ (10827)

16 molecular epidemiolog$.tw. (9334)

17 exp Communicable Diseases/ep [Epidemiology] (10293)

18 exp Infection Control/ (58285)

19 infection$.tw. (1178401)

20 exp Molecular Typing/ (10487)

21 molecular typing.tw. (3954)

22 molecular marker$.tw. (21014)

23 molecular clock.tw. (2391)

24 multiple-strain.tw. (159)

25 or/15-24 (1267122)

26 ("Molecular pharmacology" or "Biochemical genetics" or "The Journal of antibiotics" or "FEBS letters" or "The Journal of membrane biology" or "Chemico-biological interactions" or "Progress in molecular and subcellular biology" or "Folia biologica" or "Antimicrobial agents and chemotherapy" or "Journal of molecular and cellular cardiology" or "Advances in enzymology and related areas of molecular biology" or "Journal of molecular evolution" or "The Journal of antimicrobial chemotherapy" or "Molecular and cellular biochemistry" or "Journal of

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chemotherapy" or "International journal of antimicrobial agents" or "Microbial drug resistance : MDR : mechanisms, epidemiology, and disease" or "Journal of infection and chemotherapy : official journal of the Japan Society of Chemotherapy" or "Drug resistance updates : reviews and commentaries in antimicrobial and anticancer chemotherapy" or "Annals of clinical microbiology and antimicrobials" or "Expert review of anti-infective therapy" or "Probiotics and antimicrobial proteins" or "Journal of global antimicrobial resistance" or "ACS infectious diseases" or "Experimental and molecular pathology" or "Life sciences" or "Journal of lipid research" or "Progress in biophysics and molecular biology" or "Molecular biology reports" or "Antiviral research" or "Antiviral chemistry & chemotherapy" or "Antiviral therapy" or "Recent patents on anti-infective drug discovery" or "Infectious disorders drug targets" or "Molecular and cellular endocrinology" or "Molecular aspects of medicine" or "Gene" or "Molecular immunology" or "International journal of biological macromolecules" or "Molecular and biochemical parasitology" or "Bioscience reports" or "Molecular and cellular biology" or "Cellular and molecular neurobiology" or "The EMBO journal" or "Journal of biomolecular structure & dynamics" or "Molecular biology and evolution" or "Biotechnology & genetic engineering reviews" or "BioEssays : news and reviews in molecular, cellular and developmental biology" or "Histology and histopathology" or "Origins of life and evolution of the biosphere : the journal of the International Society for the Study of the Origin of Life" or "Molecular and cellular probes" or "Journal of computer-aided molecular design" or "Oncogene" or "Genes & development" or "Molecular microbiology" or "Environmental and molecular mutagenesis" or "Virus genes" or "Molecular carcinogenesis" or "Molecular neurobiology" or "Journal of molecular endocrinology" or "Molecular reproduction and development" or "Critical reviews in biochemistry and molecular biology" or "Current protocols in molecular biology" or "Zeitschrift für Naturforschung C, A journal of biosciences" or "Chirality" or "American journal of respiratory cell and molecular biology" or "Journal of molecular neuroscience : MN" or "DNA and cell biology" or "Journal of molecular recognition : JMR" or "Critical reviews in eukaryotic gene expression" or "Genes, chromosomes & cancer" or "Pathobiology : journal of immunopathology, molecular and cellular biology" or "Journal of structural biology" or "The Journal of steroid biochemistry and molecular biology" or "Molecular and cellular neurosciences" or "Mechanisms of development" or "Protein expression and purification" or "Plant molecular biology" or "Current opinion in structural biology" or "Molecular plant-microbe interactions : MPMI" or "Journal of biomolecular NMR" or "Gene expression" or "Molecular biology of the cell" or "Roumanian archives of microbiology and immunology" or "Insect biochemistry and molecular biology" or "The Plant journal : for cell and molecular biology" or "Human molecular genetics" or "Transgenic research" or "Protein science : a publication of the Protein Society" or "Molecular ecology" or "Methods in molecular biology" or "Cellular and molecular biology" or "Insect molecular biology" or "Molecular phylogenetics and evolution" or "Chromosome research : an international journal on the molecular, supramolecular and evolutionary aspects of chromosome biology" or "Molecular biotechnology" or "DNA research : an international journal for rapid publication of reports on genes and genomes" or "Virchows Archiv : an international journal of pathology" or "Molecular membrane biology" or "Matrix biology : journal of the International Society for Matrix Biology" or "Journal of computational biology : a journal of computational molecular cell biology" or "Biocell : official journal of the Sociedades Latinoamericanas de Microscopia Electronica et al" or "Molecular medicine" or "Nature medicine" or "Journal of molecular medicine : official organ of the Gesellschaft Deutscher Naturforscher und Ärzte" or "journal of molecular medicine" or "RNA" or "Molecular human

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reproduction" or "Comparative biochemistry and physiology Part B, Biochemistry & molecular biology" or "Molecular diversity" or "Spectrochimica acta Part A, Molecular and biomolecular spectroscopy" or "Molecular vision" or "Genes to cells : devoted to molecular & cellular mechanisms" or "Cellular & molecular biology letters" or "Genes & genetic systems" or "Molecular psychiatry" or "Experimental & molecular medicine" or "Molecules and cells" or "Cellular and molecular life sciences : CMLS" or "Microbiology and molecular biology reviews : MMBR" or "Journal of molecular graphics & modelling" or "Journal of biochemical and molecular toxicology" or "Molecular cell" or "Molecular genetics and metabolism" or "Comparative biochemistry and physiology Part A, Molecular & integrative physiology" or "Journal of molecular modeling" or "Bioinformatics" or "Combinatorial chemistry & high throughput screening" or "International journal of molecular medicine" or "Physiological genomics" or "The journal of gene medicine" or "Journal of plant physiology" or "Macromolecular rapid communications" or "Evolution & development" or "Journal of biomolecular techniques : JBT" or "IUBMB life" or "Applied immunohistochemistry & molecular morphology : AIMM" or "Molecular therapy : the journal of the American Society of Gene Therapy" or "Journal of molecular microbiology and biotechnology" or "Marine biotechnology" or "Biomacromolecules" or "The Journal of molecular diagnostics : JMD" or "Current protocols in cytometry" or "American journal of physiology Lung cellular and molecular physiology" or "Genesis : the journal of genetics and development" or "Current issues in molecular biology" or "Functional & integrative genomics" or "Expert reviews in molecular medicine" or "Genes and immunity" or "Molecular plant pathology" or "Comparative biochemistry and physiology Toxicology & pharmacology : CBP" or "Nature reviews Molecular cell biology" or "EMBO reports" or "Trends in molecular medicine" or "BMC genetics" or "BMC molecular biology" or "BMC gastroenterology" or "Biochemistry and molecular biology education : a bimonthly publication of the International Union of Biochemistry and Molecular Biology" or "Journal of cellular and molecular medicine" or "The pharmacogenomics journal" or "Structure" or "Nano letters" or "BMC structural biology" or "International journal of molecular sciences" or "Current molecular medicine" or "Molecular genetics and genomics : MGG" or "Expert review of molecular diagnostics" or "Molecular imaging and biology : MIB : the official publication of the Academy of Molecular Imaging" or "Molecular & cellular proteomics : MCP" or "Omics : a journal of integrative biology" or "Neuromolecular medicine" or "DNA repair" or "Annual review of plant biology" or "Archaea : an international microbiological journal" or "Molecular cancer" or "Molecular cancer research : MCR" or "Gene expression patterns : GEP" or "Journal of experimental zoology Part B, Molecular and developmental evolution" or "Genetics and molecular research : GMR" or "Statistical applications in genetics and molecular biology" or "Nature structural & molecular biology" or "Journal of molecular histology" or "Chemistry & biodiversity" or "Molecular pharmaceutics" or "The quarterly journal of nuclear medicine and molecular imaging : official publication of the Italian Association of Nuclear Medicine (AIMN) [and] the International Association of Radiopharmacology (IAR), [and] Section of the Society of Radiopharmaceutica" or "The FEBS journal" or "Molecular nutrition & food research" or "Journal of chemical theory and computation" or "RNA biology" or "Molecular systems biology" or "Medical molecular morphology" or "Future cardiology" or "Molecular pain" or "Cellular & molecular immunology" or "Molecular bioSystems" or "Molecular & cellular biomechanics : MCB" or "Molecular diagnosis & therapy" or "Molecular neurodegeneration" or "The anatomical record : advances in integrative anatomy and evolutionary biology" or "WormBook : the online review of C elegans biology" or "Molecular

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oncology" or "Sexual development : genetics, molecular biology, evolution, endocrinology, embryology, and pathology of sex determination and differentiation" or "BMB reports" or "New biotechnology" or "Molecular plant" or "Molecular ecology resources" or "Current molecular pharmacology" or "Molecular brain" or "Biomolecular NMR assignments" or "Molecular medicine reports" or "International review of cell and molecular biology" or "EMBO molecular medicine" or "Genetic testing and molecular biomarkers" or "Progress in molecular biology and translational science" or "Journal of molecular cell biology" or "Genome biology and evolution" or "Cold Spring Harbor perspectives in biology" or "Nucleus" or "Biomolecular concepts" or "Cold Spring Harbor protocols" or "Molecular informatics" or "Transcription" or "Virulence" or "Wiley interdisciplinary reviews RNA" or "Hormone molecular biology and clinical investigation" or "Chimerism" or "Theranostics" or "Nucleic acid therapeutics" or "G3 : genes - genomes - genetics" or "Advances in biological regulation" or "GM crops & food" or "Cell reports" or "Annual review of chemical and biomolecular engineering" or "ACS synthetic biology" or "Open biology" or "Biomolecules" or "MicroRNA" or "EcoSal Plus" or "The Enzymes" or "Cell systems" or "Mitochondrial DNA Part A, DNA mapping, sequencing, and analysis" or "SLAS discovery").jn. (585096)

27 14 and 26 (54026)

28 limit 27 to yr="2012 - 2017" (11035)

29 14 and 26 and 25 (4594)

30 limit 29 to yr="2012 - 2017" (1282)

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STROBE-RDS

Search Strategy:

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1 Observational Study/ (38921)

2 (observational adj3 stud$).tw. (94352)

3 exp Cohort Studies/ (1708703)

4 cohort$.tw. (421788)

5 controlled clinical trial.pt. (94399)

6 Epidemiologic Methods/ (31287)

7 exp case-control studies/ (886809)

8 (case$ adj3 control$).tw. (138990)

9 Comparative Study/ (1819870)

10 prospective$.tw. (577410)

11 retrospective$.tw. (555639)

12 Cross-Sectional Studies/ (251139)

13 prevalence/ (245273)

14 or/1-13 (4258993)

15 respondent driven.tw. (952)

16 respondentdriven.tw. (1)

17 participant driven.tw. (44)

18 or/15-17 (994)

19 ("Journal of public health dentistry" or "Psychopharmacology bulletin" or "Demography" or "Medical care" or "The Southeast Asian journal of tropical medicine and public health" or "Preventive medicine" or "Canadian journal of public health = Revue canadienne de santé publique" or "Papua and New Guinea medical journal" or "Public health" or "Indian journal of public health" or "Nursing outlook" or "Salud pública de México" or "Community dentistry and oral epidemiology" or "Roczniki Państwowego Zakładu Higieny" or "American journal of public health" or "International journal of health services : planning, administration, evaluation" or "Annali dell'Istituto superiore di sanità" or "Journal of the National Cancer Institute" or "The Journal of the Egyptian Public Health Association" or "Transactions of the Royal Society of Tropical Medicine and Hygiene" or "Bulletin of the World Health Organization" or "Journal of community health" or "Journal of health politics, policy and law" or "Family & community health" or "World Health Organization technical report series" or "Journal of epidemiology and community health" or "Epidemiologic reviews" or "Annual review of public health" or "Journal of public health policy" or "International quarterly of community health education" or "Journal of tropical pediatrics" or "The journal of primary prevention" or "Journal of policy analysis and management : [the journal of the Association for Public Policy Analysis and Management]" or

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"Health affairs" or "Health policy" or "Community dental health" or "Journal of community health nursing" or "National Toxicology Program technical report series" or "Public health nursing" or "The Journal of rural health : official journal of the American Rural Health Association and the National Rural Health Care Association" or "The Health service journal" or "The Milbank quarterly" or "Health policy and planning" or "American journal of health promotion : AJHP" or "AIDS policy & law" or "American journal of preventive medicine" or "Asia-Pacific journal of public health" or "Journal of aging & social policy" or "Journal of law and health" or "Health promotion international" or "Journal of the National Cancer InstituteMonographs" or "Health reports" or "The International journal on drug policy" or "Ethnicity & disease" or "European journal of public health" or "Developments in health economics and public policy" or "Journal of preventive medicine and hygiene" or "European journal of cancer prevention : the official journal of the European Cancer Prevention Organisation (ECP)" or "The Australian journal of rural health" or "Health & social care in the community" or "Health matrix" or "Central European journal of public health" or "Journal of agromedicine" or "European journal of health law" or "Health care analysis : HCA : journal of health philosophy and policy" or "Journal of medical screening" or "Journal of travel medicine" or "Pacific health dialog" or "Ophthalmic epidemiology" or "Health and human rights" or "Journal of correctional health care : the official journal of the National Commission on Correctional Health Care" or "Journal of public health management and practice : JPHMP" or "Health & place" or "Revista española de salud pública" or "Journal of health communication" or "Journal of health services research & policy" or "Ethnicity & health" or "Eastern Mediterranean health journal = La revue de santé de la Méditerranée orientale = al-Majallah al-ṣiḥḥīyah li-sharq al-mutawassiṭ" or "Environmental health and preventive medicine" or "Tropical medicine & international health : TM & IH" or "Australian and New Zealand journal of public health" or "Advances in health sciences education : theory and practice" or "Journal of prevention & intervention in the community" or "Health education & behavior : the official publication of the Society for Public Health Education" or "Revista panamericana de salud pública = Pan American journal of public health" or "Anales del sistema sanitario de Navarra" or "Health promotion journal of Australia : official journal of Australian Association of Health Promotion Professionals" or "Ciência & saúde coletiva" or "Public health reports" or "Public health nutrition" or "Community practitioner : the journal of the Community Practitioners' & Health Visitors' Association" or "Journal of urban health : bulletin of the New York Academy of Medicine" or "Issue brief" or "The journal of mental health policy and economics" or "Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco" or "Health expectations : an international journal of public participation in health care and health policy" or "Cornell journal of law and public policy" or "Scandinavian journal of public health" or "Value in health : the journal of the International Society for Pharmacoeconomics and Outcomes Research" or "Health promotion practice" or "International journal of hygiene and environmental health" or "Policy, politics & nursing practice" or "Revista de salud pública" or "Journal of health, population, and nutrition" or "Journal of medical Internet research" or "MEDICC review" or "BMC public health" or "Policy brief" or "BMC international health and human rights" or "Issues in brief" or "Toxicity report series" or "Australian journal of primary health" or "MMWR. Recommendations and reports : Morbidity and mortality weekly report. Recommendations and reports" or "Rural policy brief" or "Yale journal of health policy, law, and ethics" or "The European journal of health economics : HEPAC : health economics in prevention and care" or "MMWR. Surveillance summaries : Morbidity and mortality weekly report.

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Surveillance summaries" or "International journal for equity in health" or "Hispanic health care international : the official journal of the National Association of Hispanic Nurses" or "Applied health economics and health policy" or "International journal of health geographics" or "Health and quality of life outcomes" or "Report on carcinogens : carcinogen profiles" or "Health research policy and systems" or "Rural and remote health" or "Population health metrics" or "Journal of water and health" or "Journal of public health" or "Preventing chronic disease" or "Postępy higieny i medycyny doświadczalnej" or "Ethiopian journal of health sciences" or "PLoS medicine" or "International journal of environmental research and public health" or "Journal of preventive medicine and public health = Yebang Ŭihakhoe chi" or "Globalization and health" or "Health economics, policy, and law" or "International journal of prisoner health" or "Global public health" or "International journal of qualitative studies on health and well-being" or "Journal of immigrant and minority health" or "Progress in community health partnerships : research, education, and action" or "Healthcare policy = Politiques de santé" or "American journal of men's health" or "Journal of Nepal Health Research Council" or "Disaster medicine and public health preparedness" or "Zoonoses and public health" or "East African journal of public health" or "Geospatial health" or "International journal of public health" or "Disability and health journal" or "World health & population" or "Social work in public health" or "Public health genomics" or "Deutsches Ärzteblatt international" or "Journal of research in health sciences" or "Population health management" or "Journal of infection and public health" or "NCHS data brief" or "Global health action" or "Global health promotion" or "Perspectives in public health" or "Journal of environmental and public health" or "International health" or "Journal of primary care & community health" or "Epidemiology and health" or "Translational behavioral medicine" or "Western Pacific surveillance and response journal : WPSAR" or "Translational psychiatry" or "Journal of global health" or "Hawai'i journal of medicine & public health : a journal of Asia Pacific Medicine & Public Health" or "Paediatrics and international child health" or "Pathogens and global health" or "Israel journal of health policy research" or "WHO South-East Asia journal of public health" or "Journal of epidemiology and global health" or "Value in health regional issues" or "The Lancet. Global health" or "LGBT health" or "International journal of health policy and management" or "Global health, science and practice" or "Journal of racial and ethnic health disparities" or "Current environmental health reports" or "Public health research & practice" or "Health promotion and chronic disease prevention in Canada : research policy and practice").jn. (244689)

20 14 and 19 (57524)

21 limit 20 to yr="2013 - 2017" (15883)

22 15 and 18 and 19 (98)

23 limit 22 to yr="2013 - 2017" (59)

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Additional File 2. Journals Assessed for Endorsement

RECORD

1. African health sciences
2. Aging & mental health
3. American journal of community psychology
4. American journal of men's health
5. Australian journal of primary health
6. BMC family practice
7. BMC health services research
8. BMC medical research methodology
9. BMJ quality & safety
10. Child welfare
11. Clinical interventions in aging
12. Community mental health journal
13. Ethnicity & health
14. Health & place
15. Health & social care in the community
16. Health & social work
17. Health affairs
18. Health care for women international
19. Health care management review
20. Health care management science
21. Health economics
22. Health policy
23. Health services research
24. Healthcare
25. Healthcare policy = Politiques de santé
26. Healthcare quarterly
27. Hispanic health care international : the official journal of the National Association of Hispanic Nurses
28. Home health care services quarterly
29. Home healthcare now
30. Infant mental health journal
31. International journal for equity in health
32. International journal of evidence-based healthcare
33. International journal of health care quality assurance
34. International journal of health economics and management
35. International journal of technology assessment in health care
36. Israel journal of health policy research
37. Journal of allied health
38. Journal of community health
39. Journal of comparative effectiveness research
40. Journal of evaluation in clinical practice
41. Journal of global health

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42. Journal of health communication
43. Journal of health economics
44. Journal of medical economics
45. Journal of medical engineering & technology
46. Journal of mental health
47. Journal of Nepal Health Research Council
48. Journal of patient safety
49. Journal of prevention & intervention in the community
50. Journal of primary care & community health
51. Journal of women & aging
52. Managed care
53. Medical care
54. Perspectives in health information management
55. Population health management
56. Primary health care research & development
57. Professional case management
58. Psychiatric rehabilitation journal
59. Psychological services
60. Psychology, health & medicine
61. Public health reports
62. Quality management in health care
63. Research in nursing & health
64. Scandinavian journal of work, environment & health
65. Sexual & reproductive healthcare : official journal of the Swedish Association of Midwives
66. Social science & medicine
67. Social work in health care
68. Tanzania journal of health research
69. The American journal of managed care
70. The health care manager
71. The Journal of ambulatory care management
72. The journal of behavioral health services & research
73. The Journal of continuing education in the health professions
74. The journal of extra-corporeal technology
75. The journal of primary prevention
76. The Journal of school health
77. The Milbank quarterly
78. The Permanente journal

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STREGA

1. American journal of human genetics
2. American journal of medical genetics. Part A
3. American journal of medical genetics. Part B, Neuropsychiatric genetics : the official publication of the International Society of Psychiatric Genetics
4. American journal of medical genetics. Part C, Seminars in medical genetics
5. Annals of human genetics
6. Behavior genetics
7. Biochemical genetics
8. BMC genetics
9. BMC genomics
10. BMC medical genetics
11. Cancer
12. Cancer gene therapy
13. Cancer genetics
14. Cancer genomics & proteomics
15. Circulation. Cardiovascular genetics
16. Clinical epigenetics
17. Clinical genetics
18. Current molecular medicine
19. EBioMedicine
20. Epigenomics
21. European journal of medical genetics
22. Familial cancer
23. Folia biologica
24. Forensic science international. Genetics
25. Functional & integrative genomics
26. G3 : genes - genomes - genetics
27. Genes & genetic systems
28. Genes, chromosomes & cancer
29. Genetic counseling
30. Genetic epidemiology
31. Genetica
32. Genetics
33. Genome
34. Genome biology
35. Genome medicine
36. Genome research
37. Genomics
38. Hereditas
39. Human genetics
40. Human genomics
41. Human heredity
42. Human molecular genetics
43. Human mutation
44. Immunogenetics

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45. International journal of immunogenetics
46. International journal of molecular medicine
47. Journal of applied genetics
48. Journal of cardiovascular translational research
49. Journal of human genetics
50. Journal of neurogenetics
51. Molecular autism
52. Molecular neurodegeneration
53. Molecular oncology
54. Molecular vision
55. Mutagenesis
56. Mutation Research - Fundamental and Molecular Mechanisms of Mutagenesis
57. Mutation Research - Genetic Toxicology and Environmental Mutagenesis
58. Mutation research - Reviews
59. Nature genetics
60. Neurogenetics
61. Neurology
62. Ophthalmic genetics
63. Orthodontics & craniofacial research
64. Pharmacogenetics and genomics
65. Pharmacogenomics
66. Physiological genomics
67. PLoS genetics
68. Proteomics
69. Psychiatric genetics
70. Public health genomics
71. Radiation research
72. The journal of gene medicine

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STROBE-AMS

1. Advances in therapy
2. Alimentary pharmacology & therapeutics
3. Chemotherapy
4. Clinical drug investigation
5. Clinical therapeutics
6. Current drug safety
7. Drug discoveries & therapeutics
8. Drug research
9. European journal of clinical pharmacology
10. Infection
11. Infectious disorders drug targets
12. International journal of antimicrobial agents
13. International journal of clinical pharmacy
14. Journal of chemotherapy
15. Journal of global antimicrobial resistance
16. Paediatric drugs
17. Recent patents on anti-infective drug discovery
18. The Annals of pharmacotherapy
19. The International journal of pharmacy practice
20. The Journal of antibiotics
21. The Journal of antimicrobial chemotherapy
22. The Journal of dermatological treatment
23. Therapeutic drug monitoring

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STROBE-EULAR

1. Annals of the rheumatic diseases
2. Arthritis & rheumatology
3. Arthritis care & research
4. Arthritis research & therapy
5. Clinical rheumatology
6. Connective tissue research
7. Current rheumatology reviews
8. International journal of rheumatic diseases
9. Joint, bone, spine : revue du rhumatisme
10. Lupus
11. Modern rheumatology
12. Pediatric rheumatology online journal
13. Reumatología clinica
14. Rheumatology
15. Rheumatology international
16. Scandinavian journal of rheumatology
17. The Journal of rheumatology

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STROBE-ME

1. Biochemical genetics
2. Biomolecules
3. Bioscience reports
4. BMB reports
5. BMC gastroenterology
6. BMC genetics
7. Cell reports
8. Cellular & molecular immunology
9. Chemico-biological interactions
10. Combinatorial chemistry & high throughput screening
11. Current molecular medicine
12. DNA repair
13. EMBO molecular medicine
14. Experimental & molecular medicine
15. Expert review of molecular diagnostics
16. Folia biologica
17. Future cardiology
18. G3 : genes - genomes - genetics
19. Gene
20. Gene expression
21. Genes & genetic systems
22. Genes, chromosomes & cancer
23. Human molecular genetics
24. International journal of molecular medicine
25. International journal of molecular sciences
26. IUBMB life
27. Journal of lipid research
28. Journal of molecular endocrinology
29. Journal of molecular histology
30. Journal of molecular medicine
31. Life sciences
32. Medical molecular morphology
33. Methods in molecular biology
34. MicroRNA
35. Mitochondrial DNA. Part A, DNA mapping, sequencing, and analysis
36. Molecular biology reports
37. Molecular bioSystems
38. Molecular biotechnology
39. Molecular brain
40. Molecular cancer
41. Molecular cancer research : MCR
42. Molecular carcinogenesis
43. Molecular diagnosis & therapy
44. Molecular human reproduction
45. Molecular immunology

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46. Molecular medicine
47. Molecular medicine reports
48. Molecular neurobiology
49. Molecular neurodegeneration
50. Molecular nutrition & food research
51. Molecular oncology
52. Molecular psychiatry
53. Molecular systems biology
54. Molecular vision
55. Nature medicine
56. Neuromolecular medicine
57. Omics : a journal of integrative biology
58. Oncogene
59. Physiological genomics
60. RNA biology
61. The FEBS journal
62. The journal of gene medicine
63. The pharmacogenomics journal
64. Theranostics
65. Virulence

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STROBE-RDS

1. American journal of public health
2. Asia-Pacific journal of public health
3. BMC public health
4. Canadian journal of public health = Revue canadienne de sante publique
5. Ciência & saúde coletiva
6. Community dental health
7. Demography
8. International journal for equity in health
9. Journal of community health
10. Journal of epidemiology and global health
11. Journal of medical Internet research
12. LGBT health
13. Public health nutrition
14. Public health reports
15. Public health

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STROME-ID

1. Antiviral research
2. Antiviral therapy
3. BMC gastroenterology
4. BMC genetics
5. Cellular & molecular immunology
6. Current molecular medicine
7. EMBO molecular medicine
8. Expert review of molecular diagnostics
9. FEBS letters
10. Folia biologica
11. G3 : genes - genomes - genetics
12. Gene
13. Human molecular genetics
14. Infectious disorders drug targets
15. International journal of antimicrobial agents
16. International journal of molecular medicine
17. International journal of molecular sciences
18. Journal of biomolecular techniques : JBT
19. Journal of chemotherapy
20. Journal of global antimicrobial resistance
21. Journal of lipid research
22. Journal of molecular medicine : official organ of the "Gesellschaft Deutscher Naturforscher und Ärzte"
23. Life sciences
24. Molecular biology reports
25. Molecular cancer
26. Molecular cancer research : MCR
27. Molecular carcinogenesis
28. Molecular diagnosis & therapy
29. Molecular immunology
30. Molecular medicine
31. Molecular medicine reports
32. Molecular vision
33. Nature medicine
34. Omics : a journal of integrative biology
35. Recent patents on anti-infective drug discovery
36. The Journal of antibiotics
37. The Journal of antimicrobial chemotherapy
38. The pharmacogenomics journal
39. Theranostics
40. Virulence
41. Virus genes

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Additional File 3. Study flow diagram

Placeholder for

for study 1: article

(SURVEY FLOW DIAGRAM,

ONE PAGE)

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Chapter Two: Article

Additional File 1. Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

Item Category	*Checklist Item*	*Explanation*	*Reference Location and/or Notes*
Design	Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely.)	Lines 111 – 112: "Eligible participants were researchers involved in manuscript writing (in the past 10 years) reporting the results of an observational study."
IRB (Institutional Review Board) approval and informed consent process	IRB approval	Mention whether the study has been approved by an IRB.	Lines 83 – 84: "The University of Split School of Medicine ethical review committee granted ethical approval."
	Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	*The full informed consent document is available to read in Supplemental File 2.* *"The purpose of this research project is to better understand the use of and attitudes towards the STrenghtening the Reporting of OBservational Studies in Epidemiology (STROBE) Statement (https://www.strobe-statement.org/), a reporting guideline for cohort, case-control and cross-sectional studies….Your participation includes completing an online survey that will take approximately 10 minutes…* *All data are stored in a password-protected electronic format and are only accessible by those directly involved in the project.* *If you have any questions about the research study, please contact Melissa Sharp… or Pr. Darko Hren... This study project has been approved by the University of Split ethics committee…"*

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Item Category	*Checklist Item*	*Explanation*	*Reference Location and/or Notes*
	Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	The full informed consent document is available to read in Supplemental File 2.
Development and pre-testing **Recruitment process and description of the sample having access to the questionnaire**	Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	Lines 81 – 83: "Prior to distribution, we piloted the survey within the Methods in Research on Research (MiRoR) network [171], allowing collaborators to give feedback on content and functionality [194]."
	Open survey versus closed survey	An "open survey" is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).	*The survey was open*
	Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	Recruitment section: lines 111 - 134
	Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	Recruitment section: lines 111 - 134

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Item Category	*Checklist Item*	*Explanation*	*Reference Location and/or Notes*
Survey administration	Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	*E-mails were sent using Microsoft Word's mail merge function and the scraped emails of authors in an Excel spreadsheet. The survey was open so we did not track respondents automatically. E-mail responses were manually entered in Excel.*
	Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site	*Journals contacted are listed in Supplemental File 4. Journals who participated may be more willing to endorse reporting guidelines (i.e. STROBE) and their authors would therefore have been more likely to have used them.* *Personal contacts from the first author (lines 114 – 117) may also be more biased to have used reporting guidelines before due to the nature of their work and affiliation with the first author.*
	Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	*The survey was completely voluntary*
	Incentives	Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	*There were no monetary incentives for participation.*
	Time/Date	In what timeframe were the data collected?	Lines 112 – 113: "The survey was distributed from March 5 to August 31, 2018."
	Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	*Items were not randomized or alternated.*

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Item Category	*Checklist Item*	*Explanation*	*Reference Location and/or Notes*
	Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	Lines 88 - 90: "After consenting to participate, adaptive questioning branched the survey based on participant's level of awareness and use of STROBE (i.e., never heard of, never used; heard of, never used; heard of, have used)."
	Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	*The survey flow is presented in Figure 1 and the full survey is in Supplemental File 2.*
	Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	*The survey flow is presented in Figure 1 and the full survey is in Supplemental File 2.*
	Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if "yes", how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as "not applicable" or "rather not say", and selection of one response option should be enforced.	*There was no completeness check at the end of the survey.*
	Review step	State whether respondents were able to review and change their answers (eg, through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	*The back button and review functionalities were not enabled so participants could not change answers if they learned new information and/or wanted to respond in a more socially desirable manner.*

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Item Category	*Checklist Item*	*Explanation*	*Reference Location and/or Notes*
Response rates	Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	*View rates were defined as those who opened the survey and viewed/loaded the first page of the survey (which was the informed consent page. IP addresses were automatically logged.* Lines 180 – 181: "However, we know that 1293 visitors read the informed consent page and 1265 (97.8%) agreed to participate."
	View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	*Not applicable.*
	Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called "recruitment" rate.	Lines 180 – 181: "However, we know that 1293 visitors read the informed consent page and 1265 (97.8%) agreed to participate."
	Completion rate (Ratio of users who finished the survey/users who agreed to participate)	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate "informed consent" page or if the survey goes over several pages. This is a measure for attrition. Note that "completion" can involve leaving questionnaire items blank. This is not a measure for	Lines 140 – 141: "Completion/dropout rates were calculated overall and per survey branch based on completion of the final forced-response question." Lines 180 – 183: "However, we know that 1293 visitors read the informed consent page and 1265 (97.8%) agreed to participate. After evaluating free-text responses, seven indicated ineligibility (e.g., *"I do not do observational research"*). Of the

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Item Category	*Checklist Item*	*Explanation*	*Reference Location and/or Notes*
		how completely questionnaires were filled in. (If you need a measure for this, use the word "completeness rate".)	1258 eligible participants, 1015 (80.7%) completed the survey."
Preventing multiple entries from the same individual	Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)?	*Visitors were tracked using SurveyMonkey's multiple standard cookies for tracking website visitors* [195,196]. *We allowed multiple IP addresses as some participants came from the same institutions and experienced access issues.*
	IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	*IP addresses were automatically collected; based on completeness and judgement (i.e., immediately consecutive access cases using identical IP addresses with no data or extreme time outliers with no responses), duplicate entries were deleted prior to analyses.*
	Log file analysis	Indicate whether other techniques to analyze the log file for identification of	*None*

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Item Category	*Checklist Item*	*Explanation*	*Reference Location and/or Notes*
		multiple entries were used. If so, please describe.	
	Registration	In "closed" (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	*The survey was open so registration was not necessary.*
Analysis	Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	*Only complete questionnaires were analyzed.*
	Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	*There was no cutoff point for submitting "too soon."*
	Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.	*No methods were used to adjust for the non-representative sample.*

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Placeholder for

Additional File 2. Survey copy

for study 2: article

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Additional File 3. Editorial Offices Contacted and Journal Pools with Accompanying Search Strategies

Editorial Offices Contacted

1. Advances in therapy
2. African health sciences
3. Aging & mental health
4. Alimentary pharmacology & therapeutics
5. American journal of community psychology
6. American journal of human genetics
7. American journal of medical genetics. Part A
8. American journal of medical genetics. Part B, Neuropsychiatric genetics : the official publication of the International Society of Psychiatric Genetics
9. American journal of medical genetics. Part C, Seminars in medical genetics
10. American journal of men's health
11. American journal of public health
12. Annals of human genetics
13. Annals of the rheumatic diseases
14. Antiviral research
15. Antiviral therapy
16. Arthritis & rheumatology
17. Arthritis care & research
18. Arthritis research & therapy
19. Asia-Pacific journal of public health
20. Australian journal of primary health
21. Behavior genetics
22. Biochemical genetics
23. Biomolecules
24. Bioscience reports
25. BMB reports
26. BMC family practice
27. BMC gastroenterology
28. BMC genetics
29. BMC genomics
30. BMC health services research
31. BMC medical genetics
32. BMC medical research methodology
33. BMC public health
34. BMJ quality & safety
35. Canadian journal of public health = Revue canadienne de sante publique
36. Cancer
37. Cancer gene therapy
38. Cancer genetics
39. Cancer genomics & proteomics
40. Cell reports
41. Cellular & molecular immunology

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42. Chemico-biological interactions
43. Chemotherapy
44. Child welfare
45. Ciência & saúde coletiva
46. Circulation. Cardiovascular genetics
47. Clinical drug investigation
48. Clinical epigenetics
49. Clinical genetics
50. Clinical interventions in aging
51. Clinical rheumatology
52. Clinical therapeutics
53. Combinatorial chemistry & high throughput screening
54. Community dental health
55. Community mental health journal
56. Connective tissue research
57. Current drug safety
58. Current molecular medicine
59. Current rheumatology reviews
60. Demography
61. DNA repair
62. Drug discoveries & therapeutics
63. Drug research
64. EBioMedicine
65. EMBO molecular medicine
66. Epigenomics
67. Ethnicity & health
68. European journal of clinical pharmacology
69. European journal of medical genetics
70. Experimental & molecular medicine
71. Expert review of molecular diagnostics
72. Familial cancer
73. FEBS letters
74. Folia biologica
75. Forensic science international. Genetics
76. Functional & integrative genomics
77. Future cardiology
78. G3 : genes - genomes - genetics
79. Gene
80. Gene expression
81. Genes & genetic systems
82. Genes, chromosomes & cancer
83. Genetic epidemiology
84. Genetica
85. Genetics
86. Genome
87. Genome biology
88. Genome medicine

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89. Genome research
90. Genomics
91. Health & place
92. Health & social care in the community
93. Health & social work
94. Health affairs
95. Health care for women international
96. Health care management review
97. Health care management science
98. Health economics
99. Health policy
100. Health services research
101. Healthcare
102. Healthcare policy = Politiques de santé
103. Healthcare quarterly
104. Hereditas
105. Hispanic health care international : the official journal of the National Association of Hispanic Nurses
106. Home health care services quarterly
107. Home healthcare now
108. Human genetics
109. Human genomics
110. Human heredity
111. Human molecular genetics
112. Human mutation
113. Immunogenetics
114. Infant mental health journal
115. Infection
116. Infectious disorders drug targets
117. International journal for equity in health
118. International journal of antimicrobial agents
119. International journal of clinical pharmacy
120. International journal of evidence-based healthcare
121. International journal of health care quality assurance
122. International journal of health economics and management
123. International journal of immunogenetics
124. International journal of molecular medicine
125. International journal of molecular sciences
126. International journal of rheumatic diseases
127. International journal of technology assessment in health care
128. Israel journal of health policy research
129. IUBMB life
130. Joint, bone, spine : revue du rhumatisme
131. Journal of allied health
132. Journal of applied genetics
133. Journal of biomolecular techniques : JBT
134. Journal of cardiovascular translational research
135. Journal of chemotherapy

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136. Journal of community health
137. Journal of comparative effectiveness research
138. Journal of epidemiology and global health
139. Journal of evaluation in clinical practice
140. Journal of global antimicrobial resistance
141. Journal of global health
142. Journal of health communication
143. Journal of health economics
144. Journal of human genetics
145. Journal of lipid research
146. Journal of medical economics
147. Journal of medical engineering & technology
148. Journal of medical Internet research
149. Journal of mental health
150. Journal of molecular endocrinology
151. Journal of molecular histology
152. Journal of molecular medicine
153. Journal of Nepal Health Research Council
154. Journal of neurogenetics
155. Journal of patient safety
156. Journal of prevention & intervention in the community
157. Journal of primary care & community health
158. Journal of women & aging
159. LGBT health
160. Life sciences
161. Lupus
162. Managed care
163. Medical care
164. Medical molecular morphology
165. Methods in molecular biology
166. MicroRNA
167. Mitochondrial DNA. Part A, DNA mapping, sequencing, and analysis
168. Modern rheumatology
169. Molecular autism
170. Molecular biology reports
171. Molecular bioSystems
172. Molecular biotechnology
173. Molecular brain
174. Molecular cancer
175. Molecular cancer research : MCR
176. Molecular carcinogenesis
177. Molecular diagnosis & therapy
178. Molecular human reproduction
179. Molecular immunology
180. Molecular medicine
181. Molecular medicine reports
182. Molecular neurobiology

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183. Molecular neurodegeneration
184. Molecular nutrition & food research
185. Molecular oncology
186. Molecular psychiatry
187. Molecular systems biology
188. Molecular vision
189. Mutagenesis
190. Mutation Research - Fundamental and Molecular Mechanisms of Mutagenesis
191. Mutation Research - Genetic Toxicology and Environmental Mutagenesis
192. Mutation research - reviews
193. Nature genetics
194. Nature medicine
195. Neurogenetics
196. Neurology
197. Neuromolecular medicine
198. Omics : a journal of integrative biology
199. Oncogene
200. Ophthalmic genetics
201. Orthodontics & craniofacial research
202. Paediatric drugs
203. Pediatric rheumatology online journal
204. Perspectives in health information management
205. Pharmacogenetics and genomics
206. Pharmacogenomics
207. Physiological genomics
208. PLoS genetics
209. Population health management
210. Primary health care research & development
211. Professional case management
212. Proteomics
213. Psychiatric genetics
214. Psychiatric rehabilitation journal
215. Psychological services
216. Psychology, health & medicine
217. Public health
218. Public health genomics
219. Public health nutrition
220. Public health reports
221. Quality management in health care
222. Radiation research
223. Recent patents on anti-infective drug discovery
224. Research in nursing & health
225. Reumatología clinica
226. Rheumatology
227. Rheumatology international
228. RNA biology
229. Scandinavian journal of rheumatology

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230. Scandinavian journal of work, environment & health
231. Sexual & reproductive healthcare : official journal of the Swedish Association of Midwives
232. Social science & medicine
233. Social work in health care
234. Tanzania journal of health research
235. The American journal of managed care
236. The Annals of pharmacotherapy
237. The FEBS journal
238. The health care manager
239. The International journal of pharmacy practice
240. The Journal of ambulatory care management
241. The Journal of antibiotics
242. The Journal of antimicrobial chemotherapy
243. The journal of behavioral health services & research
244. The Journal of continuing education in the health professions
245. The Journal of dermatological treatment
246. The journal of extra-corporeal technology
247. The journal of gene medicine
248. The journal of primary prevention
249. The Journal of rheumatology
250. The Journal of school health
251. The Milbank quarterly
252. The Permanente journal
253. The pharmacogenomics journal
254. Theranostics
255. Therapeutic drug monitoring
256. Virulence
257. Virus genes

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Journals from observational-study corpus [Search run July 2017]

1. ACS synthetic biology
2. Advanced drug delivery reviews
3. Advances in therapy
4. Alimentary pharmacology & therapeutics
5. American journal of clinical oncology
6. Annals of the rheumatic diseases
7. Anti-cancer drugs
8. Anti-inflammatory & anti-allergy agents in medicinal chemistry
9. Antiviral chemistry & chemotherapy
10. Antiviral research
11. Antiviral therapy
12. Arthritis & rheumatology (Hoboken, N.J.)
13. Arthritis care & research
14. Arthritis research & therapy
15. Biochemical genetics
16. Biochemistry and molecular biology education : a bimonthly publication of the International Union of Biochemistry and Molecular Biology
17. Bioinformatics (Oxford, England)
18. Biomacromolecules
19. Biomolecular concepts
20. Biomolecules
21. Bioscience reports
22. BMB reports
23. BMC gastroenterology
24. BMC genetics
25. BMC structural biology
26. British journal of pharmacology
27. Cardiovascular & hematological disorders drug targets
28. Cardiovascular therapeutics
29. Cell reports
30. Cell systems
31. Cellular & molecular biology letters
32. Cellular & molecular immunology
33. Chemico-biological interactions
34. Chemistry & biodiversity
35. Chemotherapy
36. Chimerism
37. Clinical colorectal cancer
38. Clinical drug investigation
39. Clinical pharmacology in drug development
40. Clinical rheumatology
41. Clinical therapeutics
42. CNS & neurological disorders drug targets
43. CNS drugs
44. Cold Spring Harbor perspectives in biology
45. Cold Spring Harbor protocols

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46. Combinatorial chemistry & high throughput screening
47. Connective tissue research
48. Critical reviews in eukaryotic gene expression
49. Critical reviews in therapeutic drug carrier systems
50. Current cancer drug targets
51. Current drug delivery
52. Current drug safety
53. Current drug targets
54. Current molecular medicine
55. Current opinion in pharmacology
56. Current opinion in rheumatology
57. Current pharmaceutical biotechnology
58. Current protocols in cytometry
59. Current rheumatology reports
60. Current rheumatology reviews
61. Current vascular pharmacology
62. Daru : journal of Faculty of Pharmacy, Tehran University of Medical Sciences
63. Diabetes, obesity & metabolism
64. DNA repair
65. Drug delivery
66. Drug development research
67. Drug discoveries & therapeutics
68. Drug discovery today. Technologies
69. Drug research
70. Drug safety
71. Drugs
72. Drugs & aging
73. Drugs of today (Barcelona, Spain : 1998)
74. EMBO molecular medicine
75. EMBO reports
76. Endocrine, metabolic & immune disorders drug targets
77. European journal of clinical pharmacology
78. Evolution & development
79. Experimental & molecular medicine
80. Expert opinion on drug delivery
81. Expert opinion on drug safety
82. Expert opinion on emerging drugs
83. Expert opinion on investigational drugs
84. Expert opinion on pharmacotherapy
85. Expert opinion on therapeutic targets
86. Expert review of molecular diagnostics
87. Expert review of neurotherapeutics
88. Expert review of pharmacoeconomics & outcomes research
89. FEBS letters
90. Folia biologica
91. Functional & integrative genomics
92. Fundamental & clinical pharmacology

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93. Future cardiology
94. G3 (Bethesda, Md.)
95. Gene
96. Gene expression
97. Genes & development
98. Genes & genetic systems
99. Genes, chromosomes & cancer
100. Genome biology and evolution
101. Harm reduction journal
102. Hematology & medical oncology
103. Human molecular genetics
104. Infection
105. Infectious disorders drug targets
106. Inflammation & allergy drug targets
107. Inflammopharmacology
108. International journal for parasitology. Drugs and drug resistance
109. International journal of antimicrobial agents
110. International journal of biological macromolecules
111. International journal of clinical pharmacy
112. International journal of molecular medicine
113. International journal of molecular sciences
114. International journal of rheumatic diseases
115. IUBMB life
116. Joint, bone, spine : revue du rhumatisme
117. Journal of biomolecular NMR
118. Journal of biomolecular structure & dynamics
119. Journal of biomolecular techniques : JBT
120. Journal of cardiovascular pharmacology
121. Journal of chemotherapy (Florence, Italy)
122. Journal of computer-aided molecular design
123. Journal of drugs in dermatology : JDD
124. Journal of experimental therapeutics & oncology
125. Journal of global antimicrobial resistance
126. Journal of lipid research
127. Journal of molecular cell biology
128. Journal of molecular endocrinology
129. Journal of molecular evolution
130. Journal of molecular graphics & modelling
131. Journal of molecular histology
132. Journal of molecular medicine (Berlin, Germany)
133. Journal of molecular modeling
134. Journal of opioid management
135. Journal of pain & palliative care pharmacotherapy
136. Journal of plant physiology
137. Journal of structural biology
138. Journal of the American Pharmacists Association : JAPhA
139. Life sciences

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140. Lupus
141. Magnesium research
142. Marine biotechnology (New York, N.Y.)
143. Medical molecular morphology
144. Methods in molecular biology (Clifton, N.J.)
145. MicroRNA (Shariqah, United Arab Emirates)
146. Mitochondrial DNA. Part A, DNA mapping, sequencing, and analysis
147. Modern rheumatology
148. Molecular & cellular biomechanics : MCB
149. Molecular biology of the cell
150. Molecular biology reports
151. Molecular bioSystems
152. Molecular biotechnology
153. Molecular brain
154. Molecular cancer
155. Molecular cancer research : MCR
156. Molecular carcinogenesis
157. Molecular diagnosis & therapy
158. Molecular diversity
159. Molecular ecology
160. Molecular ecology resources
161. Molecular human reproduction
162. Molecular immunology
163. Molecular informatics
164. Molecular medicine (Cambridge, Mass.)
165. Molecular medicine reports
166. Molecular microbiology
167. Molecular neurobiology
168. Molecular neurodegeneration
169. Molecular nutrition & food research
170. Molecular oncology
171. Molecular pain
172. Molecular pharmaceutics
173. Molecular pharmacology
174. Molecular psychiatry
175. Molecular systems biology
176. Molecular therapy : the journal of the American Society of Gene Therapy
177. Molecular vision
178. Nature medicine
179. Nature reviews. Drug discovery
180. Nature reviews. Rheumatology
181. Neuromolecular medicine
182. New biotechnology
183. Nucleic acid therapeutics
184. Omics : a journal of integrative biology
185. Oncogene
186. Paediatric drugs

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187. Pediatric rheumatology online journal
188. PharmacoEconomics
189. Pharmacology & therapeutics
190. Physiological genomics
191. Plant molecular biology
192. Prescrire international
193. Pulmonary pharmacology & therapeutics
194. Recent patents on anti-cancer drug discovery
195. Recent patents on anti-infective drug discovery
196. Recent patents on endocrine, metabolic & immune drug discovery
197. Recent patents on inflammation & allergy drug discovery
198. Reumatologia clinica
199. Rheumatic diseases clinics of North America
200. Rheumatology (Oxford, England)
201. Rheumatology international
202. RNA biology
203. Scandinavian journal of rheumatology
204. Scandinavian journal of rheumatology. Supplement
205. Skin therapy letter
206. Structure (London, England : 1993)
207. The AAPS journal
208. The Annals of pharmacotherapy
209. The EMBO journal
210. The FEBS journal
211. The international journal of neuropsychopharmacology
212. The International journal of pharmacy practice
213. The Journal of antibiotics
214. The Journal of antimicrobial chemotherapy
215. The Journal of dermatological treatment
216. The journal of gene medicine
217. The Journal of membrane biology
218. The Journal of rheumatology
219. The Journal of rheumatology. Supplement
220. The pharmacogenomics journal
221. Theranostics
222. Therapeutic delivery
223. Therapeutic drug monitoring
224. Transcription
225. Transgenic research
226. Value in health regional issues
227. Virulence
228. Virus genes

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Journals Listed under Broad Subject Term "Epidemiology" in the National Library of Medicine

1. Health promotion and chronic disease prevention in Canada : research, policy and practice
2. Public health research & practice
3. Journal of racial and ethnic health disparities
4. Journal of epidemiology and global health
5. Epidemiology and psychiatric sciences
6. Chronic diseases and injuries in Canada
7. Western Pacific surveillance and response journal : WPSAR
8. Spatial and spatio-temporal epidemiology
9. Epidemiology and health
10. Epidemics
11. Cancer epidemiology
12. Biodemography and social biology
13. World health & population
14. Journal of exposure science & environmental epidemiology
15. Population health metrics
16. Journal of cancer epidemiology and prevention
17. Vector borne and zoonotic diseases
18. Scandinavian journal of public health Supplement
19. Scandinavian journal of public health
20. Revista brasileira de epidemiologia = Brazilian journal of epidemiology
21. Journal of urban health : bulletin of the New York Academy of Medicine
22. Journal of epidemiology and biostatistics
23. MSMR
24. Health & place
25. Ophthalmic epidemiology
26. Journal of medical screening
27. Central European journal of public health
28. Pharmacoepidemiology and drug safety
29. Epidemiologia e psichiatria sociale
30. Journal of exposure analysis and environmental epidemiology
31. Journal of epidemiology
32. European journal of public health
33. Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology
34. New South Wales public health bulletin
35. Epidemiology
36. Cancer causes & control : CCC
37. Bacteriologia, virusologia, parazitologia, epidemiologia
38. Annals of epidemiology
39. Social psychiatry and psychiatric epidemiology
40. Journal of clinical epidemiology
41. Infection control and hospital epidemiology
42. Geographia medica Supplement = Geographia medica Sonderband
43. Paediatric and perinatal epidemiology
44. Epidemiology and infection
45. Genetic epidemiology Supplement

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46. European journal of epidemiology
47. Genetic epidemiology
48. Neuroepidemiology
49. Zhonghua liu xing bing xue za zhi = Zhonghua liuxingbingxue zazhi
50. Epidemiological bulletin
51. Chronic diseases in Canada
52. Social science & medicine Part D, Medical geography
53. Journal of epidemiology and community health
54. Epidemiology and community health
55. Epidemiologic reviews
56. Contributions to epidemiology and biostatistics
57. Social science & medicine Medical geography
58. Journal of epidemiology and community health
59. Epidemiologia e prevenzione
60. Canada diseases weekly report = Rapport hebdomadaire des maladies au Canada
61. Scandinavian journal of social medicine
62. Scandinavian journal of social medicine Supplementum
63. Community dentistry and oral epidemiology
64. International journal of epidemiology
65. Geographia medica
66. Acta socio-medica Scandinavica
67. Acta socio-medica Scandinavica Supplement
68. Local population studies
69. American journal of epidemiology
70. Journal of hygiene, epidemiology, microbiology, and immunology
71. Population studies
72. Zhurnal mikrobiologii, epidemiologii, i immunobiologii
73. Bollettino dell'Istituto sieroterapico milanese
74. Journal of registry management
75. International journal of health geographics

Ovid MEDLINE Search Strategy

1. Observational Study/

2. (observational adj3 stud$).tw.

3. exp Cohort Studies/

4. cohort$.tw.

5. controlled clinical trial.pt.

6. Epidemiologic Methods/

7. exp case-control studies/

8. (case$ adj3 control$).tw.

9. Comparative Study/

10. prospective$.tw.

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11. retrospective$.tw.

12. Cross-Sectional Studies/

13. prevalence/

14. or/1-13

15. ("Health promotion and chronic disease prevention in Canada : research, policy and practice " or "Public health research & practice " or "Journal of racial and ethnic health disparities " or "Journal of epidemiology and global health " or "Epidemiology and psychiatric sciences " or "Chronic diseases and injuries in Canada " or "Western Pacific surveillance and response journal : WPSAR " or "Spatial and spatio-temporal epidemiology " or "Epidemiology and health " or "Epidemics " or "Cancer epidemiology " or "Biodemography and social biology " or "World health & population " or "Journal of exposure science & environmental epidemiology " or "Population health metrics " or "Journal of cancer epidemiology and prevention " or "Vector borne and zoonotic diseases " or "Scandinavian journal of public health. Supplement " or "Scandinavian journal of public health " or "Revista brasileira de epidemiologia = Brazilian journal of epidemiology " or "Journal of urban health : bulletin of the New York Academy of Medicine " or "Journal of epidemiology and biostatistics " or "MSMR " or "Health & place " or "Ophthalmic epidemiology " or "Journal of medical screening " or "Central European journal of public health " or "Pharmacoepidemiology and drug safety " or "Epidemiologia e psichiatria sociale " or "Journal of exposure analysis and environmental epidemiology " or "Journal of epidemiology" or "European journal of public health " or "Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology " or "New South Wales public health bulletin " or "Epidemiology " or "Cancer causes & control : CCC " or "Bacteriologia, virusologia, parazitologia, epidemiologia" or "Annals of epidemiology " or "Social psychiatry and psychiatric epidemiology " or "Journal of clinical epidemiology " or "Infection control and hospital epidemiology " or "Geographia medica Supplement = Geographia medica Sonderband " or "Paediatric and perinatal epidemiology " or "Epidemiology and infection " or "Genetic epidemiology Supplement " or "European journal of epidemiology " or "Genetic epidemiology " or "Neuroepidemiology " or "Zhonghua liu xing bing xue za zhi = Zhonghua liuxingbingxue zazhi " or "Epidemiological bulletin " or "Chronic diseases in Canada " or "Social science & medicine. Part D, Medical geography " or "Journal of epidemiology and community health " or "Epidemiology and community health " or "Epidemiologic reviews " or "Contributions to epidemiology and biostatistics " or "Social science & medicine. Medical geography " or "Journal of epidemiology and community health " or "Epidemiologia e prevenzione " or "Canada diseases weekly report = Rapport hebdomadaire des maladies au Canada " or "Scandinavian journal of social medicine " or "Scandinavian journal of social medicine. Supplementum " or "Community dentistry and oral epidemiology " or "International journal of epidemiology " or "Geographia medica " or "Acta socio-medica Scandinavica " or "Acta socio-medica Scandinavica Supplement " or "Local population studies " or "American journal of epidemiology " or "Journal of hygiene, epidemiology, microbiology, and immunology " or "Population studies " or "Zhurnal mikrobiologii, epidemiologii, i immunobiologii " or "Bollettino dell'Istituto sieroterapico milanese " or "Journal of registry management " or "International journal of health geographics ").jn.

16. 14 and 15

17. limit 16 to (english language and last year)

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STROBE-Endorsing Journals [Search run and downloaded June 18, 2018]

1. Acta Gastroenterológica Latinoamericana
2. African Journal of Paediatric Surgery
3. Aging
4. American Journal of Kidney Diseases
5. American Journal of Preventive Medicine
6. American Journal of Respiratory and Critical Care Medicine
7. Annals of Behavioral Medicine
8. Annals of Cardiac Anaesthesia
9. Annals of Clinical Biochemistry
10. Annals of Emergency Medicine
11. Annals of Internal Medicine
12. Annals of Medicine and Surgery
13. Annals of Pediatric Cardiology
14. Annals of Saudi Medicine
15. Annals of Surgery
16. Annals of Thoracic Medicine
17. Annals of Tropical Medicine & Public Health
18. Arab Journal of Nephrology and Transplantation
19. Archives of Public Health
20. Australian Family Physician
21. BJOG
22. BMJ Open
23. British Journal of Dermatology
24. British Medical Journal
25. Bulletin of the World Health Organization
26. Butlletí
27. Cardiovascular Therapeutics
28. Cephalagia
29. Chest
30. Chiropractic Journal of Australia
31. Clinical Orthopaedics and Related Research
32. Clinical Toxicology
33. CNS Neuroscience & Therapeutics
34. Community Dental Health
35. Community Dentistry and Oral Epidemiology
36. Croatian Medical Journal
37. Down Syndrome Research and Practice
38. Drug and Alcohol Dependence
39. Deutsches Ärzteblatt International
40. East African Journal of Public Health
41. Epidemiologic Focus
42. Epidemiology & Infection
43. European Journal of Oral Implantology
44. European Respiratory Journal
45. Fertility and Sterility
46. Gaceta Sanitaria

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47. Gastrointestinal Endoscopy
48. Global Health Action
49. Gut
50. Hematology/Oncology and Stem Cell Therapy
51. Hepatitis Monthly
52. Indian Journal of Medical Sciences
53. Indian Journal of Ophthalmology
54. Indian Journal of Pathology and Microbiology
55. Indian Pediatrics
56. Injury Prevention
57. International Journal for Ayurveda Research
58. International Journal of Clinical Practice
59. International Journal of Green Pharmacy
60. International Journal of Medical Students
61. International Journal of Nursing Studies
62. International Journal of Surgery
63. JAAD
64. Journal of American Physical Therapy Association
65. Journal of Athletic Training
66. Journal of Bone and Joint Surgery
67. Journal of Cutaneous and Aesthetic Surgery
68. Journal of Cytology Journal of Dental Research
69. Journal of Emergencies, Trauma and Shock
70. Journal of Global Infectious Diseases
71. Journal of Gynecological Endoscopy and Surgery
72. Journal of Human Nutrition and Dietetics
73. Journal of Investigational Allergology & Clinical Immunology
74. Journal of Ion Channels
75. Journal of Medical Ethics
76. Journal of Medical Sciences Research
77. Journal of the National Medical Association
78. Journal of Primary Health Care
79. Journal of Psychiatric and Mental Health Nursing
80. Journal of Orthopaedic & Sports Physical Therapy
81. Journal of Postgraduate Medicine
82. Journal of Shoulder and Elbow surgery
83. Journal of Thrombosis and Haemostasis
84. Journal of the Portuguese Society of Dermatology and Venereology
85. Journal of Reproductive Immunology
86. Lancet
87. Lancet Neurology
88. Lancet Oncology
89. Medical Decision Making
90. Medical Law Cases - For Doctors
91. Medical Research Support Foundation
92. Nature Clinical Practice Cardiovascular Medicine
93. Neuroepidemiology

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94. Neurology
95. Obstetrics & Gynecology
96. Open Medicine
97. Pain Practice
98. Pain Physician
99. Pakistan Journal of Medical and Health Sciences
100. Pflegezeitschrift
101. Philppine Journal of Otolaryngology Head and Neck Surgery
102. Physical Therapy
103. Physiotherapy
104. PLoS Computational Biology
105. PLoS Genetics
106. PLoS ONE
107. PLoS Medicine
108. PLoS Neglected Tropical Diseases
109. PLoS Pathogens
110. pt Zeitschrift für Physiotherapeuten
111. Radiology
112. Revista de Saude Publica
113. Revista Brasileira de Cirurgia Cardiovascular
114. Revista Peruana de Epidemiología
115. São Paulo Medical Journal
116. Scandinavian Journal of Work, Environment & Health
117. Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine (SJTREM)
118. Sexually Transmitted Infection
119. Therapeutics, Pharmacology and Clinical Toxicology
120. Urology Annals
121. Veterinary Radiology & Ultrasound

Ovid MEDLINE Search Strategy

1. Observational Study/
2. (observational adj3 stud$).tw.
3. exp Cohort Studies/
4. cohort$.tw.
5. controlled clinical trial.pt.
6. Epidemiologic Methods/
7. exp case-control studies/
8. (case$ adj3 control$).tw.
9. Comparative Study/
10. prospective$.tw.
11. retrospective$.tw.
12. Cross-Sectional Studies/
13. prevalence/
14. or/1-13
15. ("Acta Gastroenterológica Latinoamericana" or "African Journal of Paediatric Surgery" or "Aging" or "American Journal of Kidney Diseases" or "American Journal of Preventive Medicine" or "American

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Journal of Respiratory and Critical Care Medicine" or "Annals of Behavioral Medicine" or "Annals of Cardiac Anaesthesia" or "Annals of Clinical Biochemistry" or "Annals of Emergency Medicine" or "Annals of Internal Medicine" or "Annals of Medicine and Surgery" or "Annals of Pediatric Cardiology" or "Annals of Saudi Medicine" or "Annals of Surgery" or "Annals of Thoracic Medicine" or "Annals of Tropical Medicine & Public Health" or "Arab Journal of Nephrology and Transplantation" or "Archives of Public Health" or "Australian Family Physician" or "BJOG" or "BMJ Open" or "British Journal of Dermatology" or "British Medical Journal" or "Bulletin of the World Health Organization" or "Butlletí" or "Cardiovascular Therapeutics" or "Cephalagia" or "Chest" or "Chiropractic Journal of Australia" or "Clinical Orthopaedics and Related Research" or "Clinical Toxicology" or "CNS Neuroscience & Therapeutics" or "Community Dental Health" or "Community Dentistry and Oral Epidemiology" or "Croatian Medical Journal" or "Down Syndrome Research and Practice" or "Drug and Alcohol Dependence" or "Deutsches Ärzteblatt International" or "East African Journal of Public Health" or "Epidemiologic Focus" or "Epidemiology & Infection" or "European Journal of Oral Implantology" or "European Respiratory Journal" or " Fertility and Sterility" or "Gaceta Sanitaria" or "Gastrointestinal Endoscopy" or "Global Health Action" or "Gut" or "Hematology/Oncology and Stem Cell Therapy" or "Hepatitis Monthly" or "Indian Journal of Medical Sciences" or "Indian Journal of Ophthalmology" or "Indian Journal of Pathology and Microbiology" or "Indian Pediatrics" or "Injury Prevention" or "International Journal for Ayurveda Research" or "International Journal of Clinical Practice" or "International Journal of Green Pharmacy" or "International Journal of Medical Students" or "International Journal of Nursing Studies" or "International Journal of Surgery" or "JAAD" or "Journal of American Physical Therapy Association" or "Journal of Athletic Training" or "Journal of Bone and Joint Surgery" or "Journal of Cutaneous and Aesthetic Surgery" or "Journal of Cytology" or "Journal of Dental Research" or "Journal of Emergencies, Trauma and Shock" or "Journal of Global Infectious Diseases" or "Journal of Gynecological Endoscopy and Surgery" or "Journal of Human Nutrition and Dietetics" or "Journal of Investigational Allergology & Clinical Immunology" or "Journal of Ion Channels" or "Journal of Medical Ethics" or "Journal of Medical Sciences Research" or "Journal of the National Medical Association" or "Journal of Primary Health Care" or "Journal of Psychiatric and Mental Health Nursing" or "Journal of Orthopaedic & Sports Physical Therapy" or "Journal of Postgraduate Medicine" or "Journal of Shoulder and Elbow surgery" or "Journal of Thrombosis and Haemostasis" or "Journal of the Portuguese Society of Dermatology and Venereology" or "Journal of Reproductive Immunology" or "Lancet" or "Lancet Neurology" or "Lancet Oncology" or "Medical Decision Making" or "Medical Law Cases - For Doctors" or "Medical Research Support Foundation" or "Nature Clinical Practice Cardiovascular Medicine" or "Neuroepidemiology" or "Neurology" or "Obstetrics & Gynecology" or "Open Medicine " or "Pain Practice" or "Pain Physician" or "Pakistan Journal of Medical and Health Sciences" or "Pflegezeitschrift" or "Philippine Journal of Otolaryngology Head and Neck Surgery" or "Physical Therapy" or "Physiotherapy" or "PLoS Computational Biology" or "PLoS Genetics" or "PLoS ONE" or "PLoS Medicine" or "PLoS Neglected Tropical Diseases" or "PLoS Pathogens" or "pt Zeitschrift für Physiotherapeuten" or "Radiology" or "Revista de Saude Publica" or "Revista Brasileira de Cirurgia Cardiovascular" or "Revista Peruana de Epidemiología" or "São Paulo Medical Journal" or "Scandinavian Journal of Work, Environment & Health" or "Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine (SJTREM)" or "Sexually Transmitted Infection" or "Therapeutics, Pharmacology and Clinical Toxicology" or "Urology Annals" or "Veterinary Radiology & Ultrasound ").jn.

16. 14 and 15
17. limit 16 to (english language and last year)

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Scimago Journal & Country Rank Top Ranked Journals in "Medicine" [Search run and downloaded July 6, 2018]

1. CA - A Cancer Journal for Clinicians
2. Nature Reviews Genetics
3. MMWR. Recommendations and reports : Morbidity and mortality weekly report. Recommendations and reports / Centers for Disease Control
4. Nature Reviews Immunology
5. Nature Reviews Cancer
6. Annual Review of Immunology
7. Vital and health statistics. Series 10, Data from the National Health Survey
8. New England Journal of Medicine
9. Nature Medicine
10. Physiological Reviews
11. The Lancet Oncology
12. The Lancet
13. Immunity
14. Cancer Cell
15. Genome Research
16. Annual Review of Pathology: Mechanisms of Disease
17. The Lancet Neurology
18. Clinical Microbiology Reviews
19. Accounts of Chemical Research
20. Vital & health statistics. Series 3, Analytical and epidemiological studies / [U.S. Dept. of Health and Human Services, Public Health Service, National Center for Health Statistics]
21. Journal of the American College of Cardiology
22. MMWR. Surveillance summaries : Morbidity and mortality weekly report. Surveillance summaries / CDC
23. Journal of Clinical Oncology
24. Nature Reviews Drug Discovery
25. The Lancet Infectious Diseases
26. The Lancet Diabetes and Endocrinology
27. Science Translational Medicine
28. MMWR. Morbidity and mortality weekly report
29. European Heart Journal
30. Circulation
31. JAMA - Journal of the American Medical Association
32. The Lancet Global Health
33. Annual Review of Genomics and Human Genetics
34. Journal of Experimental Medicine
35. European Urology
36. Molecular Systems Biology
37. JAMA Psychiatry
38. JAMA Internal Medicine
39. Journal of Extracellular Vesicles
40. Gastroenterology
41. Annual Review of Clinical Psychology
42. The Lancet Respiratory Medicine

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43. Annals of the Rheumatic Diseases
44. Journal of Clinical Investigation
45. Acta Neuropathologica
46. Nature Reviews Disease Primers
47. Annals of Internal Medicine
48. American Journal of Human Genetics
49. Gut
50. Trends in Immunology
51. Nano Today
52. Nature Microbiology
53. eLife
54. NCHS data brief
55. FEMS Microbiology Reviews
56. EMBO Journal
57. World Psychiatry
58. Cancer Discovery
59. Circulation Research
60. Annual Review of Medicine
61. Diabetes Care
62. Nature Reviews Clinical Oncology
63. JACC: Heart Failure
64. Journal of Cell Biology
65. Blood
66. Endocrine Reviews
67. Cell Systems
68. Molecular Psychiatry
69. JAMA oncology
70. Annual Review of Public Health
71. The Lancet Haematology
72. American Journal of Respiratory and Critical Care Medicine
73. The Lancet HIV
74. PLoS Medicine
75. Brain
76. Science advances
77. European Journal of Heart Failure
78. Vital and health statistics. Series 2, Data evaluation and methods research
79. Progress in Retinal and Eye Research
80. Immunological Reviews
81. Annals of Neurology
82. Reports on Progress in Physics
83. Journal of Hepatology
84. Annals of Oncology
85. JAMA Cardiology
86. Hepatology
87. Nature Reviews Neurology
88. Journal of the National Cancer Institute
89. American Journal of Psychiatry

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90. Nature Reviews Endocrinology
91. Human Reproduction Update
92. Chem
93. The Lancet Psychiatry
94. Clinical Psychology Review
95. Microbiome
96. Trends in Endocrinology and Metabolism
97. Leukemia
98. Clinical Infectious Diseases

Ovid MEDLINE Search Strategy

1. Observational Study/
2. (observational adj3 stud$).tw.
3. exp Cohort Studies/
4. cohort$.tw.
5. controlled clinical trial.pt.
6. Epidemiologic Methods/
7. exp case-control studies/
8. (case$ adj3 control$).tw.
9. Comparative Study/
10. prospective$.tw.
11. retrospective$.tw.
12. Cross-Sectional Studies/
13. prevalence/
14. or/1-13
15. ("CA - A Cancer Journal for Clinicians" or "Nature Reviews Genetics" or "MMWR. Recommendations and reports : Morbidity and mortality weekly report. Recommendations and reports / Centers for Disease Control" or "Nature Reviews Immunology" or "Nature Reviews Cancer" or "Annual Review of Immunology" or "Vital and health statistics. Series 10, Data from the National Health Survey" or "New England Journal of Medicine" or "Nature Medicine" or "Physiological Reviews" or "The Lancet Oncology" or "The Lancet" or "Immunity" or "Cancer Cell" or "Genome Research" or "Annual Review of Pathology: Mechanisms of Disease" or "The Lancet Neurology" or "Clinical Microbiology Reviews" or "Accounts of Chemical Research" or "Vital & health statistics. Series 3, Analytical and epidemiological studies / [U.S. Dept. of Health and Human Services, Public Health Service, National Center for Health Statistics]" or "Journal of the American College of Cardiology" or "MMWR. Surveillance summaries : Morbidity and mortality weekly report. Surveillance summaries / CDC" or "Journal of Clinical Oncology" or "Nature Reviews Drug Discovery" or "The Lancet Infectious Diseases" or "The Lancet Diabetes and Endocrinology" or "Science Translational Medicine" or "MMWR. Morbidity and mortality weekly report" or "European Heart Journal" or "Circulation" or "JAMA - Journal of the American Medical Association" or "The Lancet Global Health" or "Annual Review of Genomics and Human Genetics" or "Journal of Experimental Medicine" or "European Urology" or "Molecular Systems Biology" or "JAMA Psychiatry" or "JAMA Internal Medicine" or "Journal of Extracellular Vesicles" or "Gastroenterology" or "Annual Review of Clinical Psychology" or "The Lancet Respiratory Medicine" or "Annals of the Rheumatic Diseases" or "Journal of Clinical Investigation" or "Acta Neuropathologica" or "Nature Reviews Disease Primers" or "Annals of Internal Medicine" or "American Journal of Human Genetics" or "Gut" or "Trends in Immunology" or "Nano

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Today" or "Nature Microbiology" or "eLife" or "NCHS data brief" or "FEMS Microbiology Reviews" or "EMBO Journal" or "World Psychiatry" or "Cancer Discovery" or "Circulation Research" or "Annual Review of Medicine" or "Diabetes Care" or "Nature Reviews Clinical Oncology" or "JACC: Heart Failure" or "Journal of Cell Biology" or "Blood" or "Endocrine Reviews" or "Cell Systems" or "Molecular Psychiatry" or "JAMA oncology" or "Annual Review of Public Health" or "The Lancet Haematology" or "American Journal of Respiratory and Critical Care Medicine" or "The Lancet HIV" or "PLoS Medicine" or "Brain" or "Science advances" or "European Journal of Heart Failure" or "Vital and health statistics. Series 2, Data evaluation and methods research" or "Progress in Retinal and Eye Research" or "Immunological Reviews" or "Annals of Neurology" or "Reports on Progress in Physics" or "Journal of Hepatology" or "Annals of Oncology" or "JAMA Cardiology" or "Hepatology" or "Nature Reviews Neurology" or "Journal of the National Cancer Institute" or "American Journal of Psychiatry" or "Nature Reviews Endocrinology" or "Human Reproduction Update" or "Chem" or "The Lancet Psychiatry" or "Clinical Psychology Review" or "Microbiome" or "Trends in Endocrinology and Metabolism" or "Leukemia" or "Clinical Infectious Diseases").jn.

16. limit 15 to (english language and last year)
17. 14 and 16

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Additional File 4. Additional Analyses

Supplemental Table 1. More Detailed Sample Demographics

	Total Sample	**Group 1 Never Heard of, Never Used**	**Group 2 Heard of, Never Used**	**Group 3 Heard of, Have Used**
	n = 1015	*n = 195*	*n = 185*	*n = 635*
Time Spent in Research				
1 – 10 years	332 *(32.7)*	57 *(29.2)*	65 (*35.1)*	210 *(33.1)*
11 – 20	362 *(35.7)*	61 (*31.3)*	54 *(29.2)*	247 *(38.9)*
21 – 30	212 *(20.9)*	46 *(23.6)*	41 *(22.2)*	125 *(19.7)*
31 – 40	86 *(8.5)*	22 (*11.3)*	22 *(11.9)*	42 *(6.6)*
41 +	17 *(1.7)*	8 (*4.1)*	3 *(1.6)*	6 *(0.9)*
I do not work in research	3 *(0.3)*	1 *(0.5)*	0 *(0)*	2 *(0.3)*
Prefer not to say	3 *(0.3)*	0 *(0)*	0 *(0)*	3 *(0.5)*
Age				
18 – 24	7 *(0.7)*	3 *(1.5)*	3 *(1.6)*	1 *(0.2)*
25 – 34	178 *(17.5)*	33 *(16.9)*	35 *(18.9)*	110 *(17.3)*
35 – 44	336 *(33.1)*	46 *(23.6)*	48 *(25.9)*	242 *(38.1)*
45 – 54	253 *(24.9)*	55 *(28.2)*	35 *(18.9)*	163 *(25.7)*
55 – 64	177 *(17.4)*	37 *(19.0)*	52 *(28.1)*	88 *(13.9)*
65 – 74	54 *(5.3)*	17 *(8.7)*	12 *(6.5)*	25 *(3.9)*
75 or older	4 *(0.4)*	4 *(2.1)*	0 *(0)*	0 *(0)*
Prefer not to say	6 *(0.6)*	0 *(0)*	0 *(0)*	6 *(0.9)*
Gender				
Woman	469 *(46.1)*	97 *(49.7)*	82 *(44.3)*	289 *(45.5)*
Man	525 *(51.6)*	94 *(48.2)*	101 *(54.6)*	329 *(51.8)*
Trans	3 *(0.3)*	0 *(0)*	0 *(0)*	3 *(0.5)*
Prefer not to say	20 *(2.0)*	4 *(2.1)*	2 *(1.1)*	14 *(2.2)*
Region				
Africa	22 *(2.2)*	5 *(2.6)*	2 *(1.1)*	15 *(2.4)*
Asiatic region	31 *(3.1)*	7 *(3.6)*	4 *(2.2)*	20 *(3.1)*
Eastern Europe	33 *(3.3)*	12 *(6.2)*	5 *(2.7)*	16 *(2.5)*
Latin America	54 *(5.3)*	14 *(7.2)*	10 *(5.4)*	30 *(4.7)*
Middle East	26 *(2.6)*	11 *(5.6)*	6 *(3.2)*	9 *(1.4)*
Northern America	283 *(27.9)*	58 *(29.7)*	57 *(30.8)*	168 *(26.5)*
Pacific Region	54 *(5.3)*	4 *(2.1)*	10 *(5.4)*	40 *(6.3)*
Western Europe	465 *(45.8)*	69 *(35.4)*	83 *(44.9)*	313 *(49.3)*
Not reported	47 *(4.6)*	15 *(7.7)*	8 *(4.3)*	24 *(3.8)*

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Supplemental Table 2. Intercorrelations Between Subscales *(Subgroup 1: Have Not Heard of, Not Used)*				
	Unified Theory of Acceptance and Use of Technology (UTAUT) Subscales			
	Effort Expectancy	Performance Expectancy	Social Influence	Facilitating Conditions
Effort Expectancy	1.00			
Performance Expectancy	.577	1.00		
Social Influence	.444	.652	1.00	
Facilitating Conditions	.892	.552	.476	1.00

Supplemental Table 3. Intercorrelations Between Subscales (*Subgroup 2: Heard of, Have Not Used*)				
	Unified Theory of Acceptance and Use of Technology (UTAUT) Subscales			
	Effort Expectancy	Performance Expectancy	Social Influence	Facilitating Conditions
Effort Expectancy	1.00			
Performance Expectancy	.615	1.00		
Social Influence	.400	.561	1.00	
Facilitating Conditions	.828	.749	.411	1.00

Supplemental Table 4. Intercorrelations Between Subscales (*Subgroup 3: Heard of, Have Used*)				
	Unified Theory of Acceptance and Use of Technology (UTAUT) Subscales			
	Effort Expectancy	Performance Expectancy	Social Influence	Facilitating Conditions
Effort Expectancy	1.00			
Performance Expectancy	.549	1.00		
Social Influence	.355	.497	1.00	
Facilitating Conditions	.822	.693	.495	1.00

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Supplemental Table 5. Likert Scale Summaries

Items		All n = 1015 $\bar{x} \pm SD$	Group 1 Never Heard of, Never Used *n = 195* $\bar{x} \pm SD$	Group 2 Heard of, Never Used *n = 185* $\bar{x} \pm SD$	Group 3 Heard of, Have Used *n = 635* $\bar{x} \pm SD$
Performance Expectancy (PE)					
PE1	STROBE will be/is useful in my job	5.35 ± 1.28	5.21 ± 1.26	4.53 ± 1.23	5.64 ± 1.18
PE2	Using STROBE will enable/enables me to write papers more quickly	4.35 ± 1.40	4.63 ± 1.33	3.81 ± 1.13	4.43 ± 1.45
PE3	STROBE will increase/increases my productivity	4.10 ± 1.29	4.37 ± 1.26	3.75 ± 1.04	4.11 ± 1.34
PE4	If I use STROBE, I (will) increase my chances of getting published	5.10 ± 1.21	4.97 ± 1.11	4.53 ± 1.18	5.30 ± 1.20
PE5	If I use STROBE, I will get a more positive peer review of my paper	4.97 ± 1.19	4.89 ± 1.13	4.57 ± 1.14	5.12 ± 1.19
PE6	Using STROBE will make/makes it easier for me to write papers	4.66 ± 1.30	4.74 ± 1.21	4.05 ± 1.14	4.81 ± 1.32
PE7	Using STROBE will improve/improves the quality of my manuscripts	5.35 ± 1.22	5.10 ± 1.21	4.86 ± 1.18	5.58 ± 1.18
PE8	Using STROBE will make/makes my manuscript writing more efficient	4.71 ± 1.30	4.82 ± 1.25	4.31 ± 1.19	4.79 ± 1.32
PE9	Using STROBE increases the quality of my output for the same amount of effort	4.55 ± 1.29	4.65 ± 1.24	4.18 ± 1.16	4.63 ± 1.33
	Subscale Score	4.79 ± 1.02	4.82 ± 1.04	4.29 ± 0.93	4.93 ± 1.00
Effort Expectancy (EE)					
EE1	I think STROBE will be/is easy to use	4.92 ± 1.25	4.80 ± 1.07	4.06 ± 0.99	5.21 ± 1.24
EE2	I think STROBE's content is clear and understandable	5.25 ± 1.14	5.18 ± 1.08	4.42 ± 1.09	5.50 ± 1.06
EE3	I think that it will be/is easy for me to become skillful at using STROBE	5.14 ± 1.12	4.98 ± 1.09	4.61 ± 1.08	5.35 ± 1.08
EE4	Using STROBE will take/takes too much time compared to my normal writing process*	4.44 ± 1.40	4.20 ± 1.24	3.78 ± 1.14	4.70 ± 1.44
EE5	STROBE is so complicated, it will be/is difficult to understand what to do*	5.19 ± 1.28	4.93 ± 1.18	4.37 ± 1.17	5.51 ± 1.22
EE6	Will take/takes too long to learn how to properly use STROBE to make it worth the effort*	5.03 ± 1.36	4.71 ± 1.21	4.14 ± 1.13	5.39 ± 1.32
	Subscale Score	5.00 ± 1.03	4.80 ± 0.90	4.23 ± 0.85	5.28 ± 0.99
Social Influence (SI)					
SI1	My peers will think/think that I should use STROBE	4.29 ± 1.36	4.02 ± 1.18	3.46 ± 1.37	4.61 ± 1.29
SI2	My superiors will think/think that I should use it	4.29 ± 1.46	4.69 ± 1.29	3.31 ± 1.39	4.45 ± 1.41
SI3	The research climate is helpful in promoting the use of reporting guidelines like STROBE	4.70 ± 1.41	3.87 ± 1.33	4.16 ± 1.41	5.11 ± 1.27
SI4	In general, I think that journals will support/support the use of STROBE	5.30 ± 1.17	4.99 ± 1.06	4.53 ± 1.23	5.63 ± 1.04
SI5	I will use STROBE because a lot of scientists in my field are using it	4.24 ± 1.37	3.91 ± 1.23	3.77 ± 1.27	4.48 ± 1.39
	Subscale Score	4.56 ± 1.05	4.29 ± 0.94	3.85 ± 1.02	4.86 ± 0.97
Facilitating Conditions (FC)					
FC1	I have the knowledge necessary to use STROBE	5.32 ± 1.42	4.52 ± 1.55	4.21 ± 1.64	5.89 ± 0.92
FC2	STROBE is compatible with my current workflow	5.13 ± 1.28	4.73 ± 1.30	4.36 ± 1.26	5.47 ± 1.14
FC3	Given the format of STROBE, it will be/is easy to use	5.32 ± 1.42	4.83 ± 1.16	4.30 ± 1.06	5.36 ± 1.13
FC4	Using STROBE fits well with the way I like to work	4.93 ± 1.27	4.78 ± 1.19	4.28 ± 1.19	5.16 ± 1.25
	Subscale Score	5.17 ± 1.16	4.72 ± 1.10	4.29 ± 1.05	5.47 ± 0.92
Behavioral Intention					
BI1	I intend to use STROBE when writing my next manuscript (on an observational study)	5.13 ± 1.46	4.66 ± 1.37	4.25 ± 1.52	5.54 ± 1.32

Items are scored 1 to 7 where 1 is strongly disagree, 7 is strongly agree, and 4 is neutral. **Reverse coded for factor analyses*

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Supplemental Figure 1. Likert Scale Summaries

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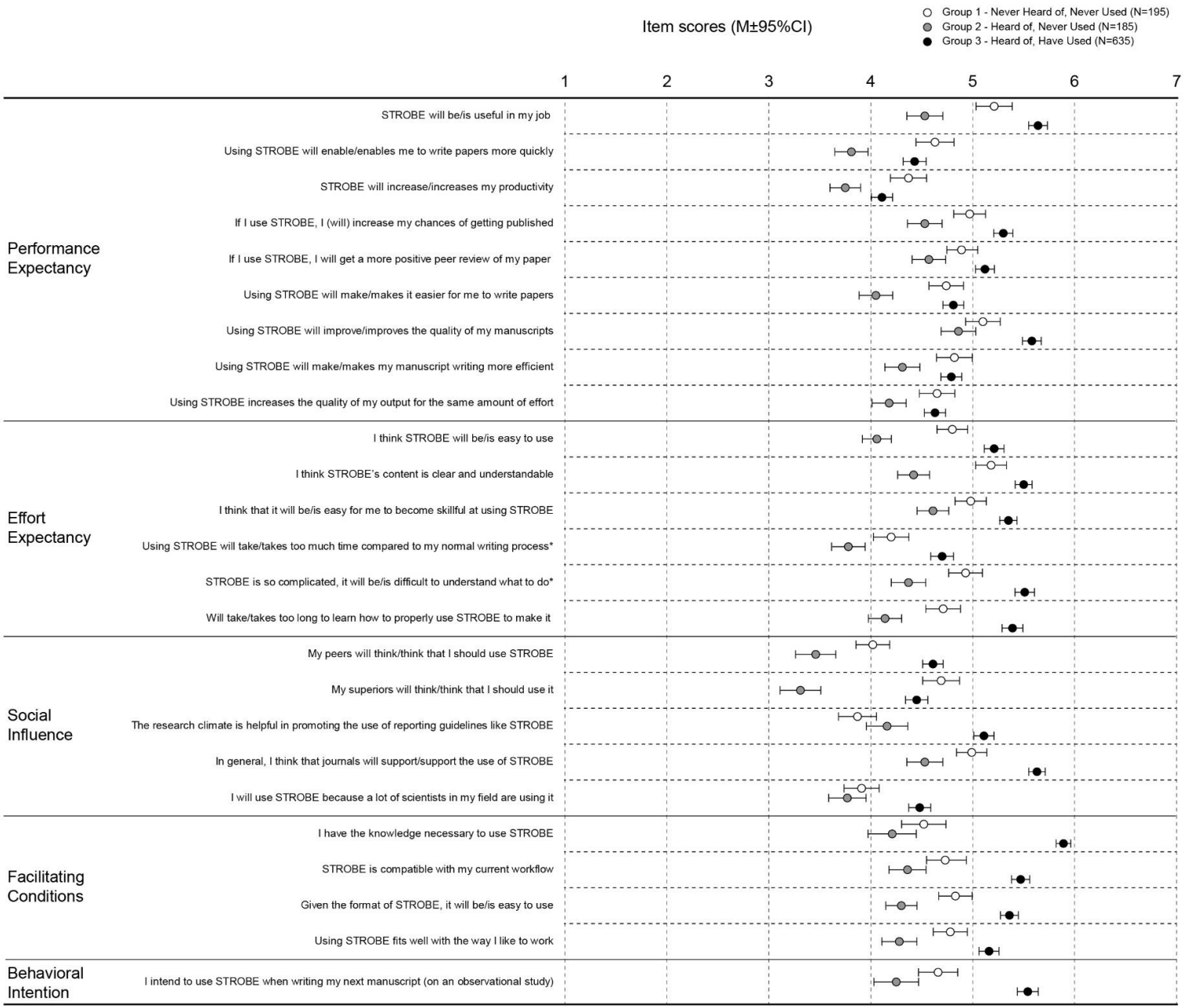

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Supplemental Table 6. Comparisons of Model Fit

Model	Group (N)	χ^2	df	RMSEA (90% CI)[a]	SRMR[b]	TLI[c,d]	CFI[c,d]	AIC
4-Factor Model	Overall *(1015)*	--	--	--	--	--	--	--
	1 *(195)*	776.900	266	.109 (.100, .118)	.087	.818	.838	12593.900
	2 *(185)*	730.552	266	.108 (.099, .117)	.085	.797	.802	12305.731
	3 *(635)*	1582.699	266	.102 (.097, .107)	**.077** [b]	.813	.834	42959.805
4-Factor Model, No FC3	Overall *(1015)*	2940.709	729	.106 (.102, .110)	.082	.808	.831	65783.337
	1 *(195)*	752.951	243	.114 (.105, .123)	.088	.804	.828	12237.318
	2 *(185)*	662.690	243	.107 (.098, .117)	.086	.800	.807	11939.113
	3 *(635)*	1483.440	243	.103 (.098, .108)	**.078** [b]	.811	.834	41606.906
4 Factor Model, No FC3, Method Effects	Overall *(1015)*	1931.539	717	.078 (.074, .082)	**.072** [b]	.895	**.909** [d]	64488.934
	1 *(195)*	489.527	239	.079 (.069, .089)	**.077** [b]	**.904** [d]	**.917** [d]	11915.867
	2 *(185)*	496.303	239	.084 (.074, .095)	**.075** [b]	.877	.894	11734.401
	3 *(635)*	927.172	239	.076 (.071, .081)	**.070** [b]	.897	**.911** [d]	40838.666
3 Factor Model, No FC3, Method Effects	Overall *(1015)*	2151.713	729	.084 (.080, .088)	**.076** [b]	.879	.893	64745.988
	1 *(195)*	513.034	243	.082 (.072, .092)	**.078** [b]	.899	**.911** [d]	11934.217
	2 *(185)*	535.677	243	.089 (.079, .099)	**.078** [b]	.863	.879	11773.649
	3 *(635)*	1186.406	245	.089 (.084, .094)	**.078** [b]	.860	.876	41187.975
3-Factor Model, No FC3	Overall *(1015)*	3185.510	741	.111 (.107, .115)	.087	.790	.812	66073.173
	1 *(195)*	779.617	247	.115 (.106, .124)	.089	.800	.821	12256.876
	2 *(185)*	717.789	247	.113 (.103, .122)	.090	.780	.803	11997.739
	3 *(635)*	1631.759	247	.109 (.104, .114)	.085	.790	.812	41818.557

$\chi 2$: Chi-squared; df: degree of freedom; RMSEA: Root Mean Square Error of Approximation with 90% Confidence Intervals; SRMR: Square Root Mean Residual; TLI: Tucker-Lewis Index; CFI: Comparative Fit Index; AIC: Akaike Information Criterion

a) Within the range (≤ 0.06) indicating a good fit between the model and the data

b) Within the range (≤ .08) indicating a good fit between the model and the data

c) Within the range (≥ .95) indicating a good fit between the model and the data

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d) Within the range ($.90 \leq x \leq .95$) indicating an acceptable fit between the model and the data
*Method Effects addresses the reverse-coded items EE4: EE5: and EE6 and the high covariance between PE4: PE5

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Supplemental Table 6 description

Upon comparison of items, FC3 was dropped from the analysis as it was redundant with the phrasing of EE1. When item FC3 was removed, the overall model converged (Supplemental File 2, Table 6). The covariance between the EE and FC domains also was reduced to .826. Despite this improved covariance by dropping FC3, the intercorrelation was still above .80 which may imply poor discriminant validity and suggest that a more parsimonious model could be obtained (32). Therefore, we decided to see if a three-factor solution would address this further and better fit our data. It did not (Table 4).

Lastly, our attention was brought to the two pairs of items (EE4:EE5 and PE4:PE5) with highly correlated errors. Significant shared variance between items suggests that they covary for reasons other than the shared influence of the latent factor. EE4 and EE5 were both reverse-coded items. Item EE6 was also reverse-coded therefore, method effects [197] needed to account for all-or-none of these relationships [198]. Upon further investigation, EE6 was also highly ranked in terms of large modification indices across subgroups. As the shared error variance between these items was conceptually consistent with domains assessed, our final model was re-specified to free these correlated errors, resulting in the best model fit. (Table 4) To be completely thorough, we combined this paired item approach with the 3-factor approach.

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Additional File 5. Recruitment Materials

EMAIL FOR JOURNAL EDITORS

Dear XX,

I am a Marie Curie doctoral research fellow working on a project about the Strengthening the Reporting of Observational Research (STROBE) reporting guidelines for observational studies. My work within the Methods in Research on Research (MiRoR) network aims to create an educational intervention for teaching research methods and writing. To lay the groundwork for the intervention, I want to first understand researcher's interactions with STROBE.

The goal of this study is to assess author's experiences with and attitudes towards STROBE. As the editorial contact for JOURNAL NAME, I am writing you in hopes that you might extend an invitation to your authors to participate in a brief survey about their experiences with STROBE. A drafted invitation letter is attached for your use should you choose to extend the invitation. The link below will direct you to the online survey for authors.

https://www.surveymonkey.com/r/ObsStudies

This project has received ethical approval from the University of Split. All information provided within the survey is confidential and data will only be presented in the aggregate.

Thank you for your time. Your contribution is greatly appreciated. Please let me know if you have any questions or concerns.

Best,

Melissa Sharp, MPH

Marie Curie Research Fellow

University of Split, *Department of Psychology*

Université Paris Descartes, Sorbonne Paris Cité, *School of Public Health (ED 393)*

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FOLLOWUP EMAIL FOR JOURNAL EDITORS

Dear xx,

I hope this email finds you well. I obtained your editorial contact information as part of previous study looking at author guidelines in relation to reporting guidelines. I am looking for authors of observational studies to take an online survey and your journal was identified as one that publishes such research designs. I have included text below that provides more details about the project as well as a link to the survey itself.

It would be greatly appreciated if you would consider extending an invitation to your authors via email. Alternately or additionally, if you or your journal has a Twitter account, you could retweet and share the survey information found here:
https://twitter.com/sharpmelk/status/996017380353552385

Please let me know if you have any questions or thoughts about this request.

Best,
Melissa

The message that could be circulated is as follows:
***
Dear readers,

We invite you to participate in a study about the Strengthening the Reporting of Observational Research (STROBE) reporting guidelines for observational studies. This study is being led by a doctoral student at the University of Split and Université Paris Descartes, Sorbonne Paris Cité as a part of the European Union-funded Methods in Research on Research (MiRoR) network. This link will direct you to the survey: https://www.surveymonkey.com/r/ObsStudies

The goal of this study is to assess author's experiences with and attitudes towards the STROBE Statement (https://www.strobe-statement.org/). You can participate in this study if you currently work on or within the past 10 years have worked on manuscripts reporting the results of observational studies. You do not need to know anything about the STROBE Statement to participate. Participation includes completing an online survey that will take approximately 10 minutes. Survey questions will be about your interactions with STROBE, your understanding of its use, and your perceptions towards the Statement.

Please feel free to disseminate this message and/or the survey through your networks. Thank you for your time. Your contribution is greatly appreciated.

Best Regards,
xx
On behalf of
Melissa Sharp, MPH; Marie Curie Doctoral Research Fellow
University of Split | Université Paris Descartes, Sorbonne Paris Cité

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msharp@unist.hr | melissa.sharp@etu-paris-descartes.fr | melissaksharp@gmail.com

EMAIL FOR INDIVIDUAL AUTHORS

Dear xx,

We invite you to participate in a study about the Strengthening the Reporting of Observational Research (STROBE) reporting guidelines for observational studies. This study is being led by a doctoral student at the University of Split and Université Paris Descartes, Sorbonne Paris Cité as a part of the European Union-funded Methods in Research on Research (MiRoR) network.

This link will direct you to the survey: https://www.surveymonkey.com/r/ObsStudies

The goal of this study is to assess author's experiences with and attitudes towards the STrenghtening the Reporting of OBservational Studies in Epidemiology (STROBE) Statement (https://www.strobe-statement.org/), a reporting guideline for cohort, case-control and cross-sectional studies. You can participate in this study if, you currently work on or within the past 10 years have worked on manuscripts reporting the results of observational studies (e.g., cohort, case-control, cross-sectional). You do not need to know anything about the STROBE Statement to participate.

Your participation includes completing an online survey that will take approximately 10 minutes. Survey questions will be about your interactions with STROBE, your understanding of its use, and your perceptions towards the Statement.

This project has received ethical approval from the University of Split. All information provided within the survey is confidential and data will only be presented in the aggregate.

Please feel free to disseminate this message and/or the survey through your networks. Thank you for your time. Your contribution is greatly appreciated.

Best Regards,
xx

On behalf of
Melissa Sharp, MPH; *Marie Curie Doctoral Research Fellow*
University of Split Université Paris Descartes, Sorbonne Paris Cité,
msharp@unist.hr | melissa.sharp@etu-paris-descartes.fr | melissaksharp@gmail.com

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EMAIL FOR INDIVIDUAL AUTHORS (SHORTENED)

Dear xx,

I am a Marie Curie Research doctoral fellow working on a project about the Strengthening the Reporting of Observational Research (STROBE) reporting guidelines for observational studies. My work within the Methods in Research on Research (MiRoR) network aims to create an educational intervention for teaching research methods and writing. To lay the groundwork for the intervention, I want to first understand researcher's interactions with STROBE.

The goal of this study is to assess author's experiences with and attitudes towards STROBE. I am writing you to invite you to participate in a brief survey about your experiences with STROBE. You do not need to know anything about the STROBE Statement to participate. This link will direct you to the survey: https://www.surveymonkey.com/r/ObsStudies

This project has received ethical approval from the University of Split. All information provided within the survey is confidential and data will only be presented in the aggregate.

Thank you for your time. Your contribution is greatly appreciated. Please let me know if you have any questions or concerns.

Best,
Melissa Sharp, MPH
Marie Curie Research Fellow
University of Split, *Department of Psychology*
Université Paris Descartes, Sorbonne Paris Cité, *School of Public Health (ED 393)*

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EMAIL FOR INDIVIDUAL AUTHORS

Dear Dr. XX,

I hope this email finds you well. I am looking for authors of observational studies to take an online survey and believe that you *may* be eligible to participate. I have included text below that provides more details about the project as well as a link to the survey itself.

It would be greatly appreciated if you would take the survey (https://www.surveymonkey.com/r/ObsStudies) and/or extend an invitation to others via email (drafted text below). **Average completion time is 6 minutes.** Alternately or additionally, if you have a Twitter account, you could retweet/share the survey information found here: https://twitter.com/sharpmelk/status/996017380353552385

Please let me know if you have any questions or thoughts about this request.

--
Best,
Melissa Sharp, MPH
Marie Curie Research Fellow
University of Split, Department of Psychology
Université Paris Descartes, Sorbonne Paris Cité
INSERM, U1153 Epidemiology and Biostatistics Sorbonne Paris Cité Research Center (CRESS), Methods of therapeutic evaluation of chronic diseases Team (METHODS)

The message that could be circulated is as follows:
Dear xx,

I invite you to participate in a study about the Strengthening the Reporting of Observational Research in Epidemiology (STROBE) reporting guidelines for observational studies. This study is being led by a doctoral student at the University of Split and Université Paris Descartes, Sorbonne Paris Cité as a part of the European Union-funded Methods in Research on Research (MiRoR) network. This link will direct you to the survey: https://www.surveymonkey.com/r/ObsStudies

The goal of this study is to assess author's experiences with and attitudes towards the STROBE Statement (https://www.strobe-statement.org/). You can participate in this study if you currently work on or within the past 10 years have worked on manuscripts reporting the results of observational studies. You do not need to know anything about the STROBE Statement to participate. Participation includes completing an online survey that will take less than 10 minutes.

Please feel free to disseminate this message and/or the survey through your networks. Thank you for your time. Your contribution is greatly appreciated.

Best Regards,
xx
On behalf of
Melissa Sharp, MPH; Marie Curie Doctoral Research Fellow
University of Split | Université Paris Descartes, Sorbonne Paris Cité

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FOLLOWUP EMAIL FOR INDIVIDUAL AUTHORS

Dear xx,

Apologies if you saw my previous email and are one of the nearly 1000 people that took the online survey. (Thank you!) Please feel free to let me know or ignore this message.

If not…I am looking for authors of observational studies to take an online survey and believe that you *may* be eligible to participate. I have included text below that provides more details about the project as well as a link to the survey itself.

It would be greatly appreciated if you would take the survey (https://www.surveymonkey.com/r/ObsStudies) and/or extend an invitation to others via email (drafted text below). **Average completion time is 6 minutes.** Alternately or additionally, if you have a Twitter account, you could retweet/share the survey information found here: https://twitter.com/sharpmelk/status/996017380353552385

Please let me know if you have any questions or thoughts about this request.

--

Best,

Melissa Sharp, MPH

Marie Curie Research Fellow

University of Split, Department of Psychology

Université Paris Descartes, Sorbonne Paris Cité

INSERM, U1153 Epidemiology and Biostatistics Sorbonne Paris Cité Research Center (CRESS), Methods of therapeutic evaluation of chronic diseases Team (METHODS)

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Please feel free to disseminate this message and/or the survey through your networks. Thank you for your time. Your contribution is greatly appreciated.

Best Regards,

xx

On behalf of

Melissa Sharp, MPH; Marie Curie Doctoral Research Fellow

University of Split | Université Paris Descartes, Sorbonne Paris Cité

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SPACEHOLDER FOR DANA'S PAPER (1/ 9)

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SPACEHOLDER FOR DANA'S PAPER (2/9)

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SPACEHOLDER FOR DANA'S PAPER (3/9)

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SPACEHOLDER FOR DANA'S PAPER (4/9)

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SPACEHOLDER FOR DANA'S PAPER (5/9)

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SPACEHOLDER FOR DANA'S PAPER (6/9)

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SPACEHOLDER FOR DANA'S PAPER (7/9)

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SPACEHOLDER FOR DANA'S PAPER (8/9)

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SPACEHOLDER FOR DANA'S PAPER (9/9)

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Additional File 2. Qualitative Assessment Non-Specific Content Distilled

Information below is the distilled suggestions from the STROBE-extensions which were coded as non-specific in the qualitative assessment detailed in Chapter One. They are all "some key items to consider adding" to the original STROBE checklist item.

Intro: Title and abstract (1)
- The study design (e.g., cohort, cross-sectional, case-control).
- Information about the data source (e.g., bibliometric, patient registry, etc.)
- Information about the timing of data collection (e.g., longitudinal, date ranges)
- The main results (e.g., "found high rates of x", ")

Intro: Background and Rationale (2)
- Cite/discuss systematic reviews and meta-analyses - Highlight the gap in research that your work is aiming to fill

Intro: Objectives (3)
- Mention both primary and secondary pre-specified hypotheses. If the report does not cover all, consider explaining why (covered by another publication, reference protocol, etc.)
- If the research is exploratory in nature, state it

Methods: Study Design (4)
- The reason why the specific sampling method was chosen

Methods: Setting (5)
- Formative research findings used to inform the study
- Describe any characteristics of the study settings that might affect the exposures of the participants, if applicable

Methods: Participants (6)
- Define the unit analysed (person, family, twin pairs, department, school, etc.)
- Report the source of participants/clinical specimens (e.g., if the participants were a subset from a larger study)
- Clearly describe sampling frame and strategy
- Report inclusion and exclusion criteria (psychological, dietary/nutritional, physiological, clinical conditions) etc. especially if they might affect key indicators or surrogate endpoints (e.g., biomarkers)
- Clear definitions of exposed and nonexposed cohorts. Justify the choice of comparator
- Describe the conditions where subjects may change from one cohort to the other
- Describe whether treatment is restricted to new starts or encompasses all individuals with ongoing treatment
- Describe incentives for participation and recruitment

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- Describe follow-up methods and timepoints of assessemnt of serial follow-up
- For matched studies, describe matching criteria and the reasons (epidemiological and clinical) for this criteria
- For matched studies, detail the number of matched individuals per subject (e.g, number of controls per case)

Methods: Variables (7)
- The start and stop of any therapies or treatment
- The mean, median, and range for each exposure group
- The theoretical/conceptual rationale for the design of the intervention/ exposure
- The intervention/exposure described with sufficient detail to permit replication
- Description of potential confounders (other than epidemiological variables) and correlates
- For hypothesis-driven studies, the putative causal structure (consider a diagram like a directed acyclic graph)
- Sources of data and methods of assessment for each variable
- Comparability of assessment methods among groups and over time
- The level of organization at which each variable was measured

Methods: Data/Measurement (8)
- The validity/reliability of the assessment methods (survey development, validation, and evaluation)
- Timing, timepoints, and length of followup
- Any blinding of participants or data collectors
- Any methods used to support data integrity or the accuracy of the data (e.g., double-entry, methods for "data cleaning")
- Any methods used to enhance the quality of measurements
- Comparability of assessment methods among groups and over time

Methods: Bias (9)
- Describe the nature and magnitude of any potential biases and explain what approach was used to deal with these (e.g., discovery, ascertainment, selection, information, etc.)
- For quantitative outcome variables, specify if any investigation of potential bias resulting from pharmacotherapy was undertaken
- Report how bias in dietary or nutritional assessment was addressed, e.g., misreporting, changes in habits as a result of being measured, or data imputation from other sources

Methods: Study Size (10)
- Any unique restrictions placed on the study sample size
- Different determinants of sample size for different levels of organization (e.g., parent and offspring, family unit, etc.)
- How non-independence of measurements was incorporated into sample-size considerations
- The parameters, assumptions, methods, and effect size justification of the sample size calculation

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Methods: Quantitative variables (11)
- If applicable, describe how effects of treatment were dealt with

Methods: Statistical Methods (12)
- All statistical methods for each objective at a level of detail sufficient for a knowledgeable reader to replicate the methods
- Clearly indicate the unit of analysis (e.g., individual, team, family, unit, etc.)
- The validity and reliability of any measurements used - If any internal/external validation was done
- How items/variables were selected/introduced into statistical models
- Data analysis software version and options/settings used
- If the same association under study has previously been published, consider using a similar analysis model and definitions for replicative purposes
- Methods used to:
– Assess robustness of analyses (e.g, sensitivity analyses, quantitative bias assessment) – Adjust for measurement error, (i.e., from a validity or calibration study)
– Account for (complex) sampling strategy (e.g., estimator used)
– Address missing data or loss-to-follow-up
– Control for confounding
– Manage and correct for for non-independence (i.e., relatedness) of data
– Address multiple comparisons or to control for the risk of false positive findings
– Assess and address population stratification
– Identify and address repeated measures on subjects – Clean data
– Match, combine, or link data (person/individual/dataset level linkages) and an evaluation of the linkage quality

Results: Participants (13)
- The reasons for loss of data and/or participants at each stage
- The number of individuals excluded based on missing, incomplete, or implausible data
- The estimated design effect for outcomes of interest
- The use of an organizational structure diagram if you have dealing with related or matched participants (e.g., families, cases and controls)

Results: Descriptive Data (14)
- Give the distribution of measurements (including mean, median, range and variance)
- Average treatment duration for all groups
- Report any subjects that changed exposure status, those eligible for follow-up, those who completed follow-up and numbers remaining on treatment and/or in analysis at relevant time points during follow-up (eg, at yearly intervals)
- Summarize follow-up time (e.g, average and total amount), if appropriate to the study design
- Consider presenting number exposed, outcomes, and relatives risks as tabular or graphical presentations
- Give unweighted sample size and percentages
- Discuss estimated population proportions or means with estimated precision (e.g., 95% confidence interval)

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Results: Outcome Data (15)
- Consider the use of a tabular or graphical presentation (Kaplan–Meier, cumulative incidence plot) of the outcome over time for the exposed and comparison cohort
- Report outcomes at all relevant levels of organization
- For proportions and rates, report the numerator and denominator
- For continuous outcomes, report the number of observations and a measure of variability

Results: Main Results (16)
- Present both relative risks and absolute measures such as event rates per person-time, risk differences or numbers needed to treat/numbers needed to harm
- Present results per time period of follow-up, if applicable, so as to indicate any time dependence of the association between exposure and outcome
- Report methods to standardize the results from the study sample to the target population
- For assessments involving >1 rater, interrater reliability should be reported
- Give unadjusted estimates and, if applicable, adjusted estimates and their precision (e.g, 95% confidence interval). Make clear which confounders and interactions were adjusted. Report all relevant parameters that were part of the model
- Report results of any adjustments for multiple comparisons

Results: Other Analyses (17)
- Consider performing analyses to explore possible effect modification
- Consider performing sensitivity/robustness analyses for differing definitions of exposure and outcome or different statistical models
- If detailed results are available elsewhere, state how they can be accessed
- Report exclusion of misreporters, outliers, and data imputation

Discussion: Key Results (18)
- No non-specific items to add

Discussion: Limitations (19)
- Describe the main limitations of the data sources and assessment methods (e.g., laboratory or collection procedures) used and implications for the interpretation of the findings
- Discuss implications of misclassification bias, unmeasured/residual confounding, missing data, and , selection factors for treatment, and changing eligibility over time
- Discuss the implications of using data that were not created or collected to answer the specific research question(s)

Discussion: Interpretation (20)
- Give an interpretation of results in terms of a priori biological plausibility

Discussion: Generalizability (21)
- No non-specific items to add

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Other: Funding (22)
- No non-specific items to add
Additional Information
- Describe informed consent proceduers and and approval from ethical committee(s)
- If ethical approval was not obtained, explain the reason why not (e.g., public health outbreak response/non-research designation)
- Report any special ethical considerations (e.g., recruitment of minors, children, nenoates, etc.)
- Specify whether data/samples were anonymous, anonymized, or identifiable
- Describe any quality standards used in the conduct of the research
- Provide information on how to access supplemental information, the study protocol, data collection tools, raw data, and/or code
- Describe any conflicts of interest, or lack thereof, for each author
- Describe the authors' roles (CRediT and/or ICMJE criteria)

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Biographical Note

Melissa K Sharp is an epidemiologist with expertise in observational mixed-methods research. She previously earned a Masters in Public Health in Epidemiology with a Graduate Certificate in Public Health Informatics from Columbia University Mailman School of Public Health and a Bachelor of Science in Psychology with a Minor in Women and Gender Studies from Michigan State University.

This thesis contains work from her Marie Skłodowska-Curie doctoral research fellowship with the University of Split and University of Paris. Funded by the European Union Horizon 2020 research and innovation program, her work was a part of the Methods in Research on Research (MiRoR) Project, an international multidisciplinary network which aimed to reduce waste in research by investigating issues with the planning, conduct, reporting, and review of research. She focused on the reporting of observational studies and how reporting guidelines are used by authors and journals.

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