

REVIEWING THE LITERATURE

After a general research area has been identified, background reading about the topic allows the aim and scope of the research idea to be refined.

3.1 Informal Sources

A starting point for learning about potential areas of inquiry is to read nontechnical documents and other files available on the Internet. Many major public health organizations, such as the World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (CDC), have online factsheets about various diseases and risk factors for disease. Other international governmental organizations (including other agencies of the United Nations) and national governments also have factsheets, brochures, and websites that provide basic demographic, political, economic, geographic, and other health-related information about countries and regions. Newspapers and popular magazines may present compelling nontechnical articles about exposures, diseases, and/or populations that highlight what is interesting and important to know about a topic. The websites of disease advocacy organizations, personal websites, and other media may also be helpful in identifying and refining an important and meaningful study question. Informal sources that have not been peer-reviewed are not part of the formal scientific literature, so researchers must be cautious about any claims in these files that contradict more formal sources of scientific information. However, these initial background readings can provide a foundation for understanding the more technical scientific literature that will be read later as part of a thorough literature review.

3.2 Statistical Reports

When defining specific exposures, diseases, and/or populations of interest, it may be helpful to identify relevant statistics, such as the estimated prevalence of the exposure in a particular country, the annual global incidence of a disease, or the size of a particular population.

- For regional- and country-level population measures and comparisons, the World Bank's World Development Indicators database provides information about a wide range of topics.
- Additional statistical estimates can be found in the annexes of the annual reports issued by United Nations agencies, such as the World Health Organization's *World Health Statistics*, UNDP's *Human Development Report*, and UNICEF's *State of the World's Children*.
- The annual reports of private organizations like the Population Reference Bureau and the American Cancer Society include up-to-date statistical estimates and projections.
- For information about states, provinces, counties, cities, and other smaller governmental units, contact the relevant public health departments. This may be the best source of information about **vital statistics** like birth and death rates and other demographics indicators.
- The best place to find very specific information about health-related exposures and diseases may be in published scientific articles.

Although statistics may be readily found on the Internet, few are supported by citations and information about who collected the original data, how the data were collected, and even when the data were collected. When possible, trace the statistic back to its original source rather than relying on secondary reports. If the source of data is not clear, the statistic may not be trustworthy.

3.3 Abstract Databases

An **abstract** is a paragraph-length summary of an article, chapter, or book. Abstracts for journal articles in the health sciences usually provide a brief description of the study population (such as the sample size and the location of the study), the study design, and the key findings of the study. **Abstract databases** allow researchers to search thousands of abstracts for keywords or other terms. A careful and comprehensive search of at least one major abstract database is the most important component of a careful literature search.

Some abstract databases are available to the public at no cost. The most popular publicly available health science database is **PubMed**, which is a service of the U.S. National Library of Medicine of the National Institutes of Health, and provides access to more than 25 million abstracts. European PubMed Central (Europe PMC) is similar to PubMed but has more extensive coverage of European and Canadian journals. SciELO (the Scientific Electronic Library Online) and LILACS (Literatura Latino Americana e do Caribe em Ciências da Saúde) primarily focus on literature from Central and South America, and they allow searches to be conducted in English, Spanish, and Portuguese. African Journals Online (AJOL) allows searches of journals published by African institutions. Several other national and regional databases allow for searching in other languages.

Other health abstract databases are available from libraries via subscription, such as:

- CAB Direct, from the Centre for Agriculture and Biosciences International (CABI), which focuses on agriculture and nutrition

- CINAHL, the Cumulative Index to Nursing and Allied Health Literature
- Embase, a product of the large publishing company Elsevier
- ERIC, the Educational Resources Information Center, which is sponsored by the U.S. Department of Education
- MEDLINE, which is sponsored by the U.S. National Library of Medicine and features only journals that have applied for inclusion and passed through a review process
- PsycINFO, which is supported by the American Psychological Association (APA)
- Scopus, from Elsevier
- Web of Science, from the company Thomson Reuters, which includes journals from the sciences, social sciences, and arts and humanities as well as conference proceedings in the sciences

Additional search options are provided by the Cochrane Library and by companies that produce, manage, and distribute online journal collections such as EBSCO (which provides a variety of discipline-specific EBSCOhost databases like SPORT-Discus, which has extensive coverage of sports studies research), JSTOR, Lexis-Nexis (which focuses on business and law), Ovid, and ProQuest. Some publishing companies offer databases of the articles published in their journals, including LWW Journals Online (from Lippincott, Williams & Wilkins, an imprint of the large publisher Wolters Kluwer), SAGE Journals Online, Elsevier's ScienceDirect, SpringerLink, Taylor & Francis Online, and the Wiley Online Library. A librarian can provide information about the best databases to use for particular research questions.

Even though these databases cover thousands of journals, many peer-reviewed journals are not included in any of them, especially journals not published in English. Therefore, a supplemental search with a general search engine like Google Scholar may be helpful for identifying additional relevant abstracts. A supplemental search is especially important when the topic of interest is narrow enough to yield only a small or moderate number of hits.

Abstract databases can be searched with keywords or MeSH terms, using Boolean operators like AND, OR, and NOT. Limits can be set so that results include only abstracts with particular publication years, languages, or other selected parameters. Databases can also be searched by article title, author (often using a last name and first initials format, such as "Baker JD" or "Patel AR"), and journal title. See Chapter 22 for more information about how to successfully search abstract databases.

3.4 Full-Text Articles

Abstracts provide a glimpse into the content of an article. However, the only way to truly understand a study is to read the full text of the article. Some articles are available online in their entirety as open-access files on journal websites, in digital archives like PubMed Central, or on the personal websites of the authors themselves. Most university libraries subscribe to thousands of online journals that allow patrons to access electronic versions of articles. Most university libraries also have a limited

number of journals available in print form on their shelves, but a physical search of the stacks is unlikely to be required unless the article is relatively old. Universities often offer free or low-cost interlibrary loan services to affiliates, and these “loans” of journal articles usually take the form of electronic files or photocopies of the article that do not need to be returned. Research institutions from low- and middle-income countries can gain free access to hundreds of journals through the HINARI Access to Research in Health Programme, a service of the World Health Organization.

When none of these options yields a copy of the article of interest, another option is to contact the author directly and ask for a copy. Some database entries include the email addresses for article authors, and many journals provide contact information along with the abstract for the articles on their websites. At minimum, many database entries and most journal articles list the institutional affiliations of authors, and an Internet search for those institutions—or a search of social networking websites—will often yield contact information. There is no risk in writing to an author to politely request an electronic copy of an article. Most authors will be flattered that someone is interested in their work. At worst, the requester will get no response from the author. At best, the author might send an electronic copy of the article and an offer of further assistance within minutes of the request being sent.

3.5 Critical Reading

Once the researcher acquires a copy of the full-text article, a practical plan of action is to:

- Re-read the abstract.
- Look carefully at the tables and figures, which usually display the most important results.
- Read (or at least skim) the entire text of the article.
- Review the reference list for any additional sources that the reviewer should read.

Chapter 32 provides a checklist for the particular information to look for within each section of a paper that follows the standard outline for scientific reporting.

All articles should be evaluated carefully. Critical reading involves asking a series of questions about the **internal validity** of a study in order to ascertain how well a particular study was designed, conducted, interpreted, and reported and to assess how likely it is that the resulting paper presents the truth about a particular research question in a particular population at a particular place and time. For example, a reader should ask:

- What was the goal of the study? Were the methods appropriate for the goal? Was the main study question answered?
- Were the methods used to collect and analyze data scientifically valid? For example, did a study collecting new survey data select an appropriate sample population, recruit an adequate number of participants, use a validated questionnaire, and apply appropriate statistical tests? Was the study conducted ethically? Have the authors acknowledged and discussed the limitations of the study methods?

- Do the results seem reasonable? What types of bias in the design, conduct, analysis, and interpretation of the study might have caused some of the results to be inaccurate?
- Are all of the study's conclusions supported by the study's results? If a study was attempting to answer a question about causality, does the article provide sufficient evidence to support that claim?

Critical reading also requires questioning the **external validity** of the study, which is the likelihood that the results of a study with internal validity can be generalized to other populations, places, and times. Questions about external validity (also called **generalizability**) might include ones like:

- How well do the findings of this study fit with existing knowledge about the topic? Have **replication studies** in diverse populations supported the generalizability of the findings?
- For experimental studies, how likely is it that the observations from the trial would occur in everyday life outside laboratory conditions?
- To what other populations might the results apply? For example, are results from a study in Canadian men ages 30–49 likely to be applicable to Mexican men ages 30–49, Canadian women ages 30–49, and/or Canadian men ages 50–69?

3.6 Annotated Bibliographies

One of the common approaches used to track the articles identified during a literature review is the creation of an **annotated bibliography**. An annotated bibliography includes, at minimum, a full reference for the document being reviewed and a brief summary of the article or report. Researchers may also find it helpful to take notes about how a published report relates to the proposed new research project. The goal is not to replicate a document's abstract. The goal is to summarize the content most pertinent to the new investigation.

Some annotated bibliographies for a new research project are compiled in a document file where summary paragraphs can be typed in for each source. Some reference management software programs include a field where personal notes can be added to a record, and this can be used to log annotations about a document. Sometimes it is easiest to extract the most relevant information from each source into a spreadsheet, with separate columns for essential details about the study design, study population, definitions used for exposures and outcomes, statistical results, study limitations, interpretations, and/or the reader's evaluations of internal and external validity.

3.7 What Makes Research Original?

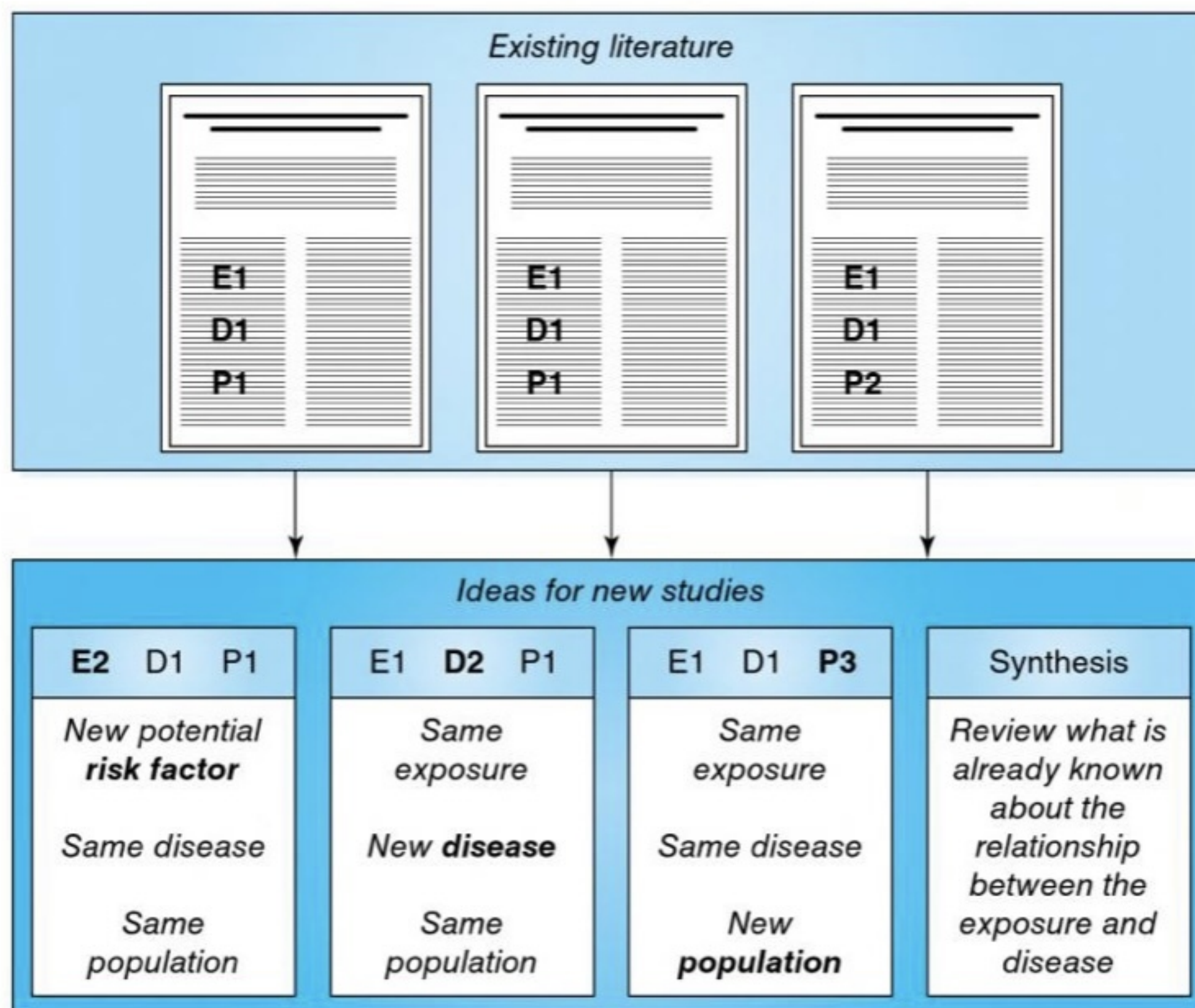
Every researcher is looking for an “original” topic. This can be a paralyzing prospect for anyone who thinks that originality requires the discovery of a newly emergent disease in a previously unrecognized people group on a remote island.

Such remarkable discoveries are occasionally featured in the news, but even a cursory review of the literature proves that the vast majority of original research is far less dramatic. For a research project to demonstrate **originality**, it needs to have only one substantive difference from previous work. That could be a new exposure of interest, a new disease of interest, a new source population, a new time period under study, or a new perspective on a field of exploration.

Figure 3-1 illustrates this point. An original research project could look at a new potential risk factor (E_2) for a disease (D_1) that is already well studied in a population (P_1). It could look at whether an exposure (E_1) that is known to increase the risk of one disease (D_1) in a population (P_1) also increases the risk of a second disease (D_2). Or it could see whether the association between an exposure (E_1) and a disease (D_1) observed in one or more parts of the world (P_1 and P_2) is also true in another part of the world (P_3). Or a research project using a meta-analysis approach could aim to synthesize everything that has already been published on the association between an exposure (E_1) and an outcome (D_1).

For example, a literature review might find that several studies have shown that older adults (the population) who take 30-minute walks several times a week (the

FIGURE 3-1 Ideas for New Studies



exposure) score higher on memory tests (the disease or outcome) than adults who do not routinely walk for exercise. A proposed new study could ask:

- Is playing table tennis (a new exposure) effective at improving memory in older adults (the same outcome and population)?
- Do older adults who walk several times a week (the same exposure and population) improve their balance (a new disease or outcome)?
- Does walking (the same exposure) improve memory (the same outcome) in children (a new population)?

Once a researcher identifies a possibly novel research question, a more complete review of the literature can help confirm that the area has not already been examined.

Some new investigators struggle to find a research topic that has not been previously explored in the literature, but a recognition that most research is about incremental steps forward opens up infinite options for new explorations. The main challenge when selecting a research question is the need to limit each research project to just one focused area. Very few studies create entirely new areas of research, but every research project has the possibility of contributing to advancing a field of research when it addresses **gaps in the literature** (that is, missing pieces of information that a new study could fill) and builds on previous work.