Question Development and Search Strategies

Co-Op Students
Department of Statistics

Bill Poluha
Sciences and Technology Library
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Goal

- Students will have a clear understanding of the benefits of carrying out a comprehensive literature search for research
Case

You got the flu last winter and you are wondering whether you should get a flu shot next winter. Are flu shots really effective in avoiding the flu?

Where do you begin?  
http://www.flu.gov/
Pre-Test

- Let’s see where your knowledge about question development and search strategies is at
- The following is a brief self-assessment:
  https://www.surveymonkey.com/s/pretestsearch
- No marks are assessed
- Your answers are anonymous
- You can obtain a copy at the end of the test for comparison with the post-test
What Are Research Questions?
Objective 1

Analyze

www.medicalwebsitedesign.info
Given a question formulated in preparation for a literature search, you will be able to differentiate background and foreground questions listing two characteristics specific to each type of question.
Ask the Right Question

“Paper or plastic?”

copyright The New Yorker
Types of Questions

- A two-model framework can be used to frame your question:
  - Background Questions
  - Foreground Questions

- This framework helps you to identify appropriate resources to better answer your question
Background Questions

topics + definitions

facts

Background Questions

Examples:

*How fast can a cheetah run?*
*Who wrote the “Iliad”?*
*Why is the sky blue?*
Case

Begin your research on the effectiveness of flu shots for flu avoidance.

Learning Activity

• Identify two background questions related to the case
• Record them on your worksheet

http://www.flu.gov/
Foreground Questions

- Research based
- Specific – narrowly focused
- Data is collected and analyzed to answer the question

umanitoba.ca
Foreground Questions

Examples:

Among elderly, is ginseng effective in preventing upper respiratory tract infections compared to placebo?

Has the introduction of the Euro resulted in trade imbalances in European countries?
Questions

experience

Undergraduate  Graduate  PhD/Researcher
## Exercise #1

### Rubric

### 1. Background and Foreground Differentiation

<table>
<thead>
<tr>
<th>Objective</th>
<th>Assessment</th>
<th>Value</th>
<th>Aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Given a question formulated in preparation for a literature search, the student will be able to differentiate background and foreground questions, listing two characteristics specific to each type of question.</td>
<td>Three questions are presented that have at least one background and one foreground question. The student must identify the type of question and list two characteristics specific to the type of question.</td>
<td>2.0</td>
<td>Type of question correctly identified</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>Type of question incorrectly identified</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td>Two characteristics of the type of question correctly listed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>One characteristic of the type of question correctly listed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>No characteristics identified</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>Characteristics incorrectly identified</td>
</tr>
</tbody>
</table>

Maximum for each question: 4.0  
Total value for this section: 12.0
Exercise #1
Background and Foreground Question Differentiation

Please go to the following link to complete the exercise:

https://www.surveymonkey.com/s/RQID
Why is it Important to Match the Type of Question to Appropriate Information Resources?
Objective 2

Comprehension
Given a background or foreground question, you will be able to *select* the appropriate information resource using the *Information Retrieval Model* to answer the question, *listing one resource specific to each type of question.*
Background Resources

Monograph

2009 Influenza A/H1N1 Mass Vaccination Strategy: A Multinational Comparison

Review Article

THE LANCET Infectious Diseases
Volume 12, Issue 1, January 2012, Pages 38-44

Articles

Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis

Textbook

ENCYCLOPEDIA OF IMMUNOLOGY
SECOND EDITION

Reference
Definition

Monograph:
A detailed written study of a single specialized topic (distinguished from general studies in which the topic is dealt with as part of a wider subject such as a textbook).

Oxford English Dictionary Online Edition
Definition

Review Article:
An article or book published after examination of published material on a subject. It may be comprehensive to various degrees and the time range of material scrutinized may be broad or narrow, but the reviews most often desired are reviews of the current literature.

Finding Background Resources

http://umanitoba.ca/libraries/
Case

Research on the effectiveness of flu shots for flu avoidance.

Learning Activity

• Find a resource to answer your background questions
Background Resource Search

What type of resource did you find?

Which search resource did you use?

Did you encounter any difficulties searching?

Record your answers on the worksheet and write down any reflections you may have.
The test-negative design for estimating influenza vaccine effectiveness

Michael L. Jackson a,b, Jennifer C. Nelson a,b

a Group Health Research Institute, 1701 Minor Ave, Suite 1000, Seattle, WA, 98132-4444, United States
b Department of Bioinformatics, School of Public Health and Community Medicine, University of Washington, F-605, Medical Sciences Building, Box 357222, Seattle, WA 98195-7222, United States

ABSTRACT

Objective: The test-negative design has emerged in recent years as the preferred method for estimating influenza vaccine effectiveness (VE) in observational studies. However, the methodology behind this design has not been formally developed. Methods: In this paper we develop the rationale and underlying assumptions of the test-negative study. Under the test-negative design for influenza VE, study subjects are all persons whenever care for an acute respiratory illness (ARI). All subjects are tested for influenza infection. Influenza VE is estimated from the ratio of the odds of vaccination among subjects testing positive for influenza to the odds of vaccination among subjects testing negative. Results: With the assumption that (a) the distribution of non-influenza causes of ARI does not vary by influenza vaccination status, and (b) VE does not vary by health care-seeking behavior, the VE estimate from the sample can generalized to the full source population that gave rise to the study sample. Based on our derivation of this design, we show that test-negative studies of influenza VE can produce biased VE estimates. If they include persons seeking care for ARI when influenza is not circulating or do not adjust for calendar time. Conclusion: The test-negative design is less susceptible to bias due to misclassification of infection and its confounding by health care-seeking behavior, relative to traditional case-control or cohort studies. The cost of the test-negative design is the additional, direct-to-test assumptions that incidence of non-influenza respiratory infections is similar between vaccinated and unvaccinated groups, and that influenza VE does not vary across care-seeking strata.

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1. Introduction

Annual estimates of influenza vaccine effectiveness (VE) are needed to monitor the impact of influenza vaccination programs in the face of viral antigenic drift [1]. A typical study endpoint is VE for reducing outpatient visits for influenza, both because this endpoint has public health significance in terms of the burden of influenza [2,3], and because confirming influenza infection in persons who are uncontrolled confounding even after adjusting for measurable fac-

ors [2-4]. In recent years, the “test-negative” study has emerged as a method for removing differences in health care-seeking behavior between vaccinated and unvaccinated persons. In the study design phase, mitigating the need to measure and adjust for care-seeking behavior [1-3,7-10]. In a test-negative study, patients seeking health care for an acute respiratory illness (ARI) are recruited into...
Foreground Resources

Databases

- Subject Specific
  - PubMed.gov
  - Embase
- Multidisciplinary
  - ISI Web of Science
  - Scopus
  - Google Scholar
Finding Foreground Resources

http://umanitoba.ca/libraries
Finding Foreground Resources

Within a **Subject Guide**, look for Articles or Databases by subject to access resources for foreground questions:
Case

Research on the effectiveness of flu shots for flu avoidance.

Learning Activity

• Would you use a multidisciplinary database for this case?
• Why? or Why not?
• Record your answers on your worksheet
## Exercise #2

### Rubric

<table>
<thead>
<tr>
<th>Objective</th>
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<th>Aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Given a background or foreground question, the student will be able to select the appropriate information resource using the <em>information retrieval model</em>, to answer the question listing one resource specific to each type of question.</td>
<td>The same three questions are presented in #1 above have at least one background and one foreground question. The student must select an appropriate information resource that can be used to answer the question.</td>
<td>2.0</td>
<td>Correct information resource selected for given question type</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>Incorrect information resource selected</td>
</tr>
</tbody>
</table>

Maximum value for each question: 2.0
Total value for this section: 6.0
Exercise #2
Selecting an Information Resource

Please go to the following link to complete the exercise:

https://www.surveymonkey.com/s/bfmatch
Objective 3

Evaluation

http://4.bp.blogspot.com/-rQaFHD6NHz0/T1JrXcsKavI/AAAAAAAAAA_u/urKlFcwF7Uk/s1600/evaluation.jpg
Given a foreground question, you will be able to *justify* the database(s) chosen to carry out the search using *3-5 database selection criteria*. 
Database Selection Criteria: Foreground Questions

- Journal Databases (also known as bibliographic databases)
- Subject
  - Specific (e.g. health sciences, physics, architecture)
  - Multidisciplinary (e.g. material science comprises physics, chemistry and engineering)
- Publisher of Database (authoritative)
  - Government (e.g. National Library of Medicine)
  - Academic/Industry organization (e.g. American Chemical Society)
Database Selection Criteria: Foreground Questions

- Time period coverage (current or older)
- Search tools
  - Boolean (logic) operators
  - Thesaurus (helps you find words/phrases for your search)
  - Limit options (time period, language, publication type, etc.)
  - Search set manipulation
  - Save search results to bibliographic management software
Pattern of Literature Publication and Retrieval

Original Work (Data Collection) 2014

Primary

Paper Published 2015
Electronic or Print

Indexed in Current Index to Statistics 2015

Secondary

Retrieval

Publications 2016

Background

Textbooks 2017

Tertiary

Dictionaries, etc. 2018
Case

Research on the effectiveness of flu shots for flu avoidance.

Learning Activity

- Find one database other than the databases listed under Foreground Resources to answer the case question
- Justify your choice with at least 3 database selection criteria
- Enter the information onto your worksheet
## Exercise #3
### Rubric

3. **Justify Database Chosen**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Assessment</th>
<th>Value</th>
<th>Aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Given a foreground question, the student will be able to justify the database(s) chosen to carry out the search using 3 - 5 database selection criteria.</td>
<td>Five foreground questions are presented. Using a list of database selection criteria the student will use at least 3 criteria for each database to justify why the chosen database(s) is (are) appropriate for answering the question.</td>
<td>4.0</td>
<td>Appropriate database(s) chosen to answer question; three justification criterion correctly applied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.0</td>
<td>Appropriate database(s) chosen to answer question; two justification criterion correctly applied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td>Appropriate database(s) chosen to answer question; one justification criteria correctly applied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>Appropriate database(s) chosen to answer question; no justification criteria applied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>Inappropriate database(s) chosen</td>
</tr>
</tbody>
</table>

Maximum for each question: 4.0
Total value for this section: 20.0
Exercise #3
Justify Database Chosen

Please go to the following link to complete the exercise:

https://www.surveymonkey.com/s/dbchoice
What is a Well-Formulated Search Statement?

xspaceculturalcentre.blogspot.com
Objective 4

Application
Given a question with two distinct concepts and associated synonyms within each concept, you will be able to apply appropriate Boolean operators to combine the concepts and synonyms into a well-formulated search statement.
Anatomy of a Question

**Key Concepts:** main topics or subjects in the question.

**Synonyms:** another word meaning the same thing

(e.g. synonym of dirt = earth, soil)

**NOTE:**
It’s important to think of all possible synonyms or related words to help achieve a comprehensive search retrieval.
Anatomy of a Question

Foreground Question:

Is physical therapy effective for treating lower back pain?

Key Concepts
## Example

<table>
<thead>
<tr>
<th>Concept A</th>
<th>Concept B</th>
<th>Concept C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Therapy</td>
<td>Lower Back Pain</td>
<td></td>
</tr>
<tr>
<td>Massage</td>
<td>Lower Back Ache</td>
<td></td>
</tr>
<tr>
<td>Hydrotherapy</td>
<td>Lumbar Pain</td>
<td></td>
</tr>
<tr>
<td>Acupressure</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Case

Research on the effectiveness of flu shots for flu avoidance.

Learning Activity
• Identify key concepts and related synonyms
• Fill in the table on your worksheet

http://www.flu.gov/
How Do We Combine?

- Boolean operators are a system of symbolic logic used to express the relationship between individual terms.

- We use these logical relationships all of the time, even in non-academic related topics.

- Even a search as simple as “Cats and Dogs”
Boolean Tutorials

Take these two brief tutorials located at Colorado State University Libraries:

Boolean:
http://lib.colostate.edu/tutorials/boolean_info.html

Advanced Boolean:
http://lib.colostate.edu/tutorials/booleanadv_info.html

Note: you will need Macromedia Flash v.5 installed on your computer
Search Principles

Well-Formulated Search Statement:
(physical therapy OR massage OR hydrotherapy OR acupressure) AND (lower back pain OR lower back ache OR lumbar pain)
Search Principles

Well-Formulated Search Statement Entered into a Database:

#1 physical therapy OR massage OR hydrotherapy OR acupressure

#2 lower back pain OR lower back ache OR lumbar pain

#3 #1 AND #2
Case

Research on the effectiveness of flu shots for flu avoidance.

Learning Activity
- Combine the case key concepts and their synonyms with their appropriate Boolean operators to create a well-formulated search statement
- Enter the search statement onto your worksheet
Exercise #4
Rubric

### 4. Well-Formulated Search Statement

<table>
<thead>
<tr>
<th>Objective</th>
<th>Assessment</th>
<th>Value</th>
<th>Aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Given a question with two distinct concepts and associated synonyms within each concept, the student will be able to apply appropriate Boolean operators to combine the concepts and synonyms into a well-formulated search statement.</td>
<td>Three foreground question are presented. The student will write out a well-formulated search statement for each search question.</td>
<td>2.0</td>
<td>Synonymous and related terms within each concept combined with the OR Boolean operator enclosed in brackets; each concept set combined with the AND Boolean operator.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0</td>
<td>Synonymous and related terms within each concept combined with OR Boolean operator; each concept set combined with AND Boolean operator.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>Inappropriate Boolean operators applied combining concepts and synonyms/related terms.</td>
</tr>
</tbody>
</table>

Maximum and total value for this section: 6.0
Exercise #4
Well-Formulated Search Statement

Please go to the following link to complete the exercise:

https://www.surveymonkey.com/s/wfssd
Post-Test

Please go to the following link for the post-test.

- The same questions in the pre-test are used
- Compare these results with your pre-test results

https://www.surveymonkey.com/s/posttestsearch
Reflection

- Write your reflections on this learning unit and submit it with your worksheet to the drop box:
  - Describe your assumptions about question development and choosing a database
    - Have they changed?
    - If so how?
  - Discuss your thoughts about the process presented in this learning unit
Reflection

➢ Draw a basic flowchart that describes the process presented in this learning unit and include it with your reflection submission.

➢ Microsoft Word or PowerPoint has shapes and arrows to help you draw a flowchart.

➢ You can also use: [http://www.gliffy.com/](http://www.gliffy.com/)

➢ Here is an example of a basic flowchart and a resource page:


Contact

Should you have any questions, I can be reached at:

Bill Poluha
Librarian
Sciences and Technology Library
Machray Hall, University of Manitoba
Bill.Poluha@umanitoba.ca