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To PICO or not to PICO: What is the question?

Frameworks for developing answerable research questions

PHO Grand Rounds

Tuesday, June 7, 2016 | 12:00 PM – 1 :00 PM

Presented by:
Beata Pach, Susan Massarella, and Minakshi Sharma

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Agenda

1. Background: Research within Public Health
2. Developing a Research Question
3. Frameworks & Practical Examples
4. Questions

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Learning objectives

By the end of the session, you will:

- Understand the importance of and characteristics of good research questions
- Compare and contrast research question frameworks designed for different academic disciplines and study types
- Identify the best frameworks to help you ask answerable public health research questions
- Learn how the chosen framework guides the development of a search strategy

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Research process

1. • Identify an idea/issue
2. • ASK: Develop your answerable question
3. • ACQUIRE: Efficiently find the best evidence
4. • APPRAISE = Critically evaluate the evidence
5. • SYNTHESIZE = Use the results of the appraisal
6. • DISSEMINATE = Knowledge transfer and exchange

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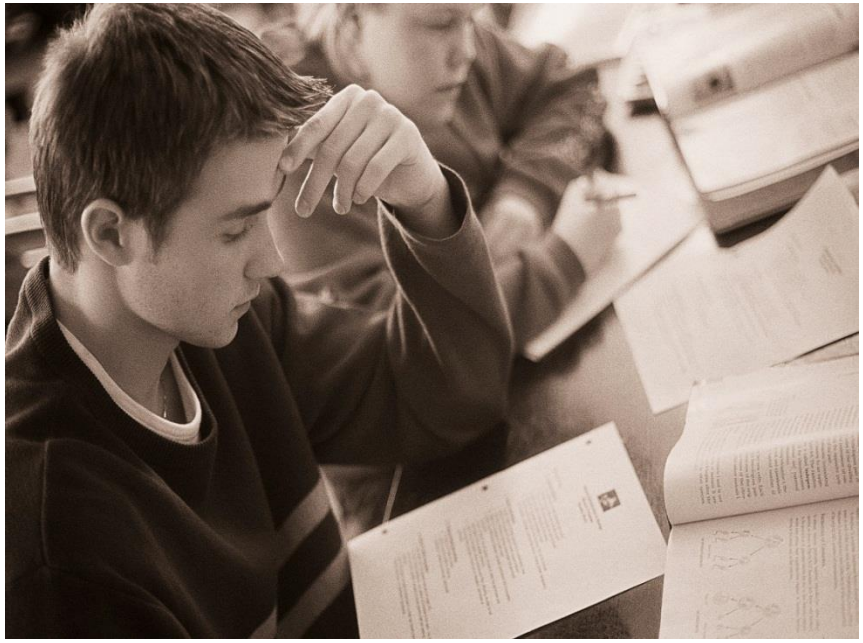
Research within public health contexts

Before you start ask yourself…

- What am I trying to find?
- How comprehensive do I need to be?
- How much time do I have?



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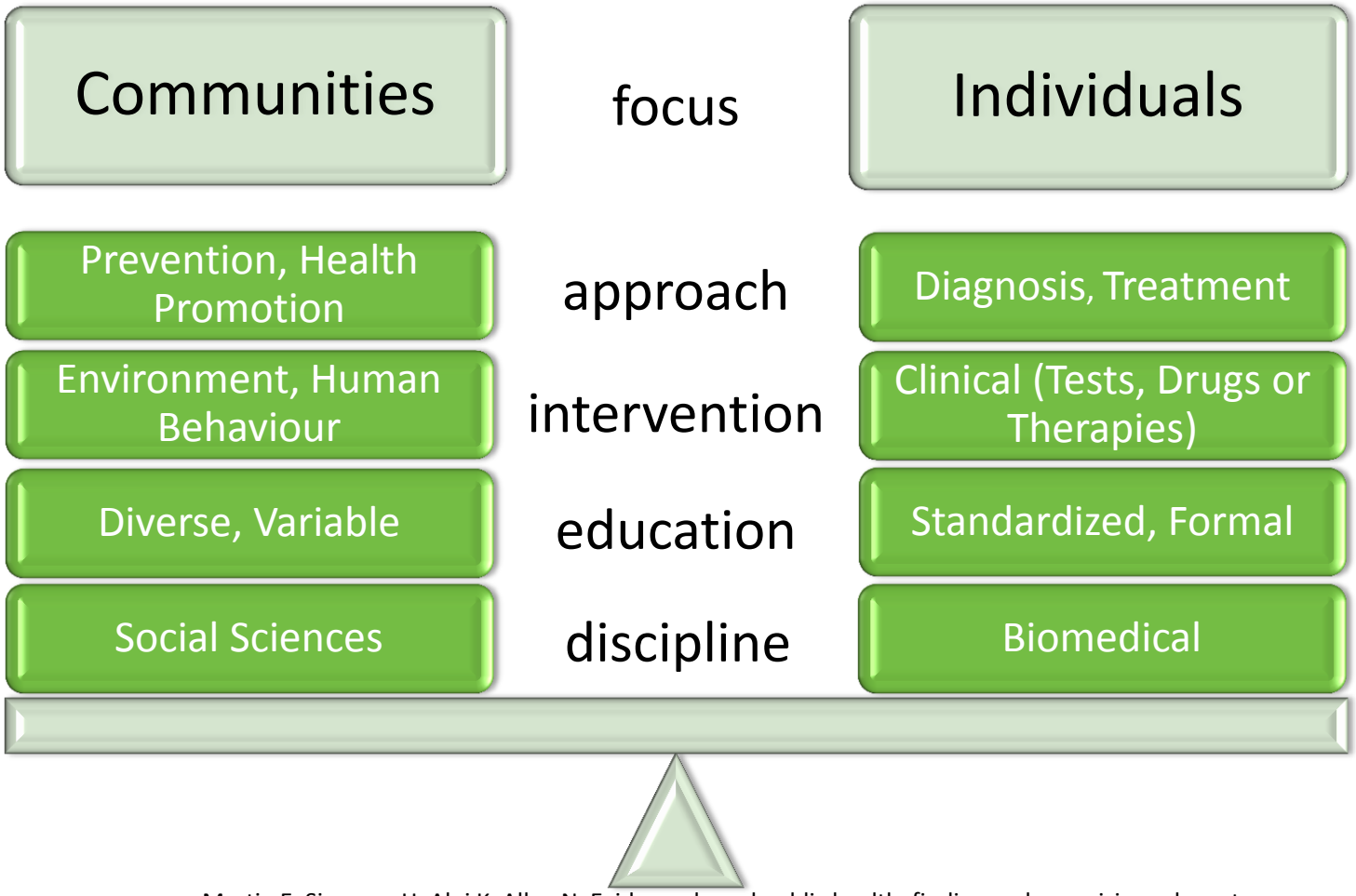
Public Health vs. Clinical Medicine



Martin E, Simpson H, Alpi K, Allee N. Evidence-based public health: finding and appraising relevant resources. Chicago, IL: Medical Library Association; 2004 [2012 Jan 16]. Available from: http://library.umassmed.edu/ebpph/class04_manual.pdf

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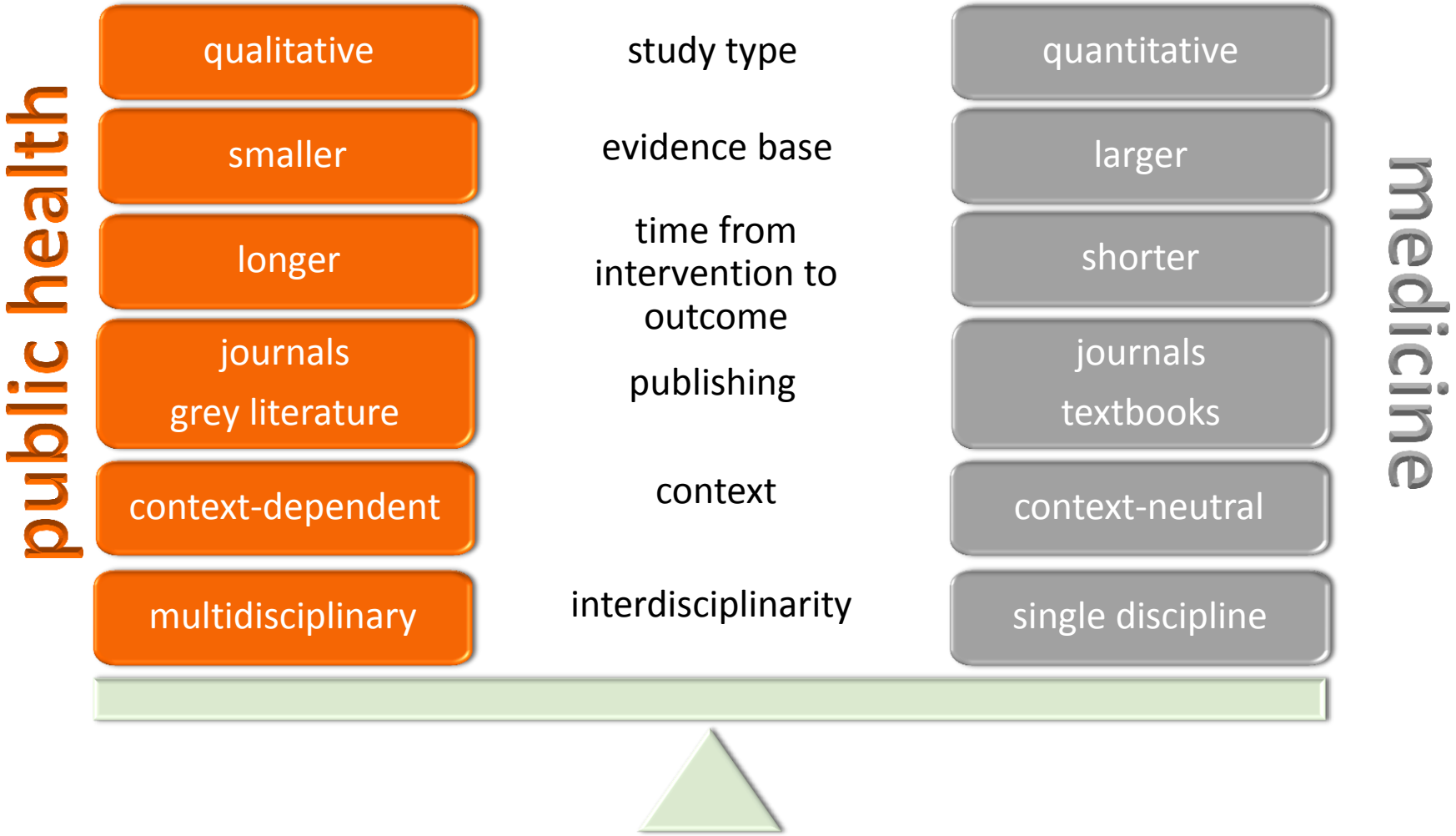
Public health evidence: it's different



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Knowledge domains of public health

Biostatistics
Chronic Diseases & Conditions
Community Health
Communicable Diseases
Disaster Control & Emergency Services
Environmental Health
Environmental Epidemiology
Epidemiology
General Public Health
Global Health
Health Services Administration
Health Promotion & Education
HIV/AIDS
Maternal & Child Health
Nutrition
Occupational Health
Public Health Informatics
Public Health Laboratory Sciences
Public Health Nursing
Social & Behavioral Sciences
Vital Statistics & Surveillance

Evidence-Based Practice for Public Health Project. Evidence-based practice for public health identified knowledge domains of public health [Internet]. Worcester, MA: The Lamar Soutter Library, University of Massachusetts Medical School; 2004 [cited 2016 Jun 7].

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Purpose of research questions

- **Defines the nature and scope of the review**
- **Identifies the concepts (together with the scoping search)**
- **Determines the search strategy and the sources to be searched**
- **Provides guidance for selecting the primary research papers needed**
- **Guides the data extraction and synthesis of the results**

When formulating a review question, ensure that you ask an open question (rather than making a statement)

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Risks of poorly defined research questions

- **Researchers may adopt erroneous or inappropriate study design**
- **Impedes the development of a clear protocol**
- **Readers may fail to understand the objective of the study (negative impact on citations)**
- **Makes it difficult to interpret the study results**
- **Causes readers to question the relevance of results**
- **Jeopardizes publication efforts**
- **Reviewers have difficulty determining if study meets inclusion criteria for systematic review/meta-analysis/meta-syntheses**

Thabane L, Thomas T, Ye C, Paul J. Posing the research question: not so simple. Can J Anaesth. 2009;56:71-9. Available from: http://link.springer.com/article/10.1007/s12630-008-9007-4/fulltext.html?view=classic

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Characteristics of good research questions (FINER)

FINER	Description
F: Feasibility	Sufficient resources (time, staff, access to resources, and funding) Use of appropriate study design Manageable in scope Adequate sample size Trained research staff
I: Interesting	Interesting [to you] as a researcher or collaborator Investigator's motivation to make it interesting
N: Novel	Thorough literature search New findings or extension of previous findings Guidance from mentors and experts
E: Ethical	Following ethical guidelines Regulatory approval from Institutional Review Board
R: Relevant	Influence on practice Furthering research and health policy

Thabane L, Thomas T, Ye C, Paul J. Posing the research question: not so simple. Can J Anaesth. 2009;56:71-9. Available from: http://link.springer.com/article/10.1007/s12630-008-9007-4/fulltext.html?view=classic

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Characteristics of good research questions (SCEPTIC)

Sceptic	Description
S: Significant	Does the answer to your question make a difference? Will it help you write the report?
C: Clear	Each term in the question much be defined and definable
E: Ethical	Following ethical guidelines Regulatory approval from Institutional Review Board
P: Parsimonious	Work from a general question to specific sub-questions and hypotheses
T: Timely	Match the scope of the question to your resources and time frame
I: Imaginative	Think creatively about how to answer the question
C: Contextualized	How will the literature be used? In the population context, to which populations will the question be applicable or generalizable?

** Source: Dr. David Naylor, DOCH class 2002*

Why use frameworks?

Applying the most appropriate framework helps to:

- manage and break down research questions
- identify the key concepts in the question
- develop appropriate search terms
- determine your inclusion and exclusion criteria

Methley AM, Campbell S, Chew-Graham C, McNally R, Cheraghi-Sohi S. PICO, PICOS and SPIDER: a comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. BMC Health Serv Res. 2014;14:579. Available from: http://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-014-0579-0
University Campus Suffolk. Using PICO & PEO: developing your research question and search strategy [Internet]. Ipswich, UK: University Campus Suffolk; [2015] [cited 2016 Jun 7]. Available from: https://my.ucs.ac.uk/Library/Subject-Guides/Nursing,-Midwifery--ODP/PICO-Searching2.pdf

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PICO

PICO	
P	Patient (prevalent/incident cases or both)
I	Intervention (exposure, prognostic factor, or test)
C	Control
O	Outcome you would like to measure or achieve

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PICO example

Topic: HPV vaccination

PICO	
P	Young women (specific country/age range)
I	HPV vaccination programs
C	Pre HPV-vaccination availability
O	Incidence of external genital warts

Question: Are HPV vaccination programs effective in reducing the incidence of external genital warts?

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PICO and its derivatives

Framework	Components
PICO	**P**opulation, **I**ntervention, **C**omparison, **O**utcome
PICOT	**P**opulation, **I**ntervention, **C**omparison, **O**utcome, **T**ime
PICOC	**P**opulation, **I**ntervention, **C**omparison, **O**utcome, **C**ontext
PO	**P**opulation/Phenomena **O**utcome
PESICO	**P**opulation, **E**nvironment, **S**takeholders, **I**ntervention, **C**omparison, **O**utcome
EPICOT	**E**vidence, **P**opulation, **I**ntervention, **C**omparison, **O**utcome, **T**imestamp
PICOTT/ PICOTS	**P**opulation, **I**ntervention, **C**omparison, **O**utcome, **T**ype of question, **T**ype of study design **P**opulation, **I**ntervention, **C**omparison, **O**utcome, **S**tudy type
PECODR	**P**roblem, **E**xposure/Intervention, **C**omparison, **O**utcome, **D**uration, **R**esults
PISCO	**P**opulation, **I**ntervention, **S**etting/**C**omparison, **O**utcome
PIPOH /S	**P**opulation, **I**ntervention, **P**rofessionals, **O**utcome, **H**ealthcare/**S**etting
PCC	**P**opulation, **C**oncept, **C**ontext

Davies KS. Formulating the evidence based practice question: a review of the frameworks. Evid Based Libr Inf Pract. 2011; 6.2, 75-80.
Leeds Institute of Health Sciences. Search concept tools. University of Leeds [cited June 6 2016]. Available from: http://medhealth.leeds.ac.uk/info/639/information_specialists/1500/search_concept_tools
The Joanna Briggs Institute. Joanna Briggs Institute reviewers' manual: 2015 edition. South Australia: The Joanna Briggs Institute; 2015. Available from: http://joannabriggs.org/assets/docs/sumari/Reviewers-Manual_Methodology-for-JBI-Scoping-Reviews_2015_v1.pdf

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Alternate frameworks

Framework	Components
ECLIPSe (formerly CLIP)	**E**xpectation, **C**lient group, **L**ocation, **I**mpact, **P**ractitioner/Professional **Se**rvice
SPICE	**S**etting, **P**erspective, **I**ntervention, **C**omparison, **E**valuation
SPIDER*	**S**ample, **P**henomenon of **I**nterest, **D**esign, **E**valuation, **R**esearch type
CIAO	**C**lient characteristics, **I**ntervention, **A**lternate intervention, **O**utcome **C**ontext, **I**nteraction, **a**nd **O**utcome
PEO	**P**opulation and their problem, **E**xposure, **O**utcome and themes
PS	**P**opulation, **S**ituation
MIP	**M**ethodology, **I**ssues, **P**articipants
PIE	**P**atient/Problem/Population, **I**ntervention/Issue, **E**ffect/Evaluation
CIMO	**C**ontext, **I**ntervention, **M**echanism, **O**utcome
PCC	

Davies KS. Formulating the evidence based practice question: a review of the frameworks. Evid Based Libr Inf Pract. 2011;6(2):75-80. Available from: https://ejournals.library.ualberta.ca/index.php/EBLIP/article/viewFile/9741/8144
University Campus Suffolk. Using PICO & PEO: developing your research question and search strategy [Internet]. Ipswich, UK: University Campus Suffolk; [2015] [cited 2016 Jun 7]. Available from: https://my.ucs.ac.uk/Library/Subject-Guides/Nursing,-Midwifery--ODP/PICO-Searching2.pdf
Wildridge V, Bell L. How CLIP became ECLIPSE: a mnemonic to assist in searching for health policy/management information. Health Info Libr J. 2002;19(2):113-5. Available from: http://onlinelibrary.wiley.comdoi/10.1046/j.1471-1842.2002.00378.x/full

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PISCO

PISCO	
P	Population
I	Intervention
S	Setting (if appropriate)
C	Comparison to Intervention (if appropriate)
O	Outcome you would like to measure or achieve

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PISCO example

Topic: Active Commuting

PISCO	
P	Adults, 19-64 years of age
I	Active commuting
S	Urban areas
C	Comparison to Intervention (if appropriate)
O	Physical health effects

Question: What are the physical health effects of active commuting in adults 19 – 64 years of age living in urban areas?

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PICOT example

Topic: Irradiated beef (PICOT)

PICOT	
Population	Ground beef
Intervention	Irradiation
Control	Non –irradiated beef
Outcome	Presence of e.coli
Time Frame	After one week

Question: One week after irradiating ground beef is there a presence of e.coli?

Fineout-Overholt E Johnson L. Teaching EBP: asking searchable, answerable clinical questions. Worldviews Evid Based Nurs. 2005;2(3):157-60.
Mayo NE, Asano M, Barbic SP. When is a research question not a research question? J Rehabil Med. 2013;45(6):513-8. Available from: http://www.medicaljournals.se/jrm/content/?doi=10.2340/16501977-1150
Mayo NE, Asano M, Barbic SP. When is a research question not a research question? J Rehabil Med. 2013;45(6):513-8. Available from: http://www.medicaljournals.se/jrm/content/?doi=10.2340/16501977-1150

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SPIDER

SPIDER	
S	Sample
P I	Phenomena of Interest
D	Design
E	Evaluation
R	Research Type

Cooke A, Smith D, Booth A. Beyond PICO: the spider tool for qualitative evidence synthesis. Qual Health Res. 2012;22(10):1435-43.

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SPIDER example

Topic: Youth attending Prenatal Classes

Sample	Adolescent parents
Phenomenon of Interest	How prenatal education is perceived? Why?
Design	Questionnaires, surveys, interviews, focus groups, case studies, observations
Evaluation (outcome measures)	views or attitudes or opinions or perceptions or beliefs or feelings
Research Type	Qualitative or Mixed Methods

Question: What are the perceptions of youth who attend prenatal classes?

Cooke A. Smith D. Booth A. Beyond PICO: the spider tool for qualitative evidence synthesis. Qual Health Res. 2012 Oct;22(10):1435-43. doi: 10.1177/1049732312452938.

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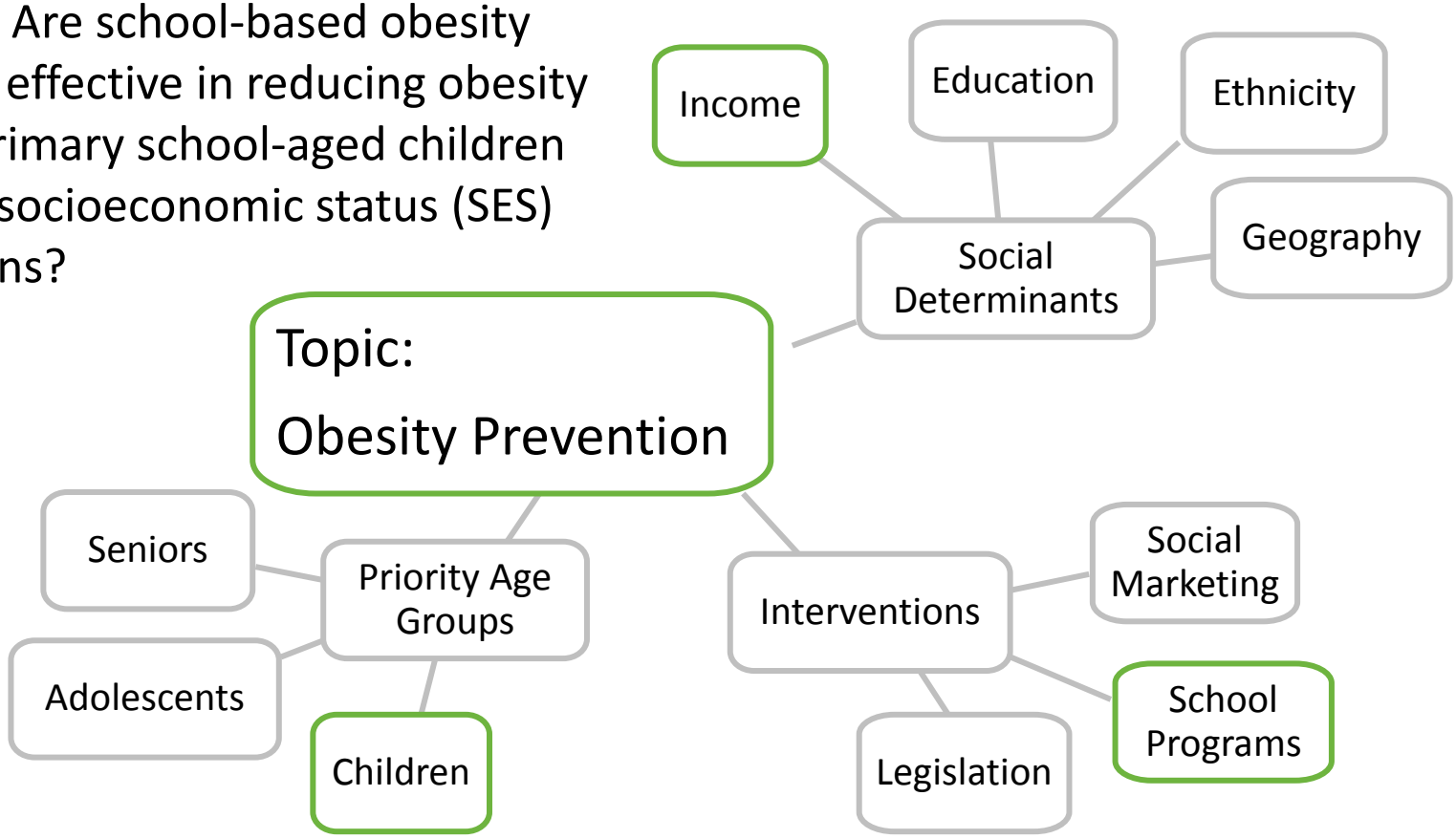
Concept map example

Question: Are school-based obesity programs effective in reducing obesity rates in primary school-aged children from low socioeconomic status (SES) populations?



Online concept mapping tools:
MindManager. Available from: https://www.mindjet.com/
Inspiration Software. Available from http://www.inspiration.com/

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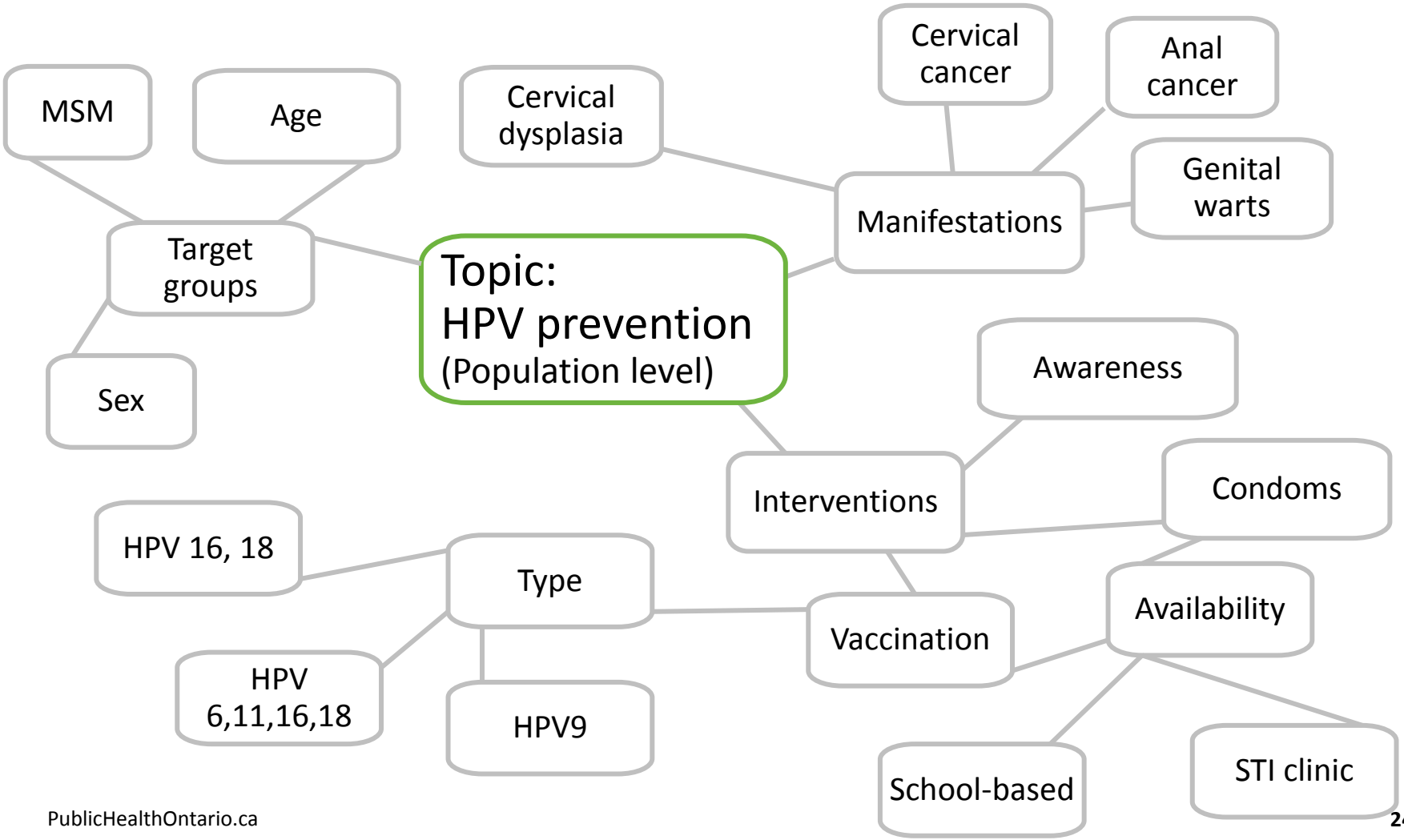
Concept map: brainstorming tool



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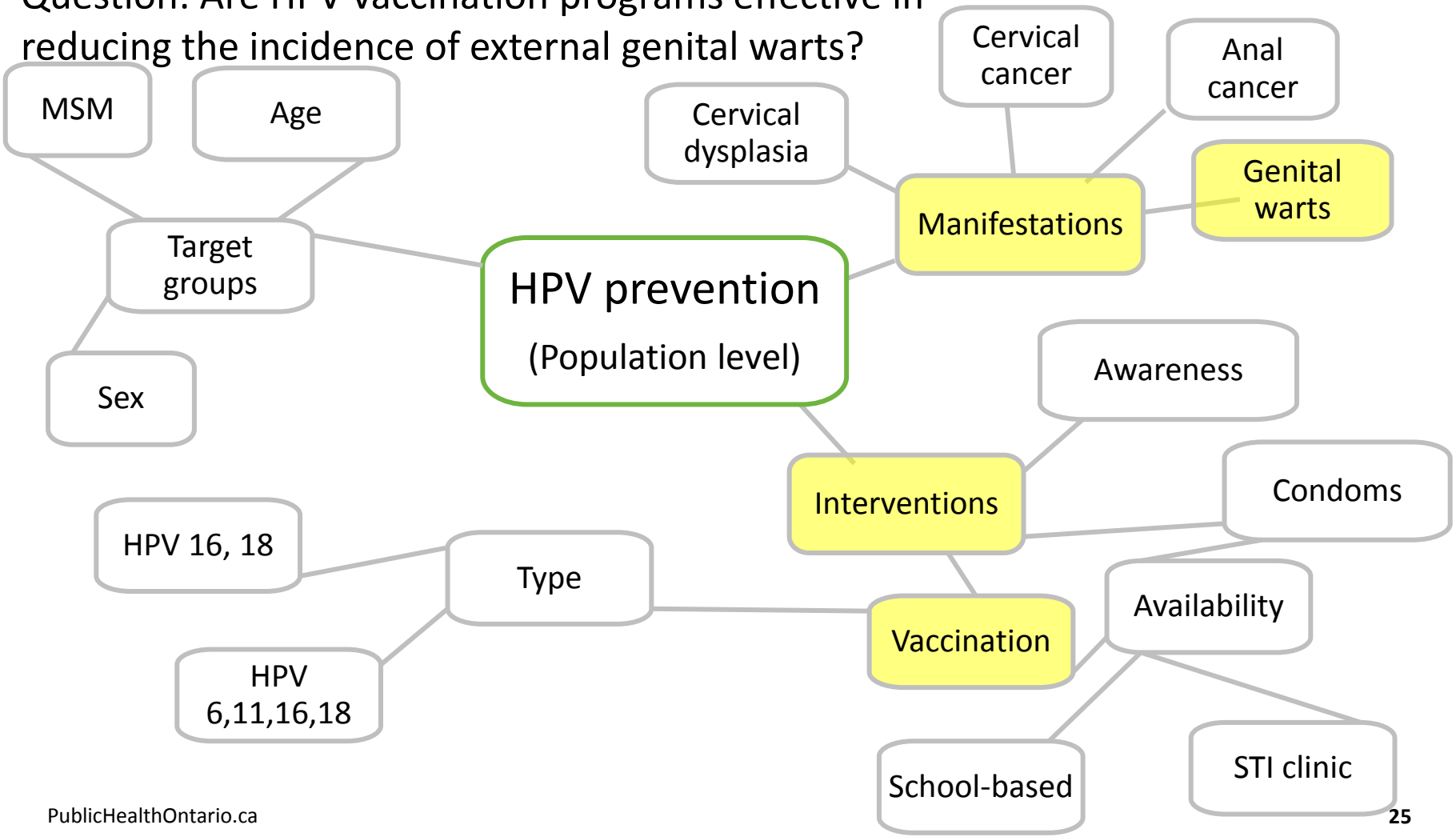
Concept map example

Question: Are HPV vaccination programs effective in reducing the incidence of external genital warts?



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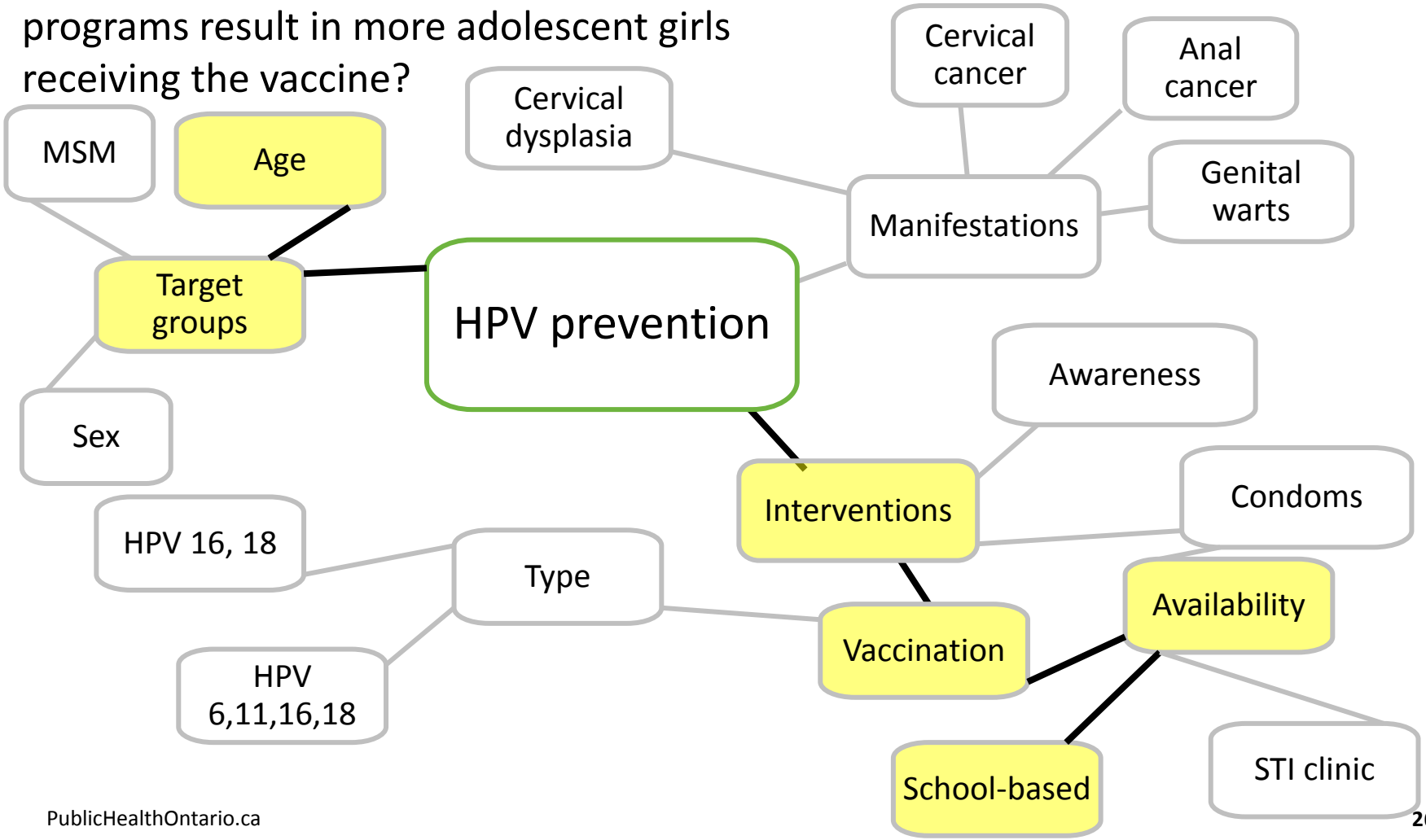
Concept map example

Question: Do school-based HPV vaccination programs result in more adolescent girls receiving the vaccine?



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ECLIPSE example: HPV vaccination uptake

ECLIPSE		
E	Expectation	More girls will get vaccinated if the HPV vaccine is provided free at school
C	Client group	Girls in grades 7 and 8
L	Location	School
I	Impact	Uptake of HPV vaccine
P	Professional	School nurse
S E	Service	Free HPV vaccination at school

Question**:** Do more girls get vaccinated if the HPV vaccine is part of a free school-based immunization campaign?

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Frameworks by discipline or study type

Framework	Discipline	Type of research
PICO, PICOTT, PICOT, PICOC, PECODR, EPICOT, PO, PS, EPICOT	Various (largely based on clinical settings)	Quantitative
PIPOH	Guidelines	Quantitative
PESICO	Speech Language Pathology	Quantitative
PISCO	Public Health	Qualitative/Mixed methods
ECLIPSE (formerly CLIP)	Health policy & management	Evaluation
Concept mapping	Any	Any
SPIDER, PIE	Social Sciences	Qualitative
CIAO	Social Work	Qualitative/Mixed methods
SPICE	Social Sciences	Mixed methods
PEO, PO, PS	Various	Qualitative
CIMO	Management / organization	Qualitative / Mixed methods
MIP	Medical ethics	Qualitative

Davies KS. Formulating the evidence based practice question: a review of the frameworks. Evid Based Libr Inf Pract. 2011; 6.2, 75-80.
Dawes M Pluye P Shea L Grad R Greenberg A & Nie JY. The identification of clinically important elements within medical journal abstracts: patient population problem, exposure intervention, comparison, outcome, duration and results (PECODR). Inform Prim Care. 2007; 15(1), 9-16.

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Next step in research process

1. • **Identify an idea/issue**
2. • **ASK: Develop your answerable question**
3. • **ACQUIRE: Efficiently find the best evidence**
4. • **APPRAISE = Critically evaluate the evidence**
5. • **SYNTHESIZE = Use the results of the appraisal**
6. • **DISSEMINATE = KTE**

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From Framework to Search Strategy (PISCO)

Question: What are the physical health effects of active commuting in adults aged 19 – 64 years living in urban areas?

PISCO Elements	Concept	Search Terms	Indexed Terms (MeSH)
Population	Adults (19 – 64 years of age)	adult* “middle age*”	"Adult"/
Intervention	Active commuting	“active commut*” “active transport*” or (“walk* or “cycl* or “bik*) adj “to work”)	Walking/ or Bicycling/ or Transportation/
Setting/ Comparison	Urban areas	City or cities or urban* or metropolitan or downtown	exp "Cities"/
Outcome	Physical health effects	health effect* or outcome* or benefit* or impact*	"Exercise"/ or "Physical Fitness“/ or Health Status/

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From framework to search strategy (PISCO)

PISCO			
PISCO	#	Searches	Results
Population: Adults	1	"Adult"/ or (adult* or "middle age*").ti,ab.	4848467
Intervention: Active Commuting	2	Walking/ or Bicycling/ or Transportation/methods or ("active commut*" or "active transport*" or "walk* to work" or "cycl* to work" or "bik* to work").ti,ab.	40344
Setting: Cities	**3**	exp "Cities"/ or (city or cities or urban* or metropolitan or downtown).ti,ab.	300952
Outcome: Health outcomes	**4**	"Exercise"/ or "Physical Fitness"/ or Health Status/ or (health effect* or health outcome* or health benefit* or health impact* or fitness or cardiovascular).ti,ab.	565744
Is this a comprehensive search?	**5**	1 and 2 and 3 and 4	225

Note: Search conducted in Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present (June 5, 2016)

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Balancing sensitivity and specificity

The search did not retrieve this article. What modifications would you make?

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PH Concept: Active Commuting

Sample search string for Active Commuting which includes indexed terms (MeSH) and text words:

Bicycling/ or Exercise/ or Health Promotion/ or Jogging/ or Life Style/ or Motor Activity/ or Physical Exertion/ or Physical Fitness/ or Recreation/ or Running/ or Sedentary Lifestyle/ or Skating/ or Walking/ or bicycle$ or bicycli$ or bike$ or biking or cycling or cylist$ or exercis$ or fitness or inline skat$ or in-line skat$ or jog$ or (physical$ adj1 activ$) or (physical$ adj1 fit$) or (physical$ adj1 inactiv$) or recreation$ or roller blad$ or roller skat$ or rollerblad$ or rollerskat$ or run$ or scooter$ or sedentary or skateboard$ or walk$

AND

Automobile Driving/ or Automobiles/ or Motor Vehicles/ or Transportation/ or Travel/ or "Facility Design and Construction"/ or Architectural Accessibility/ or Cities/ or City Planning/ or Environment Design/ or Environment/ or Housing/ or Population Density/ or Residence Characteristics/ or Rural Health/ or Rural Population/ or Suburban Health/ or Urban Health/ or Urban Health/ or Urban Population/ or Urban Renewal/ or Urbanization/ or (automobile$ or car or cars or commute or commuting or drive or driving or pedestrian$ or transit or transport$ or travel$ or vehicle$ or (architectur$ or ((bik$ or bicycl$ or cycl$) adj3 (storage$ or parking or rack$)) or ((bik$ or bicycl$ or cycl$ or walk$ or run$ or jog$ or skat$ or pedestrian$) adj3 (lane$ or path$ or trail$ or signal$)) or built environment$ or commercial density or (communit$ adj3 (characteristic$ or attribute$)) or connectivity or crossing$ or crosswalk$ or ((environment$ or communit$ or urban$ or city or cities) adj3 (plan$ or design$)) or footpath$ or green space$ or green way$ or greenspace$ or greenway$ or infrastructure$ or inner cit$ or intersection$ or (land adj1 use?) or local environment$ or neighborhood$ or neighbourhood$ or physical environment$ or population density or ((proximity or route$ or access$ or distance$) adj3 (retail$ or shop$ or store$ or service$ or school$ or park or playground or facility or facilities or amenit$ or destination$ or mall$ or (bus adj1 stop$) or station$ or arena$ or rink$)) or residential density or ((road$ or street$) adj3 network$) or sidewalk$ or smart growth or sprawl or streetscape$ or ((street$ or road$) adj3 connect$) or street pattern$ or suburb$ or (traffic$ adj3 signal$) or urban density or urban form or urbanis$ or urbaniz$ or walking distance$ or walking path$ or walking trail$ or walkway$ or zoning

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Broader PISCO search strategy

#	Searches	Results	Concepts
1	"Adult"/ or (adult* or "middle age*").ti,ab.	4848467	Population: Adult
2	Walking/ or Bicycling/ or Transportation/methods or ("active commut*" or "active transport*" or "walk* to work" or "cycl* to work" or "bik* to work").ti,ab.	40344	Intervention: Active commuting
3	exp "Cities"/ or (city or cities or urban* or metropolitan or downtown).ti,ab.	300952	Setting: Urban areas
4	1 and 2 and 3	823	

Note: Outcomes are not searched in this strategy.

Search Results from PICO, PICOS & SPIDER

Framework	Step 1	Step 2	Step 3	Relevancy
	Initial Results in Medline	After Title/Abstract Screening	After Full-Text Review	% Relevant (Step 1 > Step 3)
PICO	8158	34	12	0.14
PICOS	113	16	6	5.31
SPIDER	38	14	5	13.12

Methley AM, Campbell S, Chew-Graham C, McNally R, Cheraghi-Sohi S. PICO, PICOS and SPIDER: a comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews. BMC Health Serv Res. 2014;14:579. Available from: http://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-014-0579-0

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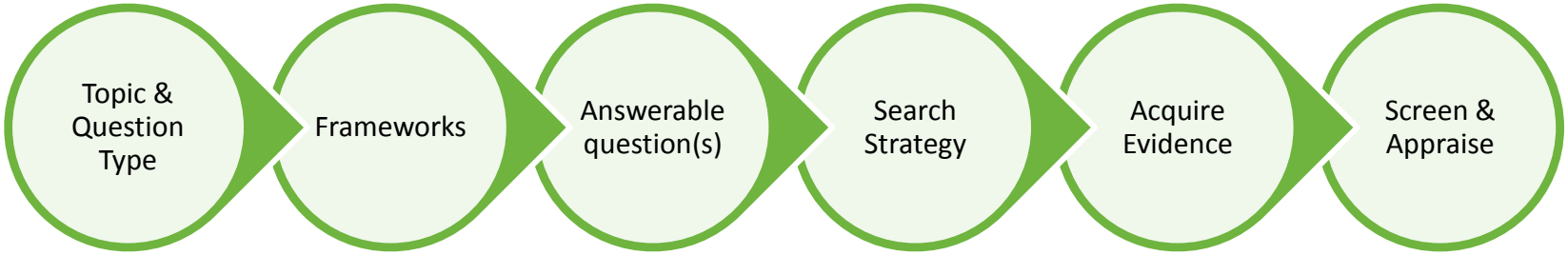
Answerable questions ➢ finding evidence

Knowing what TYPE of question you are asking will help you know what is the best study design to provide evidence to answer your question.



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Questions?

"I will be a fool in question, hoping to be the wiser by your answer."

Shakespeare W. All's Well that Ends Well act 2, sc. 2.

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Checklist

Checklist: Drafting an Answerable Question (FINER & SCEPTIC)

Criteria	Guiding Questions	Yes	No	Unclear
Is the question Feasible?	Sufficient resources in terms of time, staff, and funding?			
	Use of appropriate study design? (esp. for clinical studies)			
	Question manageable in scope?			
	Adequate sample size? (for clinical studies)			
	Skilled or trained research staff (or team)?			
Is it Interesting (for you and for others)?	Is the question interesting for you as a researcher or collaborator?			
	Investigator is motivated to make it interesting?			
Is it Contextualized?	Is the question framed into a broader context? (societal or academic discipline or theoretical model, etc.)			
Is it Novel or Imaginative?	Thorough literature search (to identify if similar studies have already been conducted)?			

Further reading

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